

VOLUME 5

COASTAL FISHES OF THE
**WESTERN
INDIAN
OCEAN**

EDITED BY

Phillip C Heemstra • Elaine Heemstra • David A Ebert • Wouter Holleman • John E Randall

COASTAL FISHES OF THE
**WESTERN
INDIAN
OCEAN**

VOLUME 5

EDITED BY

Phillip C Heemstra

Elaine Heemstra

David A Ebert

Wouter Holleman

John E Randall



Copyright © South African Institute for Aquatic Biodiversity, a National Research Facility of the National Research Foundation (NRF-SAIAB)

Published by the South African Institute for Aquatic Biodiversity, Private Bag 1015, Makhanda, 6140, South Africa

First edition 2022

Print ISBNs:

Hard covers

978-1-998950-40-9 (Set)
978-1-990951-23-7 (Volume 1)
978-1-990951-24-4 (Volume 2)
978-1-990951-25-1 (Volume 3)
978-1-990951-26-8 (Volume 4)
978-1-990951-27-5 (Volume 5)

Soft covers

978-1-998950-41-6 (Set)
978-1-998950-35-5 (Volume 1)
978-1-998950-36-2 (Volume 2)
978-1-998950-37-9 (Volume 3)
978-1-998950-38-6 (Volume 4)
978-1-998950-39-3 (Volume 5)

Electronic (PDF) ISBNs:

978-1-990951-28-2 (Volume 1)
978-1-990951-29-9 (Volume 2)
978-1-990951-30-5 (Volume 3)
978-1-990951-31-2 (Volume 4)
978-1-990951-32-9 (Volume 5)

Copyright in the text is vested in the authors.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any such information storage or retrieval system, without prior permission in writing from the publisher.

The authors and publisher have made every effort to obtain permission for and to acknowledge the use of any copyrighted material. Should any infringement of copyright have occurred, please contact the publisher, and every effort will be made to rectify omissions or errors in the event of a reprint or future edition.

The publisher gratefully acknowledges the funding from the South African Department of Science and Innovation (DSI) toward the publication of this work.

The views expressed in this publication do not reflect those of the National Research Foundation or the South African Institute for Aquatic Biodiversity, unless specifically stated.

Copy editor: Cindy Kulongowski

Proofreaders: Jenny Gon, Liz Gowans and Robert McKenzie

Design and layout: Ink Design Publishing Solutions, Cape Town, www.inkdesign.co.za

Front cover photographs: Allen Walker Photography (www.awphotosa.com)

Inside cover maps: Willem Coetzer and Susan Abraham

Printed by CADAR Printers, Gqeberha, South Africa

CONTENTS

CLASS OSTEICHTHYES – BONY FISHES (cont.)	
ORDER PERCIFORMES (cont.)	4
Key to perciform families	4
SUBORDER GOBIOIDEI	18
FAMILY GOBIIDAE – Gobies and mudskippers	19
FAMILY MICRODESMIDAE – Wormfishes and dartgobies	187
FAMILY XENISTHMIDAE – Wrigglers	198
FAMILY KRAEMERIIDAE – Sand-darts	200
FAMILY SCHINDLERIIDAE – Schindler’s fishes	202
SUBORDER ACANTHUROIDEI	203
FAMILY EPHIPPIDAE – Spadefishes, orbfishes and platax	203
FAMILY SCATOPHAGIDAE – Scats	207
FAMILY SIGANIDAE – Rabbitfishes or spinefoots	209
FAMILY LUVARIDAE – Luvar	217
FAMILY ZANCLIDAE – Moorish idol	218
FAMILY ACANTHURIDAE – Surgeonfishes	219
SUBORDER SPHYRAENOIDEI	245
FAMILY SPHYRAENIDAE – Barracudas	245
SUBORDER SCOMBROIDEI	252
SUBORDER SCOMBROLABRACOIDEI	253
FAMILY SCOMBROLABRACIDAE – Black mackerel	253
FAMILY GEMPYLIDAE – Snake mackerels	254
FAMILY TRICHIURIDAE – Cutlassfishes	261
FAMILY SCOMBRIDAE – Mackerels, Spanish mackerels, bonitos and tunas	270
SUBORDER XIPHIODEI	291
FAMILY XIPHIIDAE – Swordfish	291
FAMILY ISTIOPHORIDAE – Billfishes (sailfish, marlins and spearfishes)	292
SUBORDER STROMATEOIDEI	296
FAMILY AMARSIPIIDAE – Amarsipa	297
FAMILY STROMATEIDAE – Pomfrets and butterfishes	298
FAMILY NOMEIDAE – Cigarfishes and driftfishes	300
FAMILY TETRAGONURIDAE – Squaretails	307
FAMILY ARIOMMATIDAE – Ariommas	308
FAMILY CENTROLOPHIDAE – Ruffs, butterfishes and driftfishes	310
ORDER PLEURONECTIFORMES	316
FAMILY PSETTODIDAE – Spiny turbot or adalaha	318
FAMILY CITHARIDAE – Large-scaled flounders	319
FAMILY BOTHIDAE – Lefteye flounders	321
FAMILY PARALICHTHYIDAE – Sand flounders	350
FAMILY PARALICHTHODIDAE – Measles flounder	356
FAMILY POECILOPSETTIDAE – Righteye flounders	357
FAMILY SAMARIDAE – Dwarf flounders	362
FAMILY CYNOGLOSSIDAE – Tonguefishes	366
FAMILY SOLEIDAE – Soles	385
ORDER TETRAODONTIFORMES	406
FAMILY TRIACANTHODIDAE – Spikefishes	408
FAMILY TRIACANTHIDAE – Triplespines or tripodfishes	413
FAMILY BALISTIDAE – Triggerfishes	414
FAMILY MONACANTHIDAE – Filefishes	429
FAMILY OSTRACIIDAE – Boxfishes and cowfishes	447
FAMILY ARACANIDAE – Trunkfishes	453
FAMILY TRIODONTIDAE – Threetooth puffer	454
FAMILY TETRAODONTIDAE – Puffers, tobies	454
FAMILY DIODONTIDAE – Burrfishes and porcupinefishes	474
FAMILY MOLIDAE – Molas or ocean sunfishes	480
CLASS SARCOPTERYGII – LOBE-FINNED FISHES	
ORDER COELACANTHIFORMES	486
FAMILY LATIMERIIDAE – Coelacanths	486
Colour plates	see separate PDF
Scientific and common name indexes (Volume 5)	see separate PDF

CLASS

OSTEICHTHYES



Bony Fishes

...continued



ORDER PERCIFORMES

The Perciformes, or perch-like fishes (also called the Percomorpha), are the largest group of fishes in the world, with more than 10 000 species in about 160 families. They are the most numerous of vertebrates and comprise about 40% of all bony fish species.

The classification of this group is controversial and according to some authors should include the Scorpaeniformes (Volume 2), Tetraodontiformes and Pleuronectiformes

(Volume 5), which are treated as separate orders in these volumes.

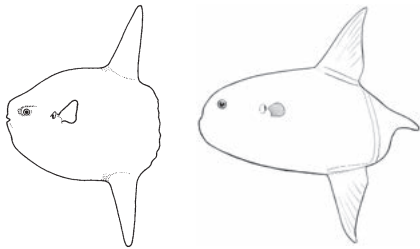
They occur in marine and fresh waters around the world, from shallow ponds to more than 2 500 m in the oceans. Most species are found in coastal areas in tropical and temperate regions. They range in size from the mature male stout flouter, *Schindleria brevipinguis* at 6.5 mm SL, to the 3.3-m bluefin tuna, *Thunnus thynnus*.

KEY TO PERCIFORM FAMILIES

Wouter Holleman and Shirleen Smith

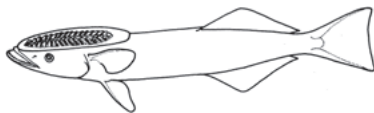
NOTE: This key is for families of fishes with species that occur in the Western Indian Ocean in less than ~200 m. (M) designates a monotypic family.

1a Body truncate, as if rear chopped off, orbiculate, compressed see **TETRAODONTIFORMES** Volume 5



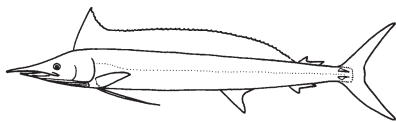
1b Body not as above 2

2a Oval, laminated suction disc on top of head **ECHENEIDAE**
(Remoras) Volume 4



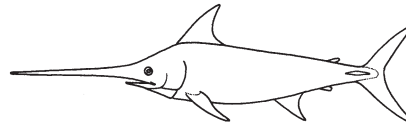
2b No suction disc on top of head 3

3a Upper jaw elongated forming a bony, spear-like bill 4

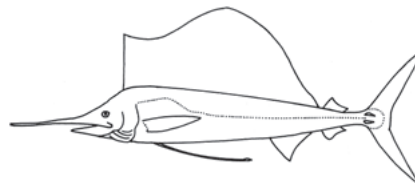


3b Upper jaw not elongated into a spear-like bill 5

4a Bill a long, flat spear; juveniles with a long, continuous dorsal fin, adults with two well-separated, short dorsal fins; one keel each side of caudal peduncle **XIPHIIDAE (M)**
(Swordfish) Volume 5

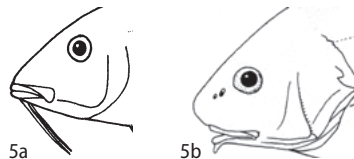


4b Bill short, rounded; dorsal fin long, its base longer than its height; two keels each side of caudal peduncle
..... **ISTIOPHORIDAE (Billfishes)** Volume 5



5a Pair of long barbels on chin; dorsal fin with 8 or 9 soft rays **MULLIDAE**
(Goatfishes) Volume 3

5b One or two short barbels on chin; dorsal fin with 21–44 soft rays **SCIAENIDAE** IN PART
(Croakers and drums) Volume 3

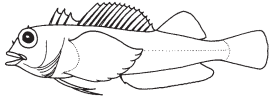


5c No barbels on chin 6

Continued ...

KEY TO PERCIFORM FAMILIES

- 6a Three separate dorsal fins, 1st of 3 or 4 spines, 2nd of 11–15 spines, 3rd of 16–22 rays **TRIPTERYGIIDAE**
(Triplefin blennies) *Volume 4*

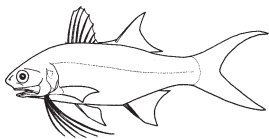


- 6b Two separate dorsal fins or one continuous dorsal fin, which may be deeply notched 7

- 7a Lower pectoral-fin rays longer than upper, and membranes incised at least partially 8

- 7b Lower pectoral-fin rays not longer than upper 9

- 8a Lower 3–8 pectoral-fin rays separate from fin and filamentous; 2 separate dorsal fins, 1st with 8 spines; snout projecting in front of mouth **POLYNEMIDAE** (Threadfins) *Volume 4*



- 8b Lower 5–7 pectoral-fin rays simple, membranes deeply incised; dorsal fin continuous and notched, with 10 spines, with cirri at tips **CIRRHITIDAE** (Hawkfishes) *Volume 4*



- 8c Lower 4–7 pectoral-fin rays simple, deeply incised; dorsal fin continuous and notched, with 17–20 spines, without cirri at tips **CHEILODACTYLIDAE** (Fingerfins) *Volume 4*



- 8d Lower 4 or 5 pectoral-fin rays simple, incised, with one elongated ray reaching to anal-fin origin; dorsal fin continuous and notched with 15–20 spines, without cirri at tips **LATRIDAE** (Trumpeters) *Volume 4*



- 9a Pelvic fins with 2 spines, one on either side of 3 rays; anal fin with 7 spines **SIGANIDAE** (Rabbitfishes or spinefoots) *Volume 5*



- 9b Pelvic fins (if present) with single spine in front (invisible in some Blenniidae), none behind 10

- 10a Teeth fused into parrot-like beak 11

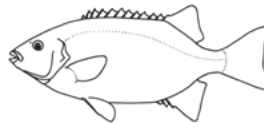


- 10b Teeth separate or absent 12

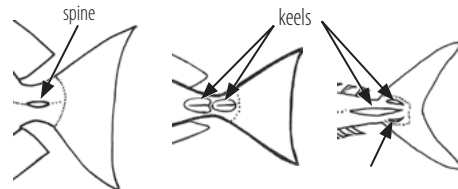
- 11a Dorsal-fin spines and rays usually of same length, fin with 9 spines, 10 rays **SCARIDAE, SCARINAE** (Parrotfishes) *Volume 4*



- 11b Dorsal-fin spines shorter than rays, fin with 11 or 12 spines, 11–24 rays **OPLEGNATHIDAE** (Knifejaws) *Volume 4*

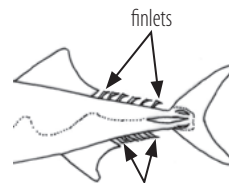


- 12a Caudal peduncle or base of caudal fin with spines or keels ... 13



- 12b Caudal peduncle without spines or keels 18

- 13a Dorsal and anal fins with finlets 14



- 13b No finlets present 15

- 14a Finlets 4 or 5; dorsal-fin spines very short; LL in sinusoidal curve; single keel on either side of peduncle **GEMPYLIDAE** IN PART,
Lepidocybium (Escolar) *Volume 5*



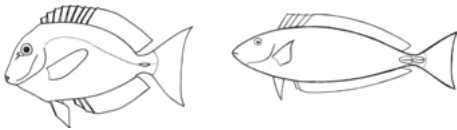
Continued ...

KEY TO PERCIFORM FAMILIES

- 14b Finlets 6 or more; dorsal-fin spines usually same length or longer than rays; LL straight or curved; usually 2 keels either side of peduncle, sometimes 1 or 3 keels **SCOMBRIDAE**
(Mackerels, Spanish mackerels, bonitos and tunas) *Volume 5*



- 15a Body deep and compressed; peduncle with single sharp spine in groove on either side, or 1 or 2 bony plates, one behind the other, with sharp keel on either side; dorsal fin continuous, with 4–9 spines **ACANTHURIDAE** (Surgeonfishes) *Volume 5*



- 15b Body not deep and compressed 16

- 16a Pelvic fins rudimentary or absent; dorsal and anal fins without spines but with short, unbranched, bony rays; bony keel each side of caudal peduncle; large fish (up to 2 m TL) with rounded head and small terminal mouth **LUVARIDAE** (M) (Luvar) *Volume 5*



- 16b Pelvic fins well-developed 17

- 17a Caudal peduncle long and square in cross-section, with 2 keels on either side at base of caudal fin; dorsal-fin spines much shorter than rays; scales with heavy keels **TETRAGONURIDAE**
(Squaretails) *Volume 5*



- 17b Peduncle not square in cross-section, with 2 small, low fleshy keels on either side at base of caudal fin (sometimes difficult to see); dorsal-fin spines longer than rays, fin divided into spinous and rayed parts; scales cycloid **ARIOMMATIDAE**
(Ariommas) *Volume 5*



- 18a Pelvic fins reduced (to scale-like spine in Trichiuridae) or absent 19

- 18b Pelvic fins present 26

- 19a Body deep, compressed, silver in colour; pelvic fins rudimentary in juveniles, absent in adults 20

- 19b Body not deep and compressed; pelvic fins present, or rudimentary in juveniles and absent in adults 21

- 20a Dorsal and anal fins with 25–30 rays, fins mostly covered by skin and scales; caudal fin lunate **MONODACTYLIDAE**
(Moonies) *Volume 3*



- 20b Dorsal fin 37–50 rays, anal fin 34–43 rays (dorsal- and anal-fin spines embedded in *P. argenteus*); fins not covered by skin and scales; caudal fin forked to lunate **STROMATEIDAE** IN PART,
Pampus (Pomfrets) *Volume 5*



- 21a Body elongate and compressed, or eel-like 22

- 21b Body fusiform to slightly elongate, generally blue to brownish in colour; pelvic fins, if present, fold into shallow groove; dorsal and anal fins without spines; dorsal fin with 40–51 soft rays, anal fin with 33–38 soft rays; opercle with 2 flat spines; gill membranes not separate from each other; scales usually cycloid and easily shed **STROMATEIDAE** IN PART,
Stromateus (Butterfishes) *Volume 5*



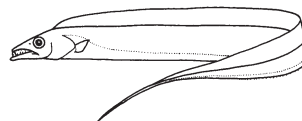
- 22a Lower jaw longer than upper, both jaws with fangs; dorsal fin with spines; body compressed 23

- 22b Lower jaw longer than upper, without fangs; dorsal fin without spines; caudal fin forked **AMMODYTIDAE** (Sandlances) *Volume 4*



- 22c Lower jaw not longer than upper; lower jaw without fangs . 24

- 23a Body long and ribbon-like; caudal fin small or absent, when absent body long and pointed **TRICHIURIDAE**
(Cutlassfishes) *Volume 5*



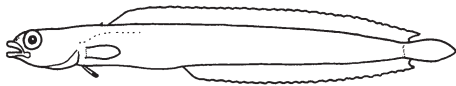
- 23b Body elongate, not ribbon-like; caudal fin deeply forked or lanceolate **GEMPYLIDAE** IN PART (Snake mackerels) *Volume 5*



Continued ...

KEY TO PERCIFORM FAMILIES

- 24a Dorsal fin without spines 25
- 24b Dorsal fin with 1 short, separate spine; dorsal and anal fins joined to caudal fin **PSEUDOCROMIDAE, CONGROGADINAE** (Snakelets) *Volume 3*



- 25a Body <20 mm, larval-like, without scales, transparent **SCHINDLERIIDAE** (Schindler's fishes) *Volume 5*



- 25b Body >20 mm, with scales; eyes on top of head; caudal fin rounded **CREEDIIDAE** (Sandburrowers) *Volume 4*

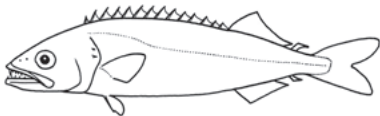


- 26a Single dorsal and anal fins, far back on body; pelvic fins modified as a sucking disc; body without scales; generally small fishes, <50 mm **GOBIESOCIDAE** (Clingfishes) *Volume 4*



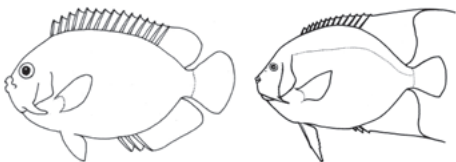
- 26b Fins not as above; body usually with scales 27

- 27a Dorsal fin 13–40 spines, 11–44 rays + 0–7 finlets; anal fin 1–2 spines, 10–35 rays + 0–7 finlets; spined dorsal-fin base longer than base of rayed part of dorsal fin (excluding finlets, if present); lower jaw longer than upper, upper jaw not protrusile, both jaws with large canines **GEMPYLIDAE** IN PART (Snake mackerels) *Volume 5*



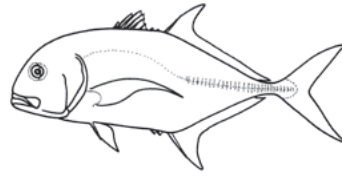
- 27b Not as above 28

- 28a Corner of preopercle with long, sharp spine; body compressed and deep **POMACANTHIDAE** (Angelfishes) *Volume 3*



- 28b Preopercle without spine, or if spine present, body not deep and compressed 29

- 29a Anal fin with 1 or 2 separate spines, sometimes embedded, before fin, + 1 spine, 15–30 rays **CARANGIDAE** (Trevallies) *Volume 4*



- 29b Anal fin without separate spines before fin 30

- 30a Two separate dorsal fins, space between last element of the anterior fin and first element of the posterior fin greater than the space between spines in anterior fin; or with separate spines between anterior and posterior fins 31

- 30b Single dorsal fin, continuous or notched, if notched to the base, the space between the last element of the anterior portion and the first element of the posterior portion about equal to the space between spines in the anterior portion; 1st element of soft dorsal fin often a spine 52

- 31a First dorsal fin 7–9 short, isolated spines, 2nd fin with 1–3 spines, 26–33 rays; body long with broad silver band **RACHYCENTRIDAE** (M) (Cobia) *Volume 4*



- 31b First dorsal fin not as above 32

- 32a First dorsal fin 7–10 spines + 3–5 short, separate spines, 2nd fin 9–11 rays; soft dorsal and anal fins in scaly sheath **EMMELICHTHYIDAE** IN PART, *Emmelichthys* (Rovers) *Volume 4*



- 32b First dorsal fin not as above; spines joined by membrane 33

- 33a Soft dorsal fin with 1 spine in front of rays 34

- 33b Soft dorsal fin without spine in front of rays 46



33a

33b

Continued ...

KEY TO PERCIFORM FAMILIES

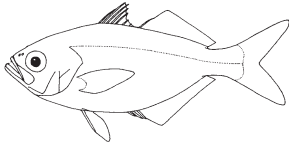
- 34a Body with LL scales 35
- 34b Body without LL scales; head with rows of sensory papillae; 1st dorsal fin 4–10 spines, 2nd dorsal fin 1 spine, 6–29 rays 44

- 35a First dorsal fin 5 spines, 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 2 spines, 8 or 9 rays; soft dorsal and anal fins opposite each other, situated far back on torpedo-shaped body
..... **SPHYRAENIDAE** (Barracudas) *Volume 5*



- 35b First dorsal fin >5 spines 36

- 36a First dorsal fin with 7 or 8 spines, 2nd dorsal fin with 1 spine, 19–23 rays; anal fin with 3 spines, 25–28 rays; body strongly compressed **LACTARIIDAE** (M) (False trevally) *Volume 3*



- 36b First dorsal fin 7 or 8 low spines, 2nd dorsal fin with 1 spine, 23–28 rays, fin depressible into groove; anal fin 2 minute spines, 23–27 rays **POMATOMIDAE** (M) (Bluefish or elf) *Volume 3*



- 36c Not as above 37

- 37a First dorsal fin with 9–11 spines, 2nd dorsal fin with 1 or 2 spines, 15–32 soft rays; anal fin with 1–3 small weak spines and 15–30 soft rays; 1st dorsal and pelvic fins fold into a groove; upper jaw not protrusile; 2 flat points on opercle
..... **NOMEIDAE** (Cigarfishes and driftfishes) *Volume 5*



- 37b First dorsal fin with 10 spines, 2nd with 1 spine 10–12 rays; anal fin 3 spines, 9 or 10 rays; dorsal and anal fins with basal scaly sheath; pelvic fins with well-developed axillary process
..... **EMMELICHTHYIDAE** IN PART, *Erythrocles* (Rovers) *Volume 4*



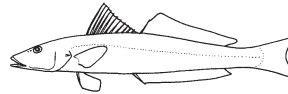
- 37c Not as above 38

- 38a First dorsal fin with 8 or 9 spines, 2nd dorsal fin with 1 spine, 13 or 14 soft rays; anal fin with 3 spines, 12 or 13 soft rays; 1st dorsal and pelvic fins do not fold into a groove; upper jaw not protrusile; maxilla with scales **SCOMBROPIDAE**
(Gnomefishes) *Volume 3*



- 38b Not as above 39

- 39a First dorsal fin with 11–13 spines, 2nd dorsal fin with 1 spine, 16–24 soft rays; anal fin with 2 spines, 17–26 soft rays; gill membranes not attached to isthmus and not separate from each other **SILLAGINIDAE** (Sillagos, smelts or Indo-Pacific whiting) *Volume 3*



- 39b Not as above 40

- 40a First dorsal fin with 12 spines, 2nd dorsal fin with 1 spine, 14 or 15 soft rays; anal fin with 2 or 3 spines, 16–18 soft rays; upper jaw with 2 or 3 large fangs in front; opercle with 5 flat points
..... **SCOMBROLABRACIDAE** (M) (Black mackerel) *Volume 5*



- 40b Not as above 41

- 41a One flat point or spine on opercle, 0–3 spines on preopercle; 1st dorsal fin with 6–8 spines, 2nd dorsal fin with 1 spine, 8–14 soft rays; anal fin with 2 spines, 8–18 soft rays; no scales on anal and dorsal fins **APOGONIDAE** (Cardinalfishes) *Volume 3*



- 41b Not as above 42

- 42a LL continues onto caudal fin; 1st dorsal fin with 6–8 spines, 2nd dorsal fin with 1 spine, 8–11 soft rays; anal fin with 1–3 spines, 7–10 soft rays; opercle with 1 or 3 spines; dorsal and anal fins with scales at least on base **EPIGONIDAE**
(Deepwater cardinalfishes) *Volume 3*



- 42b Not as above 43

Continued ...

KEY TO PERCIFORM FAMILIES

43a Opercle with 2 flat spines; 1st dorsal fin with 8–10 spines, 2nd dorsal fin with 1 spine, 9 or 10 soft rays, anal fin with 2 or 3 spines, 7–8 soft rays; LL with 25–55 scales; canines may be present, if no canines then teeth are in more than one row
 **ACROPOMATIDAE** (Lanternbellies) *Volume 3*



43b Opercle with 1–8 spines; lower end of subopercle with 1 or 2 large spines; 1st dorsal fin with 8 spines, 2nd dorsal fin with 1 spine, 8–10 soft rays, dorsal fins are well separated; anal fin with 3 spines, 6–8 soft rays; no canines, teeth in one row.....
 **HOWELLIDAE** (Pricklefishes) *Volume 3*



44a Branchiostegal rays 5; pelvic fins with frenum, innermost rays usually joined to form a disc **GOBIIDAE**
 (Gobies and mudskippers) *Volume 5*

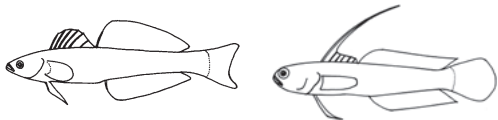


44b Branchiostegal rays 5 or 6; pelvic fins without frenum 45

45a First dorsal fin 5 or 6 spines, 9–15 rays (except *Allomicrodesmus* with 2 spines, 29–33 rays, which might occur in WIO); anal fin 9–14 rays; lower lip with completely free ventral edge; body naked or with very fine scales, 6 branchiostegal rays.....
 **XENISTHMIDAE** (Wrigglers) *Volume 5*



45b First dorsal fin 5 or 6 spines, >15 rays; anal fin 13–19 or 22–39 rays; lower lip not free; body with cycloid and/or ctenoid scales, 5 branchiostegal rays..... **MICRODESMIDAE**,
PTERELEOTRINAE (Dartgobies) *Volume 5*



45c First dorsal fin 6–10 spines, 6–12 rays; lower lip not free; 6 branchiostegal rays..... **ELEOTRIDAE** (Sleepers or gudgeons) *Volume 5*



46a Preopercle with strong spine 47

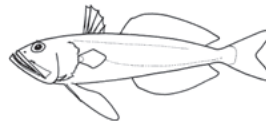


46b Preopercle without strong spine 48

47a Preopercle with strong, serrate spine; dorsal fin with 1–4 spines, 6–10 rays; scales absent **CALLIONYMIDAE** (Dragonets)
Volume 4



47b Preopercle with strong, curved spine; dorsal fin with 5 spines, 19–20 rays; scales spinoid, resembling shark denticles; pectoral fins small, not reaching anal-fin origin; pelvic fins twice length of pectoral fins **CHAMPSODONTIDAE** (Gapers) *Volume 4*



48a Opercle and subopercle with straight, sharp spine; dorsal fin with 3 spines, 12–18 rays; scales absent; pelvic-fin spine visible **DRACONETTIDAE** (Slope dragonets) *Volume 4*



48b Not as above 49

49a Dorsal-fin spines very low or embedded, showing as short, conical tubercles in front of rays 50

49b Dorsal-fin spines at least half height of rays 51

50a Dorsal-fin spines very low, with 22–27 rays; anal fin with 1 spine, 27–32 rays; pelvic-fin rays weak; LL 100–150; scales highly deciduous **AMARSIPIIDAE** (M) (Amarsipa) *Volume 5*



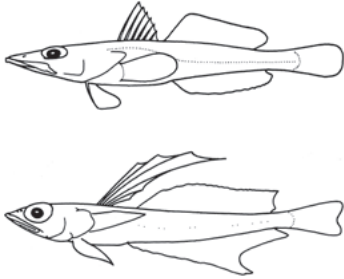
50b Dorsal-fin spines embedded, 9 or 10 rays; anal fin without spine, 10 rays, mostly covered by skin and denticles; LL obscure..... **URANOSCOPIIDAE** IN PART,
Pleuroscopus (Stargazers) *Volume 4*



Continued ...

KEY TO PERCIFORM FAMILIES

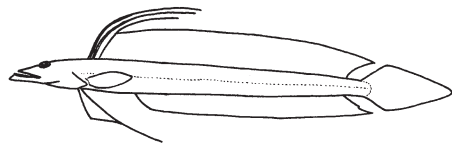
51a Mouth large, flat, bill-like, reaching to below eye; body elongate, subcylindrical and compressed posteriorly; pectoral fins reach further than anal-fin origin; no spine on preopercle; scales ctenoid **PERCOPHIDAE** (Duckbills) *Volume 4*



51b Mouth large, nearly vertical; body thick and compressed; eyes on top of head; pectoral fins short, not reaching anal-fin origin; spines on ventral preopercle; pelvic-fin spine not visible; scales absent or cycloid **URANOSCOPIDAE** IN PART (Stargazers) *Volume 4*



52a Dorsal fin with 3–8 spines, 34–47 rays; anal fin with 1 spine, 32–42 rays; pelvic fins 1 spine, 5 rays (no pelvic axillary scale); lower jaw longer than upper and with fleshy extension; gill membranes free from isthmus and separate from each other; pectoral fins as long as pelvic fins, pelvic fins reaching anus; scales large, cycloid **TRICHONOTIDAE** (Sand-divers) *Volume 4*



52b Dorsal fin without spines 53

52c Dorsal fin with 1 or more spines 56

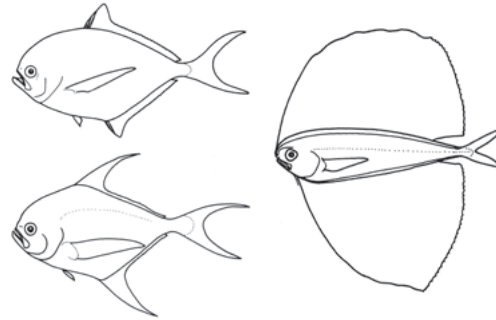
53a Body stout and depressed anteriorly or compressed and deep 54

53b Body elongate or tapered to a point 55

54a Body depressed; dorsal and anal fins situated far back on body; dorsal fin 12–14 rays; anal fin 17 or 18 rays; mouth large and nearly vertical **URANOSCOPIDAE** IN PART, *Xenocephalus* (Stargazers) *Volume 4*



54b Body compressed; dorsal and anal fins high, origin at mid-body or further forward; pelvic-fin rays not elongate; dorsal fin 31–57 rays; anal fin 21–50 rays; mouth oblique and usually to below eye **BRAMIDAE** (Pomfrets) *Volume 4*



54c Body compressed; dorsal and anal fins low; first 2 pelvic-fin rays elongate; dorsal fin with 3 or 4 rudimentary spines (lost with age), 40–45 rays; anal fin with 2 spines (lost with age), 30–33 rays **MENIDAE** (M) (Moonfish) *Volume 3*



55a Body elongate, compressed, and tapered to a point, dorsal and anal fins connected to pointed caudal fin; snout rounded; dorsal fin 82–89 rays; attains 50 cm SL, body orange-red with yellow bands **CEPOLIDAE** IN PART, *Acanthocepola* (Bandfishes) *Volume 4*



55b Body elongate, compressed and tapered; caudal fin forked; snout rounded, dorsal fin 52–66 rays; body with many colours **CORYPHAENIDAE** (Dorado or dolphinfishes) *Volume 4*



56a Anal fin without spines (first 2 rays spine-like in Pinguipedidae) 57

56b Anal fin with 1 or more spines 59

57a Anal fin 17–25 rays; pelvic fins 1 spine, 5 rays; body not elongate; dorsal fin spines shorter than rays, resembling a low crest **PINGUIPEDIDAE** (Sandperches) *Volume 4*



57b Not as above 58

Continued ...

KEY TO PERCIFORM FAMILIES

58a Dorsal fin 6–28 spines; anal fin 28–41 rays; pelvic fins with visible spine; body very elongate, almost eel-like; base of anal fin about half length base of dorsal fin **MICRODESMIDAE, MICRODESMINAE** (Wormfishes) *Volume 5*



58b Dorsal fin 3–17 spines; anal fin 99–119 rays; pelvic-fin spine present, but not visible, and with 1–4 rays; body eel-like..... **BLENNIIDAE** IN PART, *Xiphasia* (Blennies) *Volume 4*



58c Dorsal fin 1 short, separate spine; anal fin 26–66 rays..... **PSEUDOCROMIDAE, CONGROGADINAE** (Snakelets) *Volume 3*



59a Dorsal fin 1–4 spines, 43–60 rays; anal fin 1 spine, 37–53 rays; pelvic fins reach halfway to anus, half length of pectoral fins; caudal fin square; scales ctenoid, except for some cycloid scales on head..... **BRANCHIOSTEGIDAE** IN PART, *Malacanthus* (Sand-tilefishes) *Volume 3*



59b Not as above..... **60**

60a Body small and elongate, depth ~8 in SL, naked; mouth with prominent chin; head with small flaps along lower edge of preopercle; dorsal fin 4–6 spines, 13–17 rays; pelvic fins 1 spine, 5 rays..... **KRAEMERIIDAE** (Sand-darts) *Volume 5*

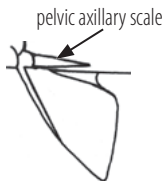


60b Not as above..... **61**

61a Body deep and compressed, depth 0.9–1.8 in SL (*Pempheris* from 2.0 in SL – see 68a)..... **62**

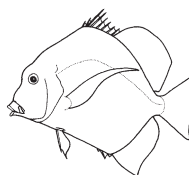
61b Body not deep or greatly compressed, depth >1.8 in SL **67**

62a Pelvic axillary scale present **63**



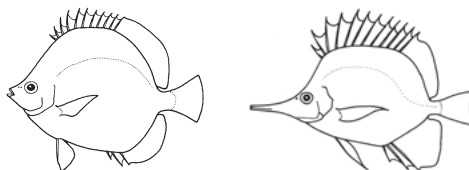
62b Pelvic axillary scale absent **65**

63a Dorsal fin 8–10 spines, 19–22 rays; anal fin 3 spines, 16–19 rays; upper jaw protrusile; pectoral fins long and falciform, reaching caudal peduncle; mouth small; dorsal-, anal- and pelvic-fin spines striated..... **DREPANEIDAE** (Sicklefishes) *Volume 3*

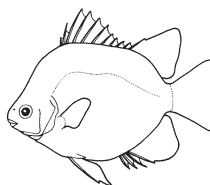


63b Not as above..... **64**

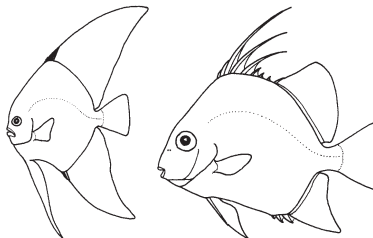
64a Dorsal fin without notch between spines and rays, with 11–17 spines, 14–30 rays; anal fin 3 or 4 spines, 14–23 rays; upper jaw protrusile..... **CHAETODONTIDAE** (Butterflyfishes) *Volume 3*



64b Dorsal fin with notch between spines and rays, with 11 or 12 spines, 16–18 rays; anal fin 4 spines, 13–16 rays; upper jaw not protrusile..... **SCATOPHAGIDAE** (Scats) *Volume 5*



65a Upper jaw not protrusile; LL complete, to base of caudal fin; dorsal fin 5–10 spines, 19–39 rays **EPHIPPIDAE** (Spadefishes, orbfishes and platax) *Volume 5*



65b Upper jaw protrusile..... **66**

Continued ...

KEY TO PERCIFORM FAMILIES

66a Dorsal fin 6 or 7 spines, fin with long whip-like filament, and 39–42 rays; caudal fin with black bar; pectoral fins with 18 or 19 rays **ZANCLIDAE** (M) (Moorish idol) *Volume 5*



66b Dorsal fin 7–10 spines, 23–38 rays; anal fin 2 or 3 spines, 22–34 rays; pectoral fins with 12–14 rays **CAPROIDAE** (Boarfishes) *Volume 3*

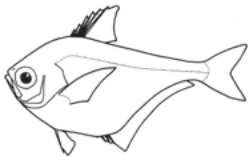


67a Dorsal fin 1 spine, anal fin 1 spine; dorsal fin without notch; body elongate **PSEUDOCHROMIDAE, ANISOCHROMINAE** (Annies) *Volume 3*



67b Dorsal and anal fins not as above **68**

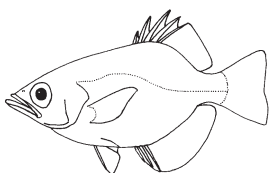
68a Base of anal fin longer than base of dorsal fin (~3× as long in *Pempheris*, and <1½× in *Parapriacanthus*); eye large; LL to end of caudal fin **PEMPHERIDAE** (Sweepers) *Volume 4*



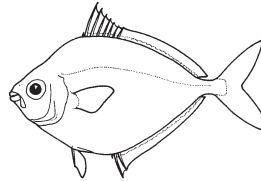
68b Base of anal fin about same length as base of dorsal fin **69**

68c Base of anal fin usually ½–¾ length base of dorsal fin **70**

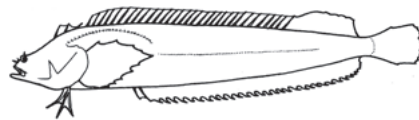
69a Dorsal fin 4–6 spines, 11–14 rays; dorsal and anal fins situated far back **TOXOTIDAE** (Archerfishes) *Volume 4*



69b Dorsal fin 7–9 spines, 15–17 rays; mouth very protrusile **LEIOGNATHIDAE** (Ponyfishes or slipmouths) *Volume 3*



69c Dorsal fin >30 spines, 3–14 rays; body elongate **CLINIDAE** IN PART, *Cancellolus* (Klipfishes) *Volume 4*

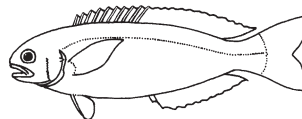


70a Head profile steep; eye large, situated far forward; mouth/maxilla more than twice eye diameter; body elongate; pelvic fins with outer 2 rays unbranched, inner 3 rays branched **OPISTOGNATHIDAE** (Jawfishes) *Volume 4*

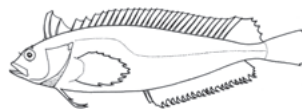


70b Not as above **71**

71a Dorsal fin 3–10 spines, 13–34 rays; anal fin 1 or 2 spines, 12–20 rays; pelvic fins 1 spine, 5 rays; opercle with 1 flat spine, preopercle with spine at angle **BRANCHIOSTEGIDAE** IN PART, *Hoplolatilus* (Sand-tilefishes) *Volume 3*



71b Dorsal fin 24–50 spines, 0–14 rays, first 3–5 spines often forming a crest; anal fin 2 spines, 19–57 rays; pelvic fins 1 hidden spine, 2 or 3 rays; body elongate **CLINIDAE** IN PART (Klipfishes) *Volume 4*



71c Not as above **72**

72a Dorsal fin deeply notched before last spine, and last spine usually longer than penultimate spine **73**

72b Dorsal fin without notch before last spine or not significantly notched (first 2 or 3 spines sometimes forming crest, or elongate in *Iniistius*) **77**

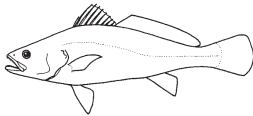
Continued ...

KEY TO PERCIFORM FAMILIES

- 73a Dorsal fin 6 or 7 + 1 spines; head bones serrate; scales cycloid **AMBASSIDAE** (Glassfishes) *Volume 3*



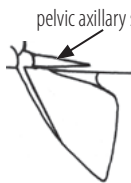
- 73b Dorsal fin 5–12 (usually 10) + 1 spines; head bones not serrate; base of anal fin < ½ length of dorsal-fin base; LL to end of caudal fin **SCIAENIDAE** IN PART (Croakers and kob) *Volume 3*



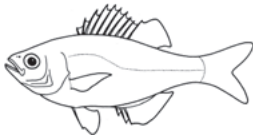
- 73c Dorsal fin >7 + 1 spines; head bones not serrate **74**

- 74a Pelvic axillary scale absent **75**

- 74b Pelvic axillary scale present **76**



- 75a Dorsal fin 9 + 1 spines; opercle with 2 spines; scales ctenoid **KUHLIIDAE** (Flagtails) *Volume 3*



- 75b Dorsal fin 10–12 + 1 spines; preopercle serrate; opercle with 2 spines **TERAPONTIDAE** (Thornfishes) *Volume 3*



- 76a Dorsal fin total spines 8 or 9; caudal fin rounded; maxilla to well behind eye; preopercle with spines **LATIDAE** (Barramundi) *Volume 3*



- 76b Dorsal fin total spines 10; caudal fin deeply forked; maxilla to anterior half of eye; opercle with one flat point **LUTJANIDAE** IN PART, *Etelis* (Snappers) *Volume 3*



- 77a Body without scales, elongate; dorsal fin with 3–17 spines; anal fin with 2 spines, often reduced and not visible in females; pelvic fins 1 spine (often hidden), 1–4 rays; LL not divided **BLENNIIDAE** IN PART (Blennies) *Volume 4*

- 77b Not as above **78**

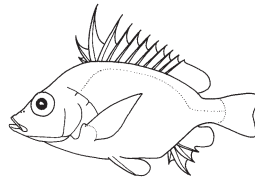
- 78a Anal fin 4–6 spines **79**

- 78b Anal fin 0–3 spines **80**

- 79a Anal fin 5 or 6 spines, 12–14 rays; scales cycloid and deciduous; lachrymal bone serrate **GERREIDAE** IN PART, *Pentapiron* (Silverbiddies) *Volume 3*



- 79b Anal fin 4–6 spines, 7–10 rays; scales ctenoid, head bones exposed **PENTACEROTIDAE** IN PART, *Pentaceros* (Armourheads) *Volume 3*



- 80a Dorsal fin 1–4 spines **81**

- 80b Dorsal fin >4 spines **82**

- 81a Anal fin 3 spines, 8–10 rays; dorsal fin tall, 4 spines, 25–27 rays, spines strong; caudal fin emarginate; head bones exposed **PENTACEROTIDAE** IN PART, *Histioporus* (Armourheads) *Volume 3*



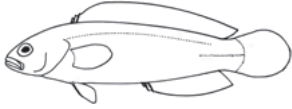
- 81b Anal fin 1 spine, 13 or 14 rays; dorsal fin 3 spines, 21 rays; pelvic fins 1 spine, 5 rays; caudal fin long and pointed; reddish in colour **CEPOLIDAE** IN PART, *Owstonia* (Bandfishes) *Volume 4*



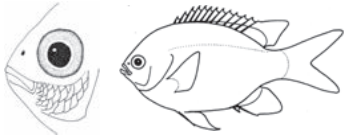
Continued ...

KEY TO PERCIFORM FAMILIES

81c Anal fin 1–3 spines, 12–21 rays; dorsal fin even, 1–4 spines, 21–32 rays, spines weak; caudal fin rounded to truncate; cheek and opercle without scales **PSEUDOCROMIDAE** (Dottybacks) *Volume 3*



82a One pair of nostrils; anal fin 2 spines; body compressed; anal fin 2 spines; LL interrupted or complete **POMACENTRIDAE** (Damsel-fishes) *Volume 4*



82b Two pairs of nostrils 83



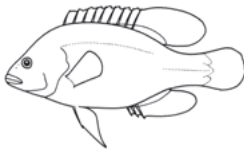
83a Anal fin 1 or 2 spines; canines present 84

83b Anal fin 2 or 3 spines; no canines present 85

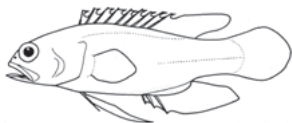
84a Anal fin 1 or 2 spines; teeth villiform with few canines; scales ctenoid; opercle with 1 spine **BRANCHIOSTEGIDAE** IN PART, *Branchiostegus* (Tilefishes) *Volume 3*



84b Anal fin 2 spines; teeth molariform with canines in front, often protruding; scales large, cycloid **LABRIDAE** IN PART (Wrasses) *Volume 4*



85a Pelvic fins 1 spine, 2–4 rays; scales mostly ctenoid; LL divided below rear of dorsal fin; pectoral fins long, extending to or beyond origin of anal fin; caudal fin round to pointed **PLESIOPIIDAE** (Longfins, comets and spiny basslets) *Volume 3*

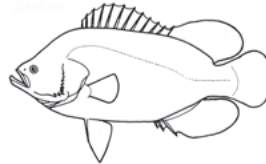


85b Pelvic fins 1 spine, 5 rays 86

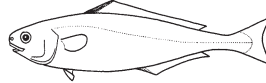
86a Dorsal-fin spines much shorter than rays 87

86b Dorsal-fin spines about same length or longer than ray 88

87a Dorsal and anal fins rounded posteriorly, reaching past base of caudal fin; caudal fin rounded **LOBOTIDAE** (Tripletails) *Volume 3*



87b Dorsal and anal fins not rounded, do not reach past caudal-fin base; caudal fin forked **CENTROLOPHIDAE** (Ruffs, butterfishes and driftfishes) *Volume 5*



87c Soft dorsal, anal and caudal fins truncate; LL to end of caudal fin **DINOPERCIDAE** (Cavebasses) *Volume 3*



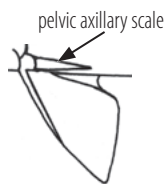
88a Pelvic fins joined to body; pectoral fins shorter than HL; scales spinoid, adherent, covering most of head; eye large, mouth strongly oblique **PRIACANTHIDAE** (Bigeyes) *Volume 3*



88b Not as above 89

89a Pelvic axillary scale absent 90

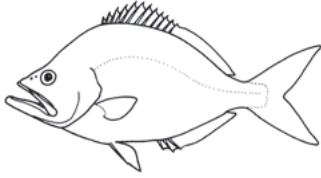
89b Pelvic axillary scale present 94



Continued ...

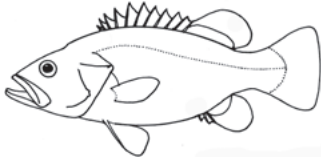
KEY TO PERCIFORM FAMILIES

- 90a Anal fin 13–15 rays; lower jaw strongly protruding
..... **PARASCORPIDIDAE** (M) (Jutjaw) *Volume 3*



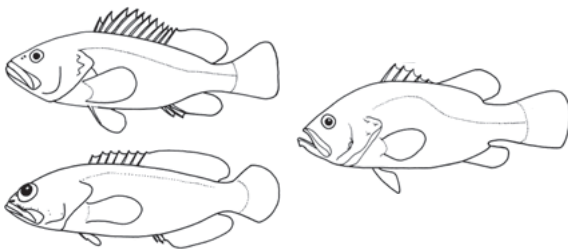
- 90b Anal fin <13 rays; lower jaw not as above 91

- 91a Opercle with horizontal ridge ending in a spine; preopercle serrate in adults, without spines; pelvic- and anal-fin spines serrate; pectoral fins shorter than pelvic fins **POLYPRIONIDAE** (Wreckfishes) *Volume 3*



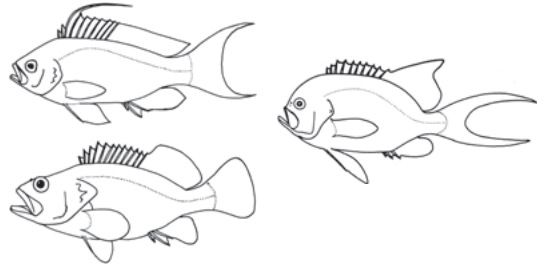
- 91b Opercle with 1–3 flat spines; preopercle serrate, sometimes with spines; pelvic- and anal-fin spines not serrate; pectoral fins generally longer than pelvic fins 92

- 92a Body scales small, LSS >78, from upper end of gill opening to caudal-fin base (reduced to 40–60 in Pseudogrammini); LL scales often inconspicuous (disjunct LL in Pseudogrammini), usually smaller than main body scales, and mostly covered by them; flap of skin joining upper part of pectoral-fin base to body; maxilla naked; supramaxilla present, covered by skin and loosely attached to upper rear edge of maxilla
..... **EPINEPHELIDAE** (Groupers, podges and soapfishes) *Volume 3*



- 92b Body scales larger, LSS usually <80, from upper end of gill opening to caudal-fin base; LL scales typically distinct; subequal in size and number to adjacent body scales; no flap of skin joining pectoral-fin base to body; supramaxilla typically absent (present in *Acanthistius* and present, but small, in some *Plectranthias*) 93

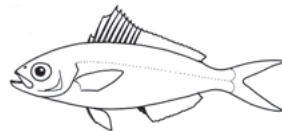
- 93a Maxilla scaly in most species; caudal fin lunate or forked in most species; branched caudal-fin rays 13 in most species (15 in *Acanthistius*); LL 25–64 scales; dorsal fin 13–20 rays
..... **ANTHIADIDAE** (Goldies, basslets, perchlets and swallowtails) *Volume 3*



- 93b Maxilla naked; caudal fin emarginate to truncate; branched caudal-fin rays 15; LL 67–77 (*Serranus*) or 42–44 (*Chelidoperca*) scales; dorsal fin 13–15 (*Serranus*) or 9–10 (*Chelidoperca*) rays
..... **SERRANIDAE** (Perchlets and sea basses) *Volume 3*



- 94a Premaxilla with 1 or 2 postmaxillary processes, visible from inside mouth; jaws highly protrusile; teeth small to minute; no teeth on vomer; preopercle not serrate; branchiostegal rays 7; often with blue and yellow stripes **CAESIONIDAE** (Fusiliers) *Volume 3*

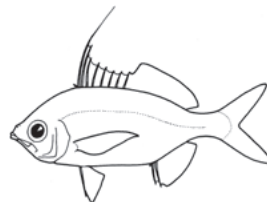


- 94b Not as above 95

- 95a Scales cycloid, often very large 96

- 95b Scales ctenoid 99

- 96a Caudal fin deeply forked; cheeks and opercle scaly; single row of scales at base of dorsal and anal fins **GERREIDAE** IN PART, *Gerres* (Silverbiddies) *Volume 3*

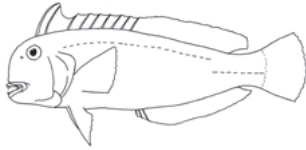


- 96b Caudal fin rounded, truncate to slightly emarginate 97

Continued ...

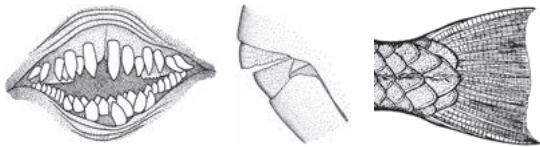
KEY TO PERCIFORM FAMILIES

97a Body compressed, profile of head steep and sharp, with 'razor-edge'; first 2 or 3 spines sometimes elongate or forming crest **LABRIDAE** IN PART, *Iniistius* (Razorfishes) *Volume 4*

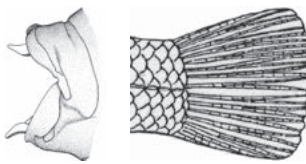


97b Not as above **98**

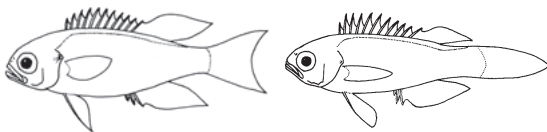
98a Three or 4 large scales at base of caudal fin; outer teeth separate or fused into a dental plate **SCARIDAE, SPARISOMATINAE** (Parrotfishes) *Volume 4*



98b No large scales at caudal-fin base; teeth in jaws conical, usually with canines anteriorly (incisors in *Anampses* and *Pseudodax*) **LABRIDAE** IN PART (Wrasses) *Volume 4*



99a LL runs along base of dorsal fin and just below top of peduncle; dorsal fin 9–11 rays; anal fin 9–11 rays; usually gold in colour **CALLANTHIIDAE** (Seaperches) *Volume 3*



99b Not as above **100**

100a Mouth highly protrusile, toothless or with few small teeth; gill rakers long and numerous; dorsal fin with deep notch before last spine, penultimate spine the shortest; dorsal and anal fins in scaly sheath (but see also 107b) **EMMELICHTHYIDAE** IN PART, *Plagiogeneion* (Rovers) *Volume 4*



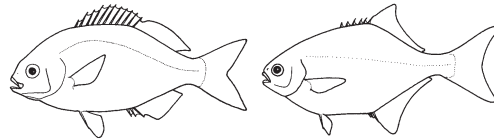
100b Not as above **101**

101a Dorsal fin with 18–23 rays; fins scaly; no spines or flat points on opercle; gill membranes attached to isthmus and attached to each other **DICHISTIIDAE** (Galjoen) *Volume 3*



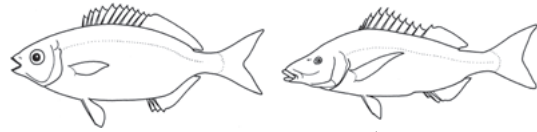
101b Not as above **102**

102a Dorsal fin 11–15 rays; fins without scales; a single row of incisor-like teeth; minute canine-like teeth in 2 or 3 rows medial to incisor-like teeth; opercle with 2 small, weak, retrorse spines **KYPHOSIDAE** (Sea chubs or rudderfishes) *Volume 3*



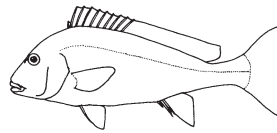
102b Not as above **103**

103a Dorsal fin 10–15 spines, 9–17 rays (but never 10 spines, 9 rays); opercle with or without spines; maxilla slots into groove in outer end of premaxilla; preopercle not serrate; no teeth on vomer; gill membranes separate from each other; no pores on chin **SPARIDAE** (Seabreams and porgies) *Volume 3*



103b Not as above **104**

104a Dorsal fin 15–25 rays; cheek and opercle scaly; head scaly except front of snout; pores on chin **HAEMULIDAE** (Grunters and rubberlips) *Volume 3*



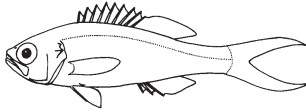
104b Not as above **105**



Continued ...

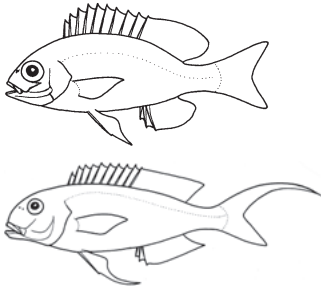
KEY TO PERCIFORM FAMILIES

105a Dorsal fin 9 spines, 10 or 11 rays; opercle with 2 spines, lower larger; uppermost pectoral- and caudal-fin rays often elongate
 **SYMPHYSANODONTIDAE** (Slopefishes) *Volume 3*



105b Not as above **106**

106a Dorsal fin 10 spines, 8–10 rays; anal fin with 7 rays; opercle without spines (some have a flat point); dorsal and anal fins in shallow groove; gill membranes separate from each other
 **NEMIPTERIDAE** (Threadfin breams, monocle breams and dwarf monocle breams) *Volume 3*

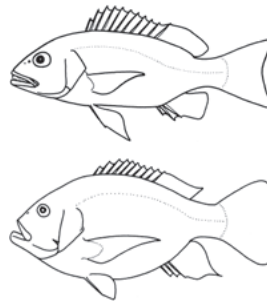


106b Not as above **107**

107a Dorsal fin 9 or 10 rays; opercle with single flat spine; gill rakers few and knob-like; gill membranes not separate from each other **LETHRINIDAE** (Emperors, emperor snappers and large-eye breams) *Volume 3*



107b Dorsal fin 10–16 rays; opercle with 2 flat points, upper hidden by skin and scales; gill rakers not as above; gill membranes separate from each other **LUTJANIDAE** IN PART (Snappers) *Volume 3*



SUBORDER GOBIOIDEI

Helen K Larson

The suborder Gobioidae is one of the largest groups of fishes, with more than 3 000 species recognised. The suborder's higher classification is still being worked on and is likely to change in the near future.

Most species are small to very small (among the smallest vertebrates known), with a wide range of body forms. Gobioid fishes are commonly found in marine to fresh waters, worldwide, mostly in tropical to temperate habitats, and are absent from polar areas. Most species live in marine tropical habitats, from freshwater to mangroves, rocky reefs, coral reefs and coastal areas and on continental slope waters to a depth of ~800 m. They are generally carnivorous, though some coral-reef species may be detritivorous or herbivorous. Despite their small size, coral-reef gobies provide a significant contribution to the energy flow of reef ecosystems, and gobioids also form a significant component of freshwater systems on tropical islands.

Eight families are recognised, with 6 represented in WIO; members of 2 families, the Odontobutidae and Rhyacichthyidae, are restricted to freshwater and are not known from the region.

KEY TO FAMILIES

- 1a No pelvic fins and no scales; single dorsal fin at rear of body, with 15–22 rays; all fin rays unsegmented, except caudal-fin rays; body slender, tiny (maximum ~20 mm SL) and transparent, resembling larvae (neotenus) ... **SCHINDLERIIDAE**



- 1b Pelvic fins present but may be reduced; if single dorsal fin present then not restricted to rear of body; all fin rays segmented (except first element of 2nd dorsal fin in one species); body form not tiny, slender and transparent 2

- 2a Lower jaw and chin distinctly protruding and pointed, with lobes or flaps tucked behind lower lip margin; lower lip thickened, its margin usually continuous, not fused to chin; underside of head, and lower margins of preopercle and opercle with scalloping or flaps; dorsal fins fused and continuous [lives in sand with only head protruding] **KRAEMERIIDAE**



Continued ...

KEY TO FAMILIES

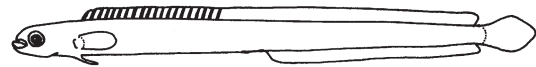
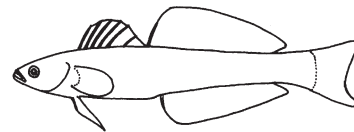
- 2b If chin protruding, then underside of head, lower preopercle margin, and lower opercle margin without scalloping or flaps; lips not thickened or papillose; dorsal fins usually separate [wide range of habitats] 3

- 3a Lower jaw protruding and lower lip with completely free ventral edge; dorsal fins separate; branchiostegal rays 6; usually very small-sized and very slender (maximum ~35 mm SL) [coral-reef habitats] **XENISTHMIDAE**



- 3b Lower jaw protruding and lower lip without completely free ventral edge; dorsal fins fused or separate; branchiostegal rays 5 or 6; body form and size variable 4

- 4a Dorsal fins separate or continuous and often long-based, with 6–28 spines, 13–66 rays; pelvic fins usually separate or mostly separate, with 1 spine, 2–5 rays, and no pelvic frenal membrane joining pelvic-fin spines; scales usually cycloid, small and mostly embedded, usually not overlapping (some species without scales); chin prominent or fleshy (especially so in microdesmines/wormfishes; less so in ptereleotrinines/dart-gobies); body elongate, often highly compressed **MICRODESMIDAE**

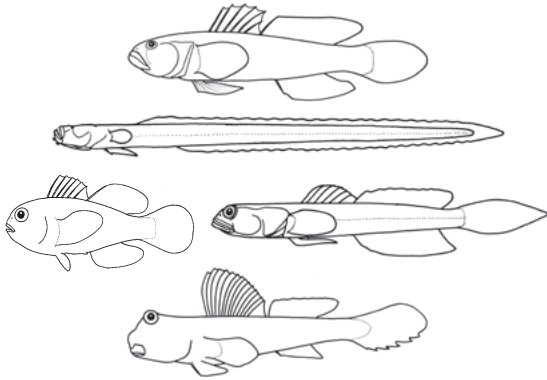
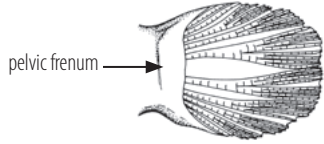


- 4b Dorsal fins usually separate, with 5–17 spines, 5–37 rays; if dorsal fins continuous, then joined by membrane to caudal fin, and skin pink to purple [mud-burrowing amblyopines]; pelvic fins may be fused or separate; scales ctenoid or cycloid, usually overlapping; chin form variable but not usually prominent or fleshy 5

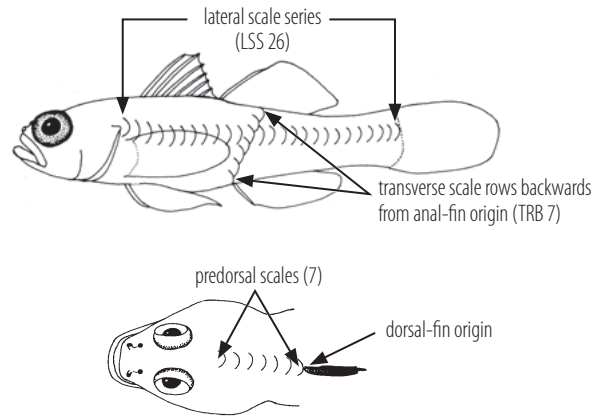
Continued ...

KEY TO FAMILIES

- 5a Branchiostegal rays 5; pelvic fins usually fused, or fins separate but bases close together; pelvic frenum usually present **GOBIIDAE**



- 5b Branchiostegal rays 6; pelvic fins always separate (may be widely so); no pelvic frenum **ELEOTRIDAE**



Counting scales on a goby.

Most goby species inhabit shallow tropical and subtropical waters, but gobies are found in nearly all benthic habitats, from freshwater to shoreline areas, to depths exceeding 500 m, and on a variety of substrates, from mud to rubble and corals. Coral reefs are particularly rich in goby species. Most are of no commercial or recreational importance other than as food for larger fishes, although a number of coral-reef species are sought for the aquarium trade. About 258 genera and more than 1 900 species worldwide, comprising nearly 5% of all described fish species; 5 subfamilies, 82 genera, and at least 330 species in WIO, excluding other strictly freshwater species in the region.

FAMILY GOBIIDAE

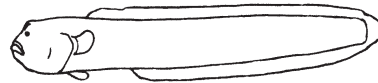
Gobies and mudskippers

Helen K Larson, with contributions from Richard Winterbottom, Margaret Zur and Mary Burridge

Generally small-sized, stout to slender-bodied, and usually with 2 separate dorsal fins. First dorsal fin 5–17 spines; 2nd dorsal fin 1 spine, 5–37 rays; anal fin 1 spine, 5–36 rays; pectoral fins broad, 12–25 rays; pelvic fins long, with 1 spine, 5 rays, and fins usually joined at spines by pelvic frenum (fleshy membrane), and innermost rays usually joined together by membrane forming a disc; caudal fin usually broad and rounded, with 16 or 17 segmented rays. Teeth usually small, sharp, arranged in one to several rows in jaws. Branchiostegal rays 5. Scales cycloid or ctenoid; head often scaly and typically with series of sensory canals and pores as well as cutaneous papillae. No lateral line on body.

KEY TO SUBFAMILIES

- 1a Second dorsal fin and anal fin connected to caudal fin; dorsal fins united by membrane; mud-burrowing, elongate gobies with pink to purple skin **Amblyopinae**



- 1b Second dorsal fin and anal fin both separated from caudal fin; dorsal fins typically separate **2**



- 2a Lower jaw with only 1 row of teeth, which may be very small; if lower eyelid present, then pelvic fins without fleshy lobes [freshwater streams; estuaries] **3**

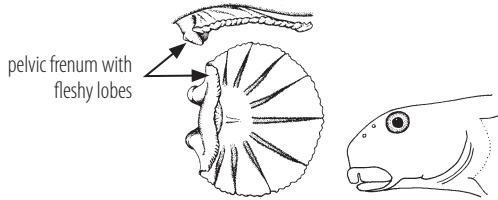


Continued ...

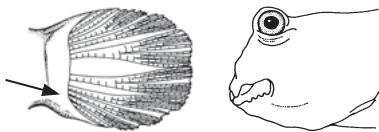
KEY TO SUBFAMILIES

2b Lower jaw usually with >1 row of teeth; and if pelvic fins with fleshy lobes, then >1 row of teeth in lower jaw; lower eyelid never present [all habitats] 4

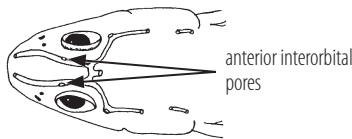
3a Pelvic frenum with fleshy lobes over pelvic-fin spines; eyes laterally placed, with lower edge fused to skin on head **Sicydiinae**



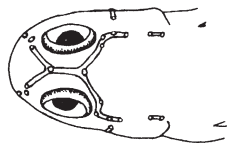
3b Pelvic frenum without fleshy lobes over pelvic-fin spines; eyes mostly dorsally placed, and lower eyelid present **Oxudercinae**



4a Paired anterior interorbital pores present or head pores completely lacking; pelvic frenum simple, not folded forward, and without fleshy lobes around pelvic-fin spines. If no head pores, then one or more of the following conditions also exist: 1) pelvic frenum present; 2) body fully to mostly scaly; and/or 3) no barbels on chin [only non-coral-reef gobies, except genus *Gnatholepis*, which has head pores] **Gobionellinae**



4b Usually single anterior interorbital pore present or head pores completely lacking (except if paired anterior interorbital pores present, then pelvic frenum folded forward, with fleshy lobe around each pelvic-fin spine). If no head pores (as in a few coral-reef species only), then one or more of the following conditions also exist: 1) no pelvic frenum; 2) body naked or with few scales on peduncle only; and/or 3) barbels present on chin **Gobiinae**



SUBFAMILY AMBLYOPINAE

Wormgobies

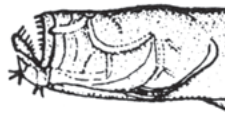
First dorsal fin 6 spines, and fin joined to 2nd dorsal fin by membrane; 2nd dorsal fin 1 spine, 27–67 rays; anal-fin 1 spine, 26–65 rays; pectoral fins 16–51 rays; pelvic fins 1 spine, 5 rays. Second dorsal fin and anal fin connected to caudal fin; first element of those fins may be unsegmented. Body compressed, elongate; head cylindrical to depressed; sides and underside of head may have fleshy ridges and barbels. Eyes small to greatly reduced. Jaws oblique to nearly vertical. Teeth usually large, stout, often caniniform. Gill opening restricted to pectoral-fin base. Scales variably present (may be embedded) or entirely absent; LSS 0–65. Gobies with unpatterned pink to purple skin, and found burrowing through mud in estuaries, mangroves and coastal mudflats. About 12 genera and 35 species occurring in Indo-Pacific; 6 genera and possibly 10 species in WIO.

KEY TO GENERA

1a Pelvic fins moderate to large, length at least 64% (usually >70%) HL, and fins always fully united and forming disc 2

1b Pelvic fins small to moderate, length ~40–62% HL, and fins either united and forming disc or emarginate posteriorly 5

2a Head and body with distinct fleshy ridges; upper lip thick and fleshy, with fringed dorsal margin; caudal fin short, usually subequal to HL; underside of lower jaw usually with several clusters of long fleshy barbels; head and body entirely naked (without scales) **Taenioides**



2b Head without distinct fleshy ridges; upper lip thick or thin, and dorsal margin not fringed; caudal fin long to very long, usually longer than HL (except *Brachyamblyopus* with caudal fin ≤ HL); underside of head with or without barbels; minute cycloid scales at least on posterior part of body (may be difficult to see without magnification) 3

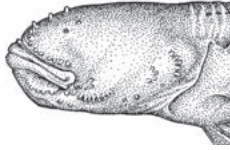
3a Pectoral fins 20–65 (usually >23) rays, most unbranched, filamentous and free from fin membrane **Odontamblyopus**

3b Pectoral fins ≤23 rays, sometimes branched but never forming filamentous rays free of fin membrane 4

Continued...

KEY TO GENERA

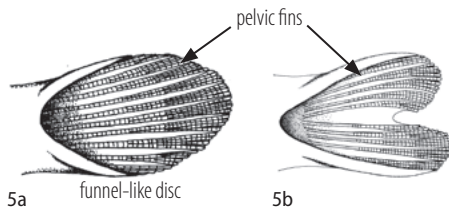
- 4a No scales on body; no barbels on head, head smooth but for short cirri and low bumps, especially around eyes and opercle *Trypauchenopsis*



- 4b Scales present at least on peduncle; head smooth and entirely without barbels, bumps or cirri *Brachyamblyopus*

- 5a Belly scaly, but ventral midline sometimes naked; pelvic fins fused medially and rounded posteriorly, forming funnel-like disc *Trypauchen*

- 5b Belly naked; pelvic fins connected medially but emarginate posteriorly, not forming funnel-like disc *Paratrypauchen*

GENUS *Brachyamblyopus* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 29 to 30 total rays; anal fin 28 to 31 total rays; pectoral fins short and rounded, with 20–23 rays, most branched, but not filamentous and free from membrane; pelvic fins fused, and pelvic frenum low; caudal fin short, subequal to or less than HL. Eyes very small, embedded in layer of muscle. Head without barbels. Mouth oblique, chin prominent; 2–6 enlarged teeth in outer row of each jaw. Body scales small, cycloid, non-imbricate and difficult to count, on sides of body from below dorsal fin to peduncle; head, breast, belly and pectoral-fin bases naked; LSS ~70–75. Vertebrae 10 + 16 = 26; first 2 pterygiophores of 2nd dorsal fin share the same interneural space. One species, with its presence in WIO uncertain.

Brachyamblyopus brachysoma (Bleeker 1854)

Short wormgoby

Amblyopus brachysoma Bleeker 1854: 510 (Priaman, Sumatra, Indonesia).

Brachyamblyopus brachysoma: Koumans 1941, 1953; Manilo & Bogorodsky 2003; Murdy 2011.

Diagnosis as for genus.

Body purplish red to deep pink. Attains 10.8 cm TL.

DISTRIBUTION Western Pacific (Vietnam, Indonesia and Philippines), except one record from Persian/Arabian Gulf in WIO (Koumans 1941), which needs specimens for verification.

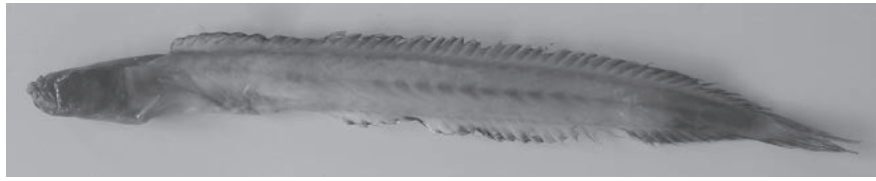
REMARKS Freshwater and brackish; burrows in thick mud, thus rarely observed.

GENUS *Odontamblyopus* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 38–48 rays; anal fin 1 spine, 31–44 rays; first elements of 2nd dorsal fin and anal fin may be segmented; pectoral fins 20–65 (usually >23) rays. Unique in subfamily in having most pectoral-fin rays unbranched, filamentous and free from membrane. Eyes very small, may be barely distinguishable. Teeth in outer row of both jaws large and fang-like; 2 symphyseal canine teeth in lower jaw. Small barbels may be present on underside of chin, especially in juveniles. Body scales small and embedded. Sensory papillae present, but not raised on fleshy folds. Marine and estuarine in habitat, living in burrows in mud (one species known to make complex burrows nearly 1 m deep). Five poorly known species, 2 in WIO.

KEY TO SPECIES

- 1a Pectoral fins 20–28 rays; chin may have a few short barbels *O. roseus*
- 1b Pectoral fins 46–65 rays (average 60); chin with many small fine barbels *O. tenuis*



Odontamblyopus roseus, 17 cm TL (SW India). KV Akhilesh © CMFRI

Odontamblyopus roseus (Valenciennes 1837)

Rosy wormgoby

PLATE 1

Amblyopus roseus Valenciennes in Cuv. & Val. 1837: 164 (Mumbai, India, Arabian Sea).

Odontamblyopus roseus: Murdy & Shibukawa 2001*;
Manilo & Bogorodsky 2003.

Second dorsal fin 38–43 rays; anal fin 36–42 rays; pectoral fins 20–28 rays. Chin may have a few short barbels.

Head and body with roseate tinge. Preserved specimens pale brown, paler ventrally; dorsal- and anal-fin edges broadly dark brown to blackish; pelvic fins and caudal fin mostly dark brown to blackish. Attains 17 cm TL.

DISTRIBUTION WIO: Pakistan to India.

REMARKS Marine; a bycatch of trawls over mud bottom.

Odontamblyopus tenuis (Day 1876)

Slender wormgoby

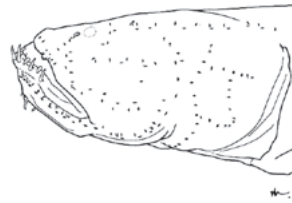
Gobioides tenuis Day 1876: 319, Pl. 69, Fig. 3 (Sindh, Pakistan).

Odontamblyopus lighti: Hoda 1980*.

Odontamblyopus tenuis: Murdy & Shibukawa 2001*;
Manilo & Bogorodsky 2003.

Second dorsal fin 38–46 rays; anal fin 32–35 rays; pectoral fins 46–65 (average 60) rays. Body extremely elongate; chin with many fine barbels.

Preserved specimens pale brown or dark brown to grey dorsally; caudal-fin rays dusky; outer teeth reddish brown in large specimens. Live colour noted by Day (1876) as having “general roseate tinge, fins colourless except the caudal, which is dark with a light outer edge.” Attains ~13 cm SL.



Odontamblyopus tenuis.

Source: Murdy & Shibukawa 2001

DISTRIBUTION Indian Ocean. WIO: Pakistan and India; elsewhere, Myanmar.

REMARKS Poorly known; apparently found in river estuaries.

GENUS *Paratrypauchen* Murdy 2008

First dorsal fin 6 spines; 2nd dorsal fin 44–54 rays; anal fin 41–49 rays; pectoral fins 12–20 rays; pelvic fins connected up to ~½ length of innermost rays, and pelvic frenum small but distinct. Distinctive small blind pit near upper rear corner of opercle. Frontals with smooth central crest; distinct bony ridge on predorsal midline; belly with distinct ventral keel. Body scales non-imbricate anteriorly, overlapping on rear half of body; predorsal area, head, breast and belly naked; LSS 52–76. Common in estuaries and coastal areas with mud substrates, but usually seen only when caught in a trawl or dredge. One species.

Paratrypauchen microcephalus (Bleeker 1860)

Comb wormgoby

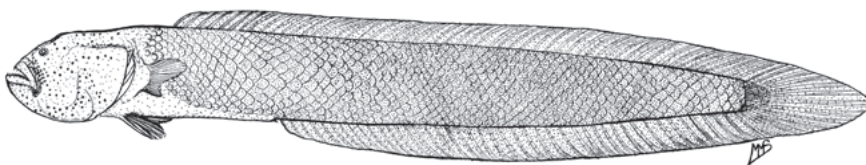
PLATE 1

Trypauchen microcephalus Bleeker 1860: 62 (Sungiduri, Borneo, Indonesia); SFSA No. 937*; Smith 1961*; SSF No. 240.102*.

Ctenotrypauchen barnardi Hora 1926: 221, Figs. 1–2 (off head of Thukela River, KwaZulu-Natal, South Africa); Barnard 1947*.

Ctenotrypauchen microcephalus: Maugé 1986; Manilo & Bogorodsky 2003.

Paratrypauchen microcephalus: Murdy 2008*.



Paratrypauchen microcephalus, 13 cm TL (South Africa). Source: SSF

Diagnosis as for genus. Second dorsal fin 44–54 rays; anal fin 41–49 rays; pectoral fins 12–20 rays, and upper rays much longer than lower rays, giving fin scimitar shape. LSS 52–76; TRB 12–14.

Head and body fleshy pink to reddish, slightly darker around jaws and pectoral-fin bases. Attains 15 cm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (KwaZulu-Natal) and Madagascar; elsewhere to east coast of India, Indonesia, Japan, Australia and Vanuatu.

REMARKS Burrows in muddy coastal substrates, such as off river mouths, at 3–33 m.

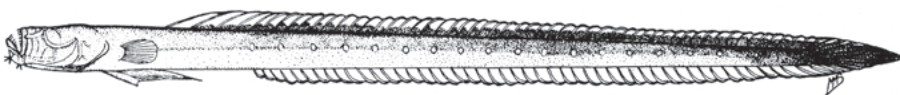
GENUS *Taenioides* Lacepède 1800

First dorsal fin 6 spines; 2nd dorsal fin 41–66 rays; anal fin 34–65 rays; pectoral fins 15–21 rays. Body elongate and compressed, head variably compressed. Mouth nearly vertical; teeth in outer row of both jaws large, sharp and pointed, interlocking when jaws closed. Barbels and fleshy flaps on underside of head, but none around eyes or on opercle. No scales. Sensory papillae present along sides, in 18–25 short rows, often paired and conspicuous; papillae rows on head raised up on ridges. Inhabit muddy substrates in estuaries and intertidal habitats, such as mangroves, and thus rarely observed. In need of revision: 13 nominal species, occurring in Indo-Pacific, all poorly known; 4 species in WIO.

KEY TO SPECIES

- 1a Margins of 2nd dorsal fin and anal fin black, and caudal fin almost entirely black; 2nd dorsal fin 66 rays, and anal fin 65 rays [1 specimen] *T. kentalleni*
- 1b Margins of 2nd dorsal fin and anal fin dark red to dusky, and caudal fin dark red to reddish brown or blackish; total dorsal-fin elements ≤ 56 , and total anal-fin elements ≤ 48 2
- 2a HL ~ 1.4 into distance between snout and anus *T. esquivel*
- 2b HL 1.7–2.2 into distance between snout and anus 3

Continued...



Taenioides esquivel, 29 cm TL
(S Mozambique). Source: Smith 1959

KEY TO SPECIES

- 3a Distance between posterior nostril and eye subequal to interorbital width; lips at corners of mouth slender and smooth *T. cirratus*
- 3b Distance between posterior nostril and eye $\sim 1/4$ interorbital width; lips at corners of mouth wide and crenulated or with short flaps *T. gracilis*

Taenioides cirratus (Blyth 1860)

Whiskered eel-goby

Amblyopus cirratus Blyth 1860: 147 [probably from fish market at Calcutta, India].

Amblyopus brachygaster: Jatzow & Lenz 1898.

Taenioides cirratus: Smith 1959; Hoda 1980*; Maugé 1986; Manilo & Bogorodsky 2003.

Second dorsal fin 41–45 rays; anal fin 44–45 rays; pectoral fins 17 rays; often 3 pairs of short barbels on underside of head; lips at corners of mouth slender, not wide and crenulated.

Head and body pinkish brown to bronze-brown, paler ventrally; dorsal fins and anal fin translucent; caudal fin brownish. Attains 20 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Oman, Pakistan, and offshore islands of East Africa (Zanzibar; Madagascar); elsewhere to east coast of India, New Guinea and Australia.

REMARKS Inhabits shallow mud-bottoms, including lower reaches of rivers; cryptic and burrowing.

Taenioides esquivel Smith 1947

Bulldog eel-goby

PLATE 1

Taenioides esquivel Smith 1947: 814 (Costa do Sol, Maputo Bay, Mozambique); SFSA No. 904*; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.98*; Whitfield 1998.

Second dorsal fin and anal fin each with 48–50 rays; pectoral fins 16 or 17 rays; 2 pairs of barbels on underside of head; lips at corners of mouth wide and rounded, with 2–4 short barbels or flaps posteriorly.

Alive, body pink, with pink to reddish fins, except pectoral fins translucent pink with darker pink rays. Attains 29 cm TL.

DISTRIBUTION WIO: Mozambique (Maputo Bay) to South Africa (Transkei region).

REMARKS Burrows in mud in permanently open estuaries.

Taenioides gracilis (Valenciennes 1837)

Slender eel-goby

PLATE 1

Amblyopus gracilis Valenciennes in Cuv. & Val. 1837: 166 (Puducherry, India).

Taenioides gracilis var. *madagascarensis* Chabanaud 1927: 414, Figs. 10–11 (Marimbo River at Soanierana, Madagascar).

Taenioides gracilis: Smith 1959; Maugé 1986; Stiassny & Raminosoa 1994.

Second dorsal fin 42–48 rays; anal fin 38–48 rays; pectoral fins 15 or 16 rays; at least 3 pairs of barbels on underside of head; lips at corners of mouth broad and crenulated or with short pointed flaps.

Alive, body deep brownish pink, reddish to deep pink ventrally; caudal fin dark red to blackish. Attains 24 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Madagascar and India; elsewhere, scattered localities eastwards to Australia.

Taenioides kentalleni Murdy & Randall 2002

Kent's eel-goby

PLATE 1

Taenioides kentalleni Murdy & Randall 2002: 2, Fig. 1 (Ras Az Zawr Bay, Saudi Arabia, Persian/Arabian Gulf).

Second dorsal fin 66 rays; anal fin 65 rays; pectoral fins 20 or 21 rays. Body long and slender; 5 pairs of short barbels on underside of head; lips broad at corners of mouth.

Head and body bluish grey; margins of 2nd dorsal fin and anal fin black, and caudal fin almost entirely black. Attains at least 20 cm SL.

DISTRIBUTION Known only from the holotype collected from the Persian/Arabian Gulf.

REMARKS Taken from the mouth of its burrow on a tidal mudflat.

GENUS *Trypauchen* Valenciennes 1837

First dorsal fin 5–6 spines; 2nd dorsal fin 40–52 rays; anal fin 39–50 rays; pectoral fins 15–20 rays; pelvic fins fused, rounded posteriorly, forming cup-shaped disc, with low pelvic frenum. Distinctive small blind pit near upper rear corner of opercle. Head and body compressed, and body somewhat elongate. Mouth small, oblique; teeth in outer rows large, stout and with blunt tips, largest teeth towards front of jaws. Body scales cycloid, may be non-imbricate anteriorly; head and nape naked; LSS 59–98. Gill opening extends ventrally from pectoral-fin base, but not to below opercle. Found in coastal areas with mud substrates, but usually only seen when caught in a trawl or dredge. Two species in Indo-Pacific, 1 in WIO.

Trypauchen vagina (Bloch & Schneider 1801)

Eel-goby

PLATE 1

Gobius vagina Bloch & Schneider 1801: 73 (Tharangambadi, India).

Trypauchen vagina: Blegvad & Løppenthin 1944; Khalaf 1961; Hoda 1980*; Kuronuma & Abe 1986; Randall 1995*; Manilo & Bogorodsky 2003; Murdy 2006.

Most fin-ray counts as for genus; pectoral fins sickle-shaped, with upper rays distinctly longer than lower rays. LSS 75–115.

Head and body reddish or bright pink to purplish. Attains 15.5 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Arabian Sea and Pakistan; elsewhere to east coast of India, Taiwan and northern Australia.

REMARKS Specimens have been collected from the gut of the reticulate whipray *Himantura uarnak*.



Taenioides gracilis, 12 cm TL (Mozambique). O Alnheim © IMR

Taenioides kentalleni, 20 cm SL, holotype (Saudi Arabia). © SJ Raredon, Smithsonian Institution

GENUS *Trypauchenopsis* Volz 1903

First dorsal fin 5–7 (usually 6) spines; 2nd dorsal fin 28–35 rays; anal fin 27–33 rays; pectoral fins 16–19 rays, and fins shorter than pelvic fins. Body compressed. Mouth slightly oblique; teeth in outer row large, but not greatly so, and not protruding when mouth closed. No scales; head smooth but for some short cirri. Only one species known.

Trypauchenopsis intermedia Volz 1903

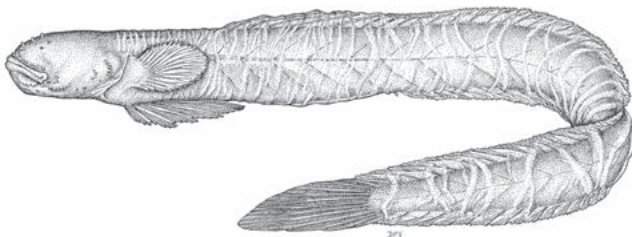
Bearded eel-goby

Trypauchenopsis intermedius Volz 1903: 555 (Banju Asin, Sumatra, Indonesia).

Taenioides jacksoni Smith 1943: 70, Fig. 2 (St Lucia, KwaZulu-Natal, South Africa); SFSA No. 903*; Smith 1959*, 1961*; Winterbottom 1976; Hoese & Winterbottom 1979; Hoese 1986*; Maugé 1986; Whitfield 1998*.

Second dorsal fin 28–35 rays; anal fin 27–33 rays; pectoral fins 16–19 rays. Mouth slightly oblique; head smooth but for short cirri and bumps, especially around eyes and opercle.

Head and body brownish, pinkish or partly translucent; dark red-brown pigment around pectoral- and pelvic-fin bases. Attains ~11 cm SL.



Trypauchenopsis intermedia, ~11 cm SL (South Africa).

Source: Whitfield 1998

DISTRIBUTION Indo-Pacific (scattered). WIO: Mozambique (Maputo Bay) to South Africa (Mthatha River); elsewhere, Myanmar, Indonesia (Sumatra; Bali), Philippines, southern Japan (Ryukyu Is.) and Micronesia (Guam).

REMARKS Burrows in mud in lower parts of open estuaries and mangrove habitats, thus not often seen.

SUBFAMILY **Gobiinae**

Gobies

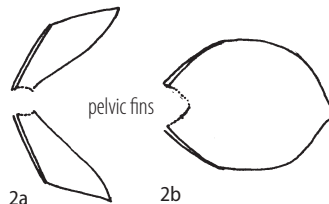
Body form variable, usually slender; no lateral line; scales usually present; usually 2 dorsal fins. First dorsal fin 5 or (usually) 6 spines; 2nd dorsal fin usually 1 spine, 6–29 rays; anal fin usually 1 spine, 5–20 rays; pectoral fins 12–23 rays; pelvic fins 1 spine, 5 rays, innermost rays usually joined by membrane forming a disc, and pelvic frenum usually present; caudal fin 16 or 17 segmented rays. Teeth usually small, sharp, arranged in one to several rows in both jaws. Scales cycloid or ctenoid; head may be scaly, and typically with series of sensory canals and pores as well as cutaneous papillae; usually single anterior interorbital pore present.

Gobiines occupy nearly all types of benthic habitats, from freshwater and near shoreline to depths exceeding 500 m, on a variety of substrates, from mud to rubble, but are most diverse on coral reefs. About 62 genera and 279 species in WIO.

KEY TO GENERA

- 1a Body naked or with only a few scales on peduncle 2
1b Body scaly at least on rear half 7

- 2a Pelvic fins separate and slender 3
2b Pelvic fins joined 4



- 3a Body deep, robust; eyes small [coral reefs] *Austrolethops*



- 3b Body slender; eyes moderate to large [coral reefs] *Trimmatom* [IN PART]

Continued ...

KEY TO GENERA

4a Teeth tricuspid, and body slender [rocky shores] *Kelloggella*



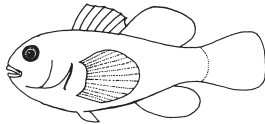
4b Teeth pointed 5

5a Body relatively elongate and compressed, its depth ~8 in SL; first element of 2nd dorsal fin and anal fin segmented [freshwater to brackish] *Croilia*



5b Body short and stout, may be compressed but never elongate, its depth ~2.5–3.5 in SL; first element of 2nd dorsal fin and anal fin unsegmented 6

6a Gill opening narrow, restricted to pectoral-fin base; head and body deep and compressed; pelvic fins short and fleshy [coral reefs] *Gobiodon*



6b Gill opening wide, reaching forward to margin of preopercle; body short and robust, compressed posteriorly, but head and anterior half of body usually rounded; pelvic fins not fleshy [deep water] *Larsonella*



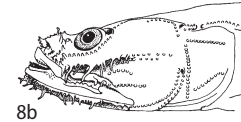
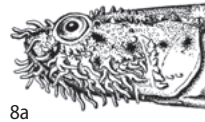
7a Barbels on underside of head, and barbels distinctly larger than any elongate papillae 8



7b No barbels on head, but papillae in rows on ventral surface of head may be elongate 9

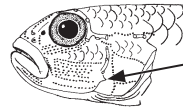
8a No cheek folds; barbels profuse and slender, forming fringe around head; head pores always present, including 1 or 2 over opercle [coral reefs] *Barbuligobius*

8b One or two distinct cheek folds; barbels may be present on chin, snout and sides of head; head pores present or absent [coral reefs and estuaries] *Gobiopsis*



9a First spines of 1st and 2nd dorsal fins rigid and thick 10
9b Dorsal-fin spines thin and flexible 11

10a Preopercle with 1–3 flat spines; nape may have small scales [coral reefs] *Oplopomus*



10b Preopercle without spines; nape scales may be as large as body scales [coral reefs] *Hazeus*

11a Preopercle with 1 large prominent spine; predorsal area naked [shallow reefs, often near estuaries] *Gladiogobius*



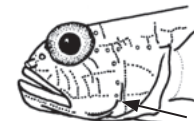
11b Preopercle with 0–9 small spines, may be ventrally directed and mostly concealed by skin 12

12a Preopercle with 1–9 spines 13

12b Preopercle smooth, without spines 14

13a Preopercle with 1–9 posteriorly directed flat spines [coral reefs] *Asterropteryx*

13b Preopercle with single ventrally directed spur-like spine, largely concealed under skin [coral reefs] *Ancistrogobius*



14a First dorsal-fin origin at rear of head, directly above end of opercle; first few spines of dorsal fin greatly elongate [coral reefs] *Discordipinna*

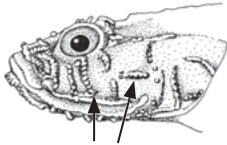


Continued...

KEY TO GENERA

14b First dorsal-fin origin above or usually behind pectoral-fin bases; dorsal-fin shape variable 15

15a Cheeks with papillae in transverse pattern (but some cheek papillae in vertical rows), and papillae prominent and raised up on fleshy flaps [coral reefs and estuaries] *Callogobius*



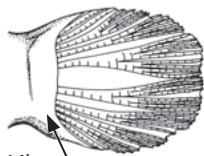
15b Cheeks with papillae either in transverse pattern (but some cheek papillae in vertical rows) or in longitudinal pattern (all papillae on cheeks arranged in more or less horizontal rows), but without prominent vertical fleshy flaps bearing papillae 16

16a Pelvic fins with thickened lobe around each pelvic-fin spine, and pelvic frenalum folded forward forming pocket 17

16b Pelvic fins with or without thickened skin around each pelvic-fin spine, and pelvic frenalum flat, sometimes fleshy, but not folded forward to form pocket 21



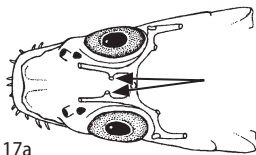
16a



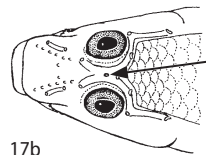
16b

17a Interorbital canals separate: 2 anterior interorbital pores 19

17b Interorbital canal single: 1 (rarely 2) anterior interorbital pore(s) 18

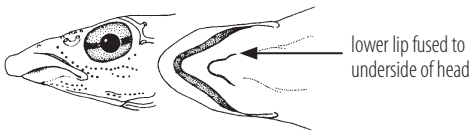


17a



17b

18a Edge of lower lip fused to underside of head, and lip free at chin only [coral reefs] *Luposicya*



lower lip fused to underside of head

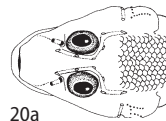
18b Edge of lower lip free at sides, but lip fused at chin [coral reefs] *Pleurosicya*

19a Pectoral-fin rays all branched; eyes small [deep water] *Lobulogobius*

19b Pectoral fins with lower 2–6 rays unbranched and tips usually thickened; eyes large 20

20a Gill openings wide and not attached to isthmus; head broad and flattened; nape scaly [coral reefs] *Phyllogobius*

20b Gill openings wide or narrow, but always attached to isthmus; head may be elongate but not flattened; nape usually naked [coral reefs] *Bryaninops*



20a



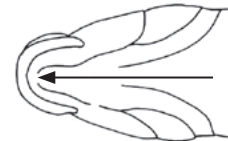
20b

21a Chin with transverse or curved mental frenalum or with free fleshy flap 22

21b Chin relatively smooth, without mental frenalum 27



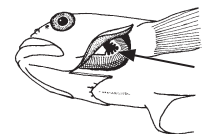
21a



21b

22a Cheek papillae in transverse pattern; 1st gill arch partly to fully bound by membrane to opercle 23

transverse cheek papillae pattern



1st gill arch bound by membrane

22b Cheek papillae in longitudinal pattern; 1st gill arch free, not bound by membrane to opercle 24

longitudinal cheek papillae pattern

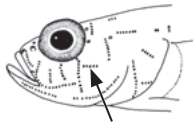


23a Upper longitudinal row of cheek papillae below eyes (if present) begins in front of rearmost vertical row of cheek papillae; oculoscapular canal over opercle usually present; mental frenalum present or absent [shallow reefs and estuaries] *Coryogalops* [IN PART]

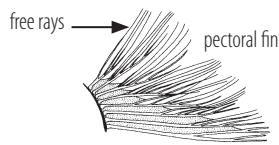
Continued ...

KEY TO GENERA

- 23b Upper longitudinal row of cheek papillae (below eyes) begins behind rearmost vertical row of cheek papillae; no oculoscapular canal and pores over opercle; single-lobed mental frenum always present *Heteroleotris*



- 24a Tips of upper pectoral-fin rays free and silk-like; no curved canine tooth at each side of lower jaw [usually shallow reefs] *Bathygobius*



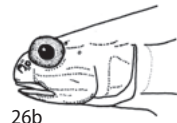
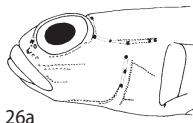
- 24b Tips of upper pectoral-fin rays not free, or if free then curved canine tooth present at each side of lower jaw 25

- 25a Second dorsal fin and anal fin each with 1 spine, 7 or 8 rays [coral reefs] *Palutrus*

- 25b Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 8–10 rays [coral reefs and estuaries] 26

- 26a Head depressed, mouth terminal; 2nd dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays [coral reefs] *Cabillus*

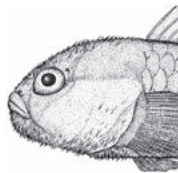
- 26b Head deep, mouth subterminal with snout partly overhanging upper lip; 2nd dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays [coral reefs and estuaries] *Istigobius* [IN PART]



26a

26b

- 27a Sides and top of head covered with fleshy bumps or fine flaps (sometimes closely set); head rounded, its underside scattered with numerous small bumps; nape naked [coral reefs] *Paragobiodon*

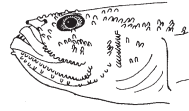


- 27b Head without fine fleshy flaps or bumps; nape scaly or naked 28

- 28a No head pores; size not >50 mm SL 29

- 28b Head pores present 32

- 29a Head papillae conspicuous, in rows which may form ridges; head depressed [coral reefs] *Feia*



- 29b Head papillae small, not forming ridges; head compressed or cylindrical 30

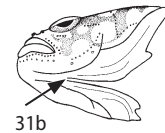
- 30a Pelvic-fin rays either all unbranched or at least 5th ray unbranched [coral reefs] *Trimmatom* [IN PART]

- 30b Pelvic-fin rays branched; body scaly 31



- 31a Gill opening ends below rear edge of preopercle; head usually broader than deep; colouration includes vertical bars on head or body [coral reefs; deep water] *Priolepis*

- 31b Gill opening extends to below eye or (rarely) at least to preopercle margin; head usually deeper than broad; colour pattern variable, but often with spots on head [coral reefs] *Trimma*

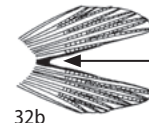
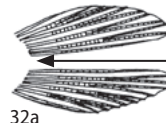


31a

31b

- 32a Pelvic fins completely separate, no membrane connecting bases of 5th rays 33

- 32b Pelvic fins partly or completely connected by membrane ... 37

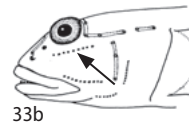
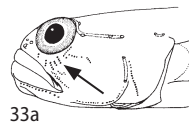


32a

32b

- 33a Cheek papillae pattern includes short transverse rows 34

- 33b Cheek papillae in longitudinal pattern 35

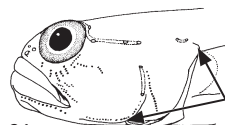


33a

33b

- 34a Gill opening wide, extends to below preopercle [coral reefs] *Amblyeleotris* [IN PART]

- 34b Gill opening restricted to pectoral-fin base [shallow reefs and estuaries] *Coryogalops* [IN PART]



34a

34b

Continued...

KEY TO GENERA

- 35a Teeth in upper jaw in 1 row; adults reach >50 mm SL [coral reefs] *Valenciennea*
 35b Teeth in upper jaw in 2 or more rows; adult size <30 mm SL 36

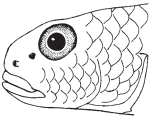
- 36a Fifth pelvic-fin ray unbranched, usually considerably reduced and may be absent; fin rays with multiple branches and often fringe-like [coral reefs] *Eviota*



- 36b Fifth pelvic-fin ray branched; fin rays branched at tips, but not fringe-like [coral reefs; deep water] *Sueviota* [IN PART]



- 37a Cheek and opercle completely scaly 38



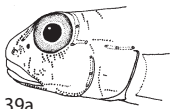
- 37b Cheek and opercle partially scaly or naked 42

- 38a Body deep, its depth <4 times in SL; head deep, with small eyes set high on head; no prominent recurved canine tooth at sides of lower jaw [coral reefs and estuaries] *Exyrius*

- 38b Body relatively slender, its depth >4 times in SL; head not particularly deep, and small eyes not set high on head; prominent recurved canine tooth may be present at sides of lower jaw 39

- 39a Transverse pattern of sensory papillae on cheek; anterior interorbital pore present 40

- 39b Longitudinal pattern of sensory papillae on cheek, and several rows usually with distinctive thin fleshy papillae; no anterior interorbital pore 41



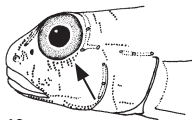
39a



39b

- 40a Papillae directly below eyes reduced to a few short rows [coral reefs] *Macrodontogobius*

- 40b Papillae directly below eyes in 10–12 short transverse rows [estuaries and coastal areas] *Arcygobius*



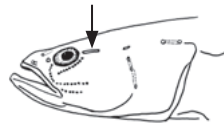
40a



40b

- 41a Large slit-like pore behind eye just at top of preopercle; no scales on branchiostegal membranes; underside of head smooth, without fleshy knobs [deep water] *Aulopareia* [IN PART]

- 41b Oval to rounded pore behind eye; scales on branchiostegal membranes; underside of head may have small fleshy knobs [deep water] *Parachaeturichthys*



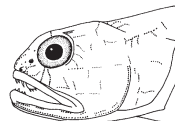
41a



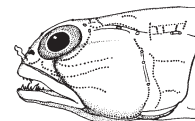
41b

- 42a Cheek papillae in transverse pattern, with transverse rows at least present under eye 43

- 42b Cheek papillae in longitudinal pattern, some rows may be very short; if rudimentary transverse rows present, then not under eye 56



42a



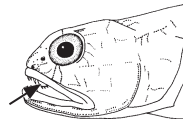
42b

- 43a The following combination of characters present: no anterior interorbital pore; scales moderately large, LSS ≤39; mouth large, reaching past eyes (nearly to end of preopercle in adult males); 1st dorsal fin tall and broad, with distinctive dark bands and/or spots, and body with dark oblique bars [estuaries and coral reefs] *Mahidolia*



- 43b Anterior interorbital pore present or absent; scales usually smaller, LSS usually ≥40; if LSS <40, then combination of colour pattern, mouth size and 1st dorsal-fin shape not as above 44

- 44a Teeth on vomer, which is curved into mouth; gill openings wide, membranes joined forming free fold across isthmus; no oculoscapular canal and associated pores over opercle; body pale with distinct dark markings [coral reefs] *Stonogobius*



- 44b No teeth on vomer (vomer itself may be curved into mouth); other combination of characters not as above 45

Continued ...

KEY TO GENERA

45a Second dorsal fin 1 spine, 12–16 rays; anal fin 1 spine, 11–17 rays; 5th ray of pelvic fins always shorter than 4th ray; single large papilla in pit on each side of chin [coral reefs] *Amblyeleotris* [IN PART]

45b Second dorsal fin 1 spine, 9–16 rays; anal fin 1 spine, 8–13 rays; 5th ray of pelvic fins longer than 4th ray; usually several papillae in 1 or 2 rows on or near chin 46



45a

45b

46a No posterior oculoscapular canal and pores over top of opercle 47

46b Posterior oculoscapular canal and at least 2 pores present over top of opercle 48



46a

46b

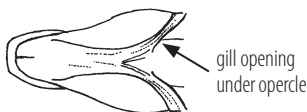
47a Head and body plain dark brown, with white band from snout tip to front of 1st dorsal fin, and fin with pale-margined black eyespot (colour pattern distinctive even in preserved specimens) [coral reefs] *Lotilia*



47b Colour not as above, instead head and body brown to yellow, with X-shaped dark marks on sides, and brown blotches on dorsal half of body [freshwater and estuarine] *Acentrogobius* [IN PART: 1 species]

48a Gill opening extends to below rear edge of preopercle or further forward 49

48b Gill opening either extends to under opercle or is restricted to pectoral-fin base; if opening close to rear edge of preopercle, then cheek with many vertical rows of sensory papillae, and most papillae rows doubled or proliferated 50



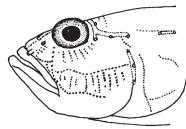
gill opening under opercle

49a Preopercular pores 0–2: if pores present, then 6 or 7 narrow vertical white lines crossing anterior half of body [coral reefs] *Psilogobius*



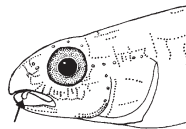
49b Preopercular pores 2 or (usually) 3; colour pattern may include pale or dark variably shaped and oriented bars, but without 6 or 7 narrow vertical white lines crossing anterior half of body [coral reefs; deep water] *Cryptocentrus*

50a Scales on preopercle, but restricted to patch behind eyes; nape scales extend upward to behind eyes; cheeks with many vertical rows of sensory papillae [estuaries and silty reefs] *Acentrogobius* [IN PART]



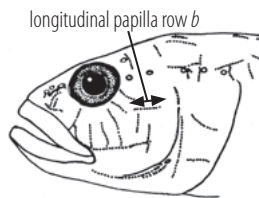
50b Preopercle nearly always naked; if scales present behind eyes then cheeks without many vertical rows of sensory papillae 51

51a Large posterolaterally directed canine tooth on lower jaw, often visible when mouth closed; snout rounded and overhangs upper lip in most species [coral reefs] .. *Amblygobius*



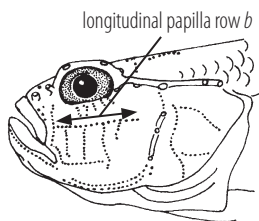
51b No large posterolaterally directed canine tooth on lower jaw; snout not overhanging upper lip 52

52a Gill opening restricted to pectoral-fin base; longitudinal papilla row *b* on cheek absent or short, not extending forward to below mideye 53



longitudinal papilla row *b*

52b Gill opening extending to below opercle; longitudinal papilla row *b* on cheek long, extending forward to under mideye or usually to below anterior margin of eye [shallow reefs and estuaries] *Drombus*

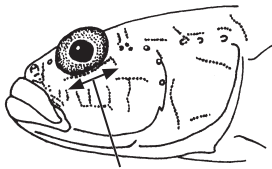


longitudinal papilla row *b*

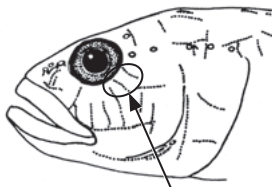
Continued ...

KEY TO GENERA

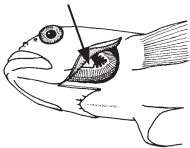
- 53a Longitudinal papilla row *a* present on cheek, directly under eye; upper rays of pectoral fins never free [shallow marine to brackish or hypersaline habitats] *Pomatoschistus*

longitudinal papilla row *a*

- 53b Longitudinal papilla row *a* below eye absent, replaced by 3–7 transverse rows; 2 or 3 upper rays of pectoral fins may be free 54

transverse rows replacing papilla row *a*

- 54a First gill arch partly bound by membrane to opercle; upper pectoral-fin rays usually free; head and nape always naked; mental frenum present but may be small [mostly shallow reefs] *Coryogalops* [IN PART]



- 54b First gill arch not bound to opercle; upper pectoral-fin rays may or may not be free; nape scaly or naked, and sides of head naked or with scales on opercle; mental frenum present or absent 55

- 55a At least 2 or 3 upper pectoral-fin rays free; scales may be present on opercle; predorsal midline scaly; no mental frenum [inshore marine] *Gobius*

- 55b Upper pectoral-fin rays free, or partly free in some species; opercle always naked; predorsal midline usually naked, occasionally scaly; indistinct mental frenum present [shallow rocky reefs] *Caffrogobius*

- 56a Anal fin always with one or more segmented rays than present in 2nd dorsal fin; eyes close-set and close to snout tip [sandy shores and estuaries] *Silhouettea*

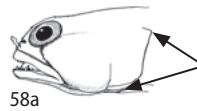
- 56b Anal fin and 2nd dorsal fin with an equal number of rays, or dorsal fin with one or more rays than in anal fin; eyes not close-set or close to snout tip 57

- 57a Body scales ctenoid at least posteriorly; mouth size variable 59

- 57b Body scales all cycloid, may be embedded anteriorly; mouth may be wide, extending to under eyes 58

- 58a Mouth wide, reaching to at least posterior margin of eyes in adults; gill opening reaching to below opercle or below posterior margin of eye; cheeks may be inflated and bulging in adults, with curved groove separating cheeks from narrow occiput [coral reefs] *Tomiyamichthys*

- 58b Mouth moderate, reaching to below anterior half of eyes; gill opening restricted to pectoral-fin base; cheeks not much inflated [marine to estuarine] *Cryptocentroides*



58a



58b

- 59a Gill opening wide, reaching to below rear edge of preopercle or further forward 60

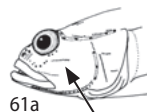
- 59b Gill opening restricted to pectoral-fin base or extending to slightly below opercle 63

- 60a Gill membranes always attached to sides of isthmus 61

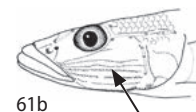
- 60b Gill membranes free from isthmus, and gill opening reaching nearly to eye [estuaries and shallow coral reefs] *Psammogobius*

- 61a Four or fewer short horizontal rows of sensory papillae on cheek, plus row directly under eye 62

- 61b At least 5, long, horizontal rows of sensory papillae crossing cheek (rows may be doubled), plus an oblique row directly under eye [estuaries and rivers] *Glossogobius*



61a



61b

- 62a Caudal fin always rounded, shorter than head; bright white spot on pectoral fins; body pale with dark spots [coral reefs] *Ctenogobiops*

- 62b Caudal fin usually pointed, longer than head; no bright white spot on pectoral fins; body colour variably with pale and dark bars, spots and/or stripes [coral reefs] *Vanderhorstia*



62a



62b

Continued ...

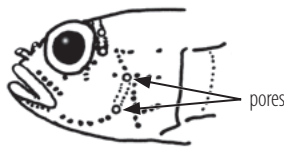
KEY TO GENERA

- 63a Caudal fin narrow and pointed, longer than head; no oculoscapular canal over opercle; 3 preopercular pores [deep water] *Obliquogobius*



- 63b Caudal fin usually broad, rounded to truncate, shorter than head; oculoscapular canal usually present over opercle, if absent then 0–2 preopercular pores [mostly shallow water] 64

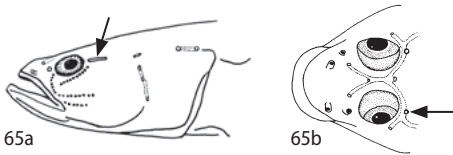
- 64a No oculoscapular canal over opercle, and preopercle with 0–2 pores [coral reefs; deep water] *Sueviota* [IN PART]



- 64b Oculoscapular canal present over opercle, and preopercle with 3 pores 65

- 65a Pore behind eye long and slit-like; only a single posterior interorbital pore; sensory papillae on cheek in longitudinal pattern [estuaries; deep water] *Aulopareia* [IN PART]

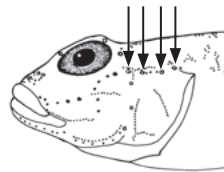
- 65b Pore behind eye rounded; anterior and posterior interorbital pores both present; sensory papillae on cheek in longitudinal pattern 66



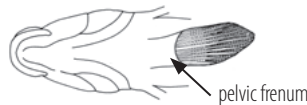
- 66a Mouth terminal; snout pointed or rounded, but tip not overhanging upper lip; no free flap or frenum on lower jaw, skin joining lower lip to isthmus 67

- 66b Mouth subterminal; snout rounded to blunt, with tip slightly overhanging upper lip; free flap or frenum on lower jaw in front of isthmus may be visible [coral reefs and estuaries] *Istigobius* [IN PART]

- 67a Pelvic frenum reduced or absent; may be 4 pores in lateral canal behind eyes; alternate rows of cheek papillae very short or may consist of single papilla; head pointed in dorsal view; postorbital branch of oculoscapular canal long and extending to under eye [coral reefs] *Fusigobius*

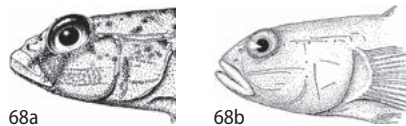


- 67b Pelvic frenum well-developed; 3 pores in lateral canal behind eyes; most rows of cheek papillae long or multiple; head usually rounded in dorsal view; postorbital branch of oculoscapular canal may or may not extend to under eye 68



- 68a Multiple irregular rows of papillae (sometimes in roughly vertical rows) usually present between 2 lowermost longitudinal rows on cheek; snout somewhat pointed [shallow reefs and estuaries] *Favonigobius*

- 68b Papillae on cheek in distinctly separate longitudinal rows, sometimes multiple rows; snout usually rounded [reefs and estuaries; deep water] *Yongeichthys*

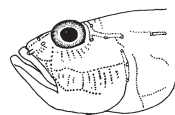


GENUS *Acentrogobius* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 7–11 rays; pectoral fins 15–20 rays. LSS 24–40; predorsal area naked or (usually) extensively scaly (and predorsal scales 10–31); cheek and operculum scaly or naked, but opercle normally with scales dorsally. Snout oblique, but not overhanging oblique mouth. Gill membranes attached behind rear edge of preopercle. Usually occur in shallow coastal waters or estuaries, with a few species entering freshwater. About 13 species, 5 in WIO.

KEY TO SPECIES

- 1a Head papillae in transverse pattern, meristics and colour not as below 2



- 1b Head papillae in longitudinal pattern, anal fin 1 spine, 7 rays; pale spots on head; pectoral fins 17 or 18 rays *A. simplex*

Continued ...

KEY TO SPECIES

- 2a Nape, breast and pectoral-fin bases naked; short lateral canal and 2 pores present over rear of opercle *A. decaryi*
- 2b Nape, pectoral-fin bases and breast with cycloid scales; lateral canal or pores present or absent over opercle 3
- 3a Gill opening reaching to rear edge of preopercle or further forward; patch of scales on cheek behind eye
..... *A. viridipunctatus*
- 3b Gill opening not reaching rear edge of preopercle, but only to under opercle; no scales on cheek behind eye 4
- 4a Anal fin 1 spine, 8 rays; pectoral fins 16 or 17 rays; no lateral canal pores at rear of opercle *A. therezieni*
- 4b Anal fin 1 spine, 9 rays; pectoral fins 17 or 18 rays; 2 pores and short lateral canal at rear of opercle *A. dayi*

Acentrogobius dayi Koumans 1941

Day's goby

PLATE 3

Acentrogobius dayi Koumans 1941: 224 (Karachi, Pakistan);
Koumans in Blegvad & Løppenthin 1944; Khalaf 1961; Hoda 1980*;
Randall 1995*; Manilo & Bogorodsky 2003; Rahimian & Pehpuri 2006.
Istigobius dayi: Kuronuma & Abe 1986.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17 or 18 rays. LSS 31–38; TRB 12–14; predorsal scales 20–24, small, reaching forward to above preopercle; breast and pectoral-fin bases with cycloid scales. Gill opening reaching to under opercle. Large canine tooth at each side of lower jaw.

Head and body pale grey, with brownish blotches and saddles; distinct small round to triangular brown to blackish spot on upper caudal base; dark brown or blackish line from behind eye, along top of preopercle and opercle, ending just above pectoral-fin base. Attains at least 84 mm SL.



Acentrogobius dayi, 84 mm SL (Persian/Arabian Gulf).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman and Pakistan.

REMARKS Found in shallow mud or other soft-substrate marine habitat.

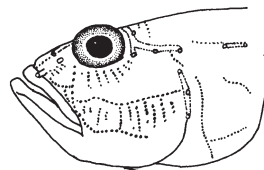
Acentrogobius decaryi (Pellegrin 1932)

Decary's goby

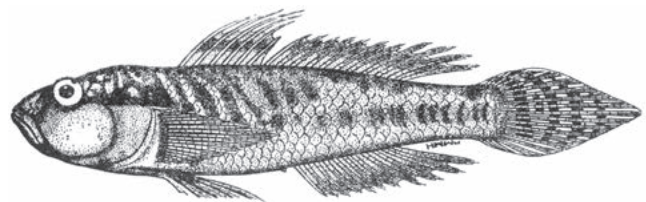
Gobius criniger var. *decaryi* Pellegrin 1932: 295, Fig. 3
(marsh near Fort Dauphin, Madagascar); Arnoult 1959*.
Ctenogobius nebulosus [in part]: Smith 1959.
Yongeichthys nebulosus [in part]: Maugé 1986.

Second dorsal fin and anal fin each with 1 spine, 10 or 11 rays; pectoral fins 17–19 rays. First dorsal fin tall in males, and most rays elongate, reaching back to middle of 2nd dorsal fin when depressed, but fin low in females. LSS 32–38; TRB 14 or 15; predorsal area, cheek and opercle naked.

Preserved specimens pale brownish, with narrow brown oblique bars across nape and anterior part of body; sides of head with black line from snout to upper jaw, but cheeks unspotted; 1st dorsal fin with dark streaks following fin rays, and black blotch posteriorly; upper part of caudal fin with dark oblique streaks. Attains 52 mm SL.



Acentrogobius decaryi, 52 mm SL, head of female syntype (Madagascar).



Acentrogobius decaryi (Madagascar). Source: Pellegrin 1932

DISTRIBUTION Known only from 14 type specimens found in Madagascar.

Acentrogobius simplex (Sauvage 1880)

White-spotted goby

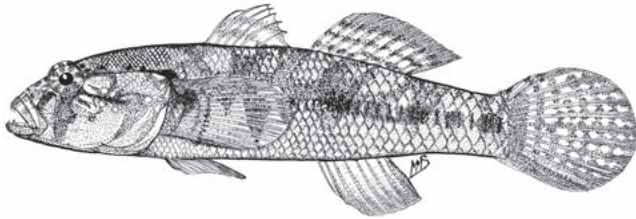
Gobius simplex Sauvage 1880: 48 (Bagamoyo, Tanzania); Sauvage 1891*.

Acentrogobius simplex: Smith 1959; Maugé 1986.

Acentrogobius ferox Smith 1959: 200, Fig. 15 (Zanzibar, Tanzania).

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 7 rays; pectoral fins 17 or 18 rays. LSS 33–40; TRB 13–15; predorsal scales 22–31, small.

Preserved specimens brownish, with darker mottled blotches and saddles on upper body; sides of head with many distinctive small white spots, and 2 or 3 oblique streaks from eyes to jaw and snout; blackish oval blotch just above pectoral-fin bases (blotch may be iridescent in live fish); 2nd dorsal fin and caudal fin with several rows of dark spots. Attains 123 mm SL.



Acentrogobius simplex, 60 mm TL, holotype of *A. ferox* (Tanzania).

Source: Smith 1959

DISTRIBUTION WIO: Tanzania, Zanzibar and Mozambique.

REMARKS Known from few specimens. Preferred habitat uncertain; small specimens have been collected in tidepools.

Acentrogobius therezieni Kiener 1963

Madagascar spring goby

Acentrogobius therezieni Kiener 1963: 328, Fig. 1

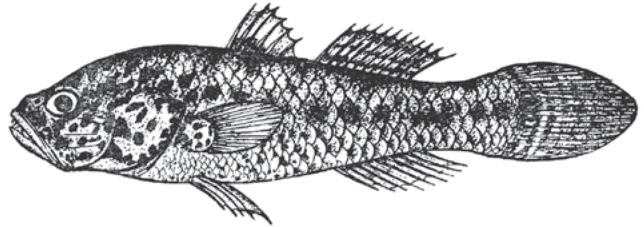
(Vilanandro, Madagascar); Maugé 1986; Stiassny & Raminosoa 1994.

Gobius simplex: Pellegrin 1933*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 16 or 17 rays. LSS 28–34; TRB 12–14; predorsal scales 19–28.

Preserved specimens brown to yellowish, with X- and \-shaped marks along midsides of body, and brownish blotches on dorsal half of body; head pale with brown round to oval spots on sides, and similar spots on pale pectoral-fin bases; 2nd dorsal fin with several rows of indistinct dusky spots;

peduncle with indistinct whitish band at caudal-fin base; caudal fin mostly plain dusky, but with brown blotches basally. Attains 74 mm SL.



Acentrogobius therezieni, 51 mm SL, holotype (Madagascar).

Source: Kiener 1963

DISTRIBUTION Possibly endemic to freshwater rivers of Madagascar in WIO region.

REMARKS Collected only from rivers and mineral springs (hard freshwater). Presumably distinct from *A. simplex*.

Acentrogobius viridipunctatus

(Valenciennes 1837)

Green-spotted goby

PLATE 3

Gobius viridipunctatus Valenciennes in Cuv. & Val. 1837: 62 (Mumbai, India).

Gobius venenatus Valenciennes in Cuv. & Val. 1837: 85 (Puducherry, India).

Acentrogobius viridipunctatus: Hoda 1980*; Manilo & Bogorodsky 2003.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 18–20 rays. LSS 30–38; TRB 11 or 12; predorsal scales 25–34, extending to close behind eyes; opercle and uppermost part of cheek behind eyes scaly. Transverse pattern of papillae below eyes. Gill opening reaches to rear edge of preopercle.

Head and body with small, scattered, iridescent greenish blue spots, and sometimes blue blotchy streak on cheek; greenish blue spots above pectoral-fin bases often most distinct. Attains 110 mm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: East Africa to India; elsewhere to east coast of India, southern Japan and northern Australia.

REMARKS Occurs in mangroves and shallow estuarine habitats.

GENUS *Amblyeleotris* Bleeker 1874

First dorsal fin 6 spines, and fin origin typically over or in front of pelvic-fin origins; 2nd dorsal fin 1 spine, 12–19 rays; anal fin 1 spine, 10–20 rays; pectoral fins 17–21 rays; pelvic-fin form variable, from separate to fully joined by membrane, and 5th ray always shorter than 4th ray. Mouth short, reaching to under mideye. Body scales ctenoid posteriorly, cycloid anteriorly; predorsal area naked to partly or fully scaly; cheek and opercle naked; LSS 50–129. Sensory papillae on head in transverse pattern; 1 enlarged papilla set in pit at each side of chin; lowermost horizontal row of cheek papillae extends backward from 4th or 5th vertical row. Gill opening extends well under opercle or further forward to below middle of preopercle. Commensal with burrowing alpheid shrimps. In need of revision, thus some species names here are provisional. About 38 species, and at least 10 in WIO.

KEY TO SPECIES

- 1a Pelvic fins separate, connected at most at very base of fins ... 6



- 1b Pelvic fins connected for at least half their length; pelvic frenalum present or absent 2
- 2a Second dorsal fin 1 spine, 16 rays; anal fin 1 spine, 17 rays; body with diffuse vertical to slightly oblique dark bands, and round dark spot above pectoral-fin bases *A. downingi*
- 2b Second dorsal fin 1 spine, 13 or 14 rays; anal fin 1 spine, 13–15 rays; colour not as above 3
- 3a Predorsal area extensively scaly; pectoral-fin bases always scaly in adults; body with 4 or 5 distinct oblique dark broad bands (deep red to crimson in life); no pelvic frenalum *A. wheeleri*
- 3b Predorsal area naked or with few scattered cycloid scales mostly on sides of nape; pectoral-fin bases usually naked, occasionally with scales; body pale with relatively narrow oblique dark bands (brown to red-brown in life); pelvic frenalum present 4
- 4a Anal fin 1 spine, 14 or 15 rays; pectoral fins 18–20 rays; distinct dark brown curved stripe from eyes to end of jaw, leaving snout pale; pectoral-fin bases naked *A. triguttata*
- 4b Anal fin 1 spine, 13 rays; pectoral fins 19–21 rays; sometimes with diffuse pale brown area extending from eye to over snout to end of jaw, or this entire area relatively pale; pectoral-fin bases usually naked, sometimes scaly 5

Continued...

KEY TO SPECIES

- 5a Pectoral fins 20 rays; body with 4 wide red-brown bands that may partly coalesce (interspaces very narrow); 1st dorsal fin with pale-margined large dark red spots and streaks *A. latifasciata*
- 5b Pectoral fins 19–21 rays; body with 4 narrow to broad red-brown slightly oblique bands, always well-separated; 1st dorsal fin with small orange to blue spots and streaks, mostly on lower half *A. sungami*
- 6a Predorsal midline scaly; pectoral-fin bases usually scaly 7
- 6b Predorsal midline naked; pectoral-fin bases usually naked 9
- 7a Body with 4 very oblique narrow bars; oblique bar on head behind eyes; black line connecting posterior margins of eyes; snout with oblique black bar; anal fin with pale stripe near middle of fin..... 8
- 7b Body with vertical to slightly oblique broad bands, but no black bars or lines behind eyes; no pelvic frenalum connecting fin spines; predorsal scales extensive, reaching to above preopercle *A. aurora*
- 8a No pelvic frenalum, and pelvic fins joined only at base; LSS 70–72; anal-fin base with broad white band, edged with blue-margined orange line *A. diagonalis*
- 8b Pelvic frenalum present, pelvic fins joined at base by low membrane; LSS 77–85; anal-fin base with narrow white line *A. neglecta*
- 9a Body with 4 dark bands, but no mottling along back; pelvic fins with thin interradial membrane connecting the fins basally *A. steinitzi*
- 9b Body with 4 dark bands, and upper half of body with speckling and mottling; pelvic fins completely separate (no pelvic frenalum) *A. periphthalma*

Amblyeleotris aurora (Polunin & Lubbock 1977)

Pinkbar shrimpgoby

PLATES 2 & 3

Cryptocentrus aurora Polunin & Lubbock 1977: 84, Figs. 13–14
(Grand Passe, Aldabra Atoll, Seychelles).

Amblyeleotris aurora: SSF No. 240.2*; Allen & Steene 1987*;

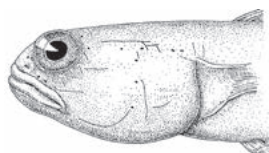
Debelius 1993*, 1999*; Randall & Goren 1993*; Eichler & Lieske 1994*;
Kuitert 1998*; Heemstra & Heemstra 2004; Fricke *et al.* 2009.

Amblyeleotris wheeleri: Debelius 1999*.

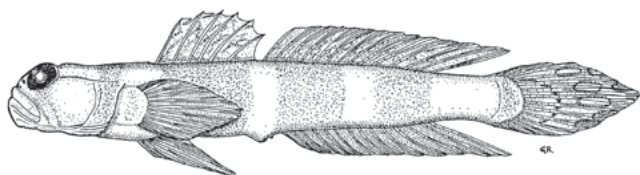
Second dorsal fin 1 spine, 13 rays; anal fin 1 spine, 14 rays; pectoral fins 18–20 rays; pelvic fins mostly separate, joined only at base, no pelvic frenalum; caudal fin pointed. LSS 64–92; TRB 23–33; nape midline scaly to above preopercle (sides of nape scaly in some specimens); body scales cycloid anteriorly,

becoming ctenoid below ~6th spine of 1st dorsal fin.

Head and body pearly white, with 4 broad pink to red-brown bands (5th band mostly across caudal-fin base and forming streak onto central rays of fin); distinctive bright red curved blotch or stripe from eyes to rear of jaw; 2nd dorsal-fin margin with row of blue-edged orange to red spots; caudal fin yellow with several horizontally elongate blue-margined red spots. Attains 73 mm SL.



Amblyeleotris aurora, 73 mm SL, head of holotype (Aldabra).
Source: Polunin & Lubbock 1977



Amblyeleotris aurora, 73 mm SL, holotype (Aldabra).
Source: Polunin & Lubbock 1977

DISTRIBUTION Indian Ocean. WIO: South Africa (Park Rynie), Comoros, Aldabra and Amirante Is. (Seychelles), Réunion (photographs only, not confirmed) and Maldives; elsewhere, Andaman Sea, Indonesia (Sumatra) and New Guinea.

REMARKS Commensal with alpheid shrimp *Alpheus randalli*, in sandy areas on outer reef flats and reef slopes, at 10–35 m.

Amblyeleotris diagonalis Polunin & Lubbock 1979

Diagonal shrimpgoby

PLATE 2

Amblyeleotris diagonalis Polunin & Lubbock 1979: 245, Fig. 4 (Lizard I., Great Barrier Reef, Australia); Randall & Goren 1993*; Randall 1994, 1995*; Randall *et al.* 1994*; Kuitert 1998*; Manilo & Bogorodsky 2003.

Second dorsal fin and anal fin each with 1 spine, 13 rays; pectoral fins 19 or 20 rays; pelvic fins joined only at base, no pelvic frenum. LSS 70–72; TRB 23 or 24; nape scales reaching forward to rear edge of preopercle; body scales cycloid anteriorly, becoming ctenoid below ~5th spine of 1st dorsal fin.

Head and body whitish, with 6 narrow oblique brown to orange-brown bars, anteriormost bar crossing head over

preopercle narrowest, sometimes broken, and usually darker than other bars; upper half of body with scattered irregular brownish spots and short streaks in interspaces between oblique bars; thin blackish stripe curves through eyes onto snout tip. Attains 60 mm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, Kenya, Mozambique (photographs only), Madagascar, Seychelles, Chagos and Maldives; elsewhere, Ryukyu Is., Great Barrier Reef and Solomon Is.

REMARKS Commensal with alpheid shrimp *Alpheus bellulus* or *A. ochrostriatus*, on sandy or rubble bottom, at 6–40 m.

Amblyeleotris downingi Randall 1994

Shoulderspot shrimpgoby

PLATE 2

Amblyeleotris downingi Randall 1994: 318, Pls. 1–4 (Kubbar I., Kuwait, Persian/Arabian Gulf); Randall 1995*.

Second dorsal fin 1 spine, 16 rays; anal fin 1 spine, 17 rays; pectoral fins 18–20 rays; pelvic fins fully joined, and pelvic frenum present. LSS 116–129; TRB 29–34; nape midline naked, but sides scaly to above opercle; body scales cycloid anteriorly, becoming ctenoid below 2nd dorsal-fin origin.

Body pale yellowish brown to whitish, with 3 broad diffuse brownish to orange-brown bars and short darker lines crossing dorsum in interspaces; large round blackish spot directly above pectoral-fin bases, and short brownish bar across opercle; blue-margined orange oblique line on sides of nape behind eyes; 1st dorsal-fin base with diffuse blackish spot. Attains 101 mm SL.



Amblyeleotris downingi, 101 mm SL (Kuwait). © JE Randall, Bishop Museum

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf; elsewhere, Thailand and Indonesia (Sumatra).

REMARKS Commensal with alpheid shrimp *Alpheus bellulus* or *A. ochrostriatus*, on silty sand and rubble bottom, at 12–17 m.

Amblyeleotris latifasciata Polunin & Lubbock 1979

Broad-banded shrimpgoby

PLATE 3

Amblyeleotris latifasciata Polunin & Lubbock 1979: 247, Fig. 5 (between Cabulan I. and Vandanon I., Cebu Strait, Philippines); Fricke *et al.* 2009.

Second dorsal fin and anal fin each with 1 spine, 13 rays; pectoral fins 20 rays; pelvic fins joined, with low frenum. LSS 87–92; TRB 29 or 30; predorsal area naked; ctenoid scales on body extending forward to below 3rd spine of 1st dorsal fin.

Head and body with 5 broad red-brown bands and scattered pale blue, orange and brown spots (mostly dorsally); head with round brown and blue spots on cheek and opercle; 1st dorsal fin pale bluish white, with blue-edged reddish spots and oblique streaks; 2nd dorsal fin pale bluish white, with horizontal to oblique blue lines, and row of bright orange spots along fin margin; anal fin brown to brown-streaked along base, with 2 or 3 pale blue lines distally; caudal fin with red margin and blue-edged red streaks following fin rays inward from distal margin. Attains 75 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Réunion (photographs only, not confirmed) and Sri Lanka; elsewhere, Andaman Sea to Philippines.

REMARKS Commensal with alpheid shrimps, at 10–25 m, on sandy and coral-rubble substrates.

Amblyeleotris neglecta Jaafar & Randall 2009

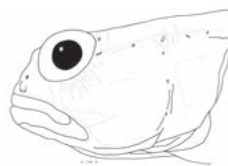
Neglected shrimpgoby

PLATE 3

Amblyeleotris neglecta Jaafar & Randall 2009: 23, Fig. 1, Pl. 1 (Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 12–14 rays; anal fin 1 spine, 13–15 rays; pectoral fins 18 or 19 rays; pelvic fins joined only at base, and pelvic frenum low. LSS 77–85; TRB 19 or 20; nape scales reaching forward to rear edge of preopercle; body scales cycloid anteriorly, becoming ctenoid below ~5th spine of 1st dorsal fin.

Head and body whitish, with 5 nebulous orange-brown oblique bars, anteriormost bar crossing head over preopercle diffuse, sometimes broken, uppermost part of bars darkest, and bars becoming less oblique posteriorly; scattered irregular brownish spots and short streaks in interspaces between bars; dorsal fins with darker-edged blue spots. Attains 54 mm SL.



Amblyeleotris neglecta, 54 mm SL, head of holotype (Red Sea).
Source: Jaafar & Randall 2009

DISTRIBUTION WIO: northern Red Sea.

REMARKS Commensal with alpheid shrimps, on sandy or rubble bottoms, to ~15 m deep. Resembles *A. diagonalis*.

Amblyeleotris periophthalma (Bleeker 1853)

Orange-speckled shrimpgoby

PLATES 2 & 3

Eleotris periophthalmus Bleeker 1853: 477 (Jakarta, Java, Indonesia); Borsieri 1904.

Cryptocentrops exilis Smith 1958: 153, Pl. 2 (Zanzibar, Tanzania); Smith & Smith 1963*.

Amblyeleotris (Amblyeleotris) periophthalmus: Smith 1958*.

Amblyeleotris periophthalmus: Goren 1986.

Amblyeleotris periophthalma: Randall & Goren 1993*; Randall *et al.* 1994*; Randall 1995*; Kuitert 1998*; Debelius 1999*; Manilo & Bogorodsky 2003; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 or 12 rays; pectoral fins 16–20 rays; pelvic fins joined only at bases of 5th rays, no pelvic frenum. LSS 63–80; TRB 21–28; predorsal area usually naked, sides with cycloid scales to just over rear part of opercle; ctenoid scales on body extending forward to below 3rd and 4th spines of 1st dorsal fin or to gap between dorsal fins.

Head and body whitish to pale yellowish, with 5 broad orange to reddish brown blotchy bands (centre of bands sometimes paler than edges); pale interspaces on body with brownish to orange mottling and spots, and head with similarly coloured round spots; 2 red spots or 1 blotch at corners of mouth; caudal-fin base with curved brownish bar. Attains 58 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, East Africa to South Africa (Sodwana Bay), Tanzania (Zanzibar), Seychelles, Réunion (photographs only), Mauritius and Maldives; elsewhere widespread in western Pacific to Rapa Iti.

REMARKS Commensal with alpheid shrimps, including *Alpheus ochrostriatus*, at 10–25 m, on sandy and coral-rubble substrate.

Amblyeleotris steinitzi (Klausewitz 1974)

Steinitz's shrimpgoby

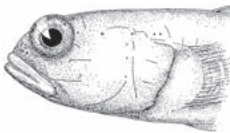
PLATES 2 & 4

Cryptocentrus steinitzi Klausewitz 1974: 70, Figs. 1–2 (reef at El Himeira, Sinai, Egypt, Gulf of Aqaba, Red Sea); Polunin & Lubbock 1977*; Goren 1979.

Amblyeleotris steinitzi: Randall 1983*; Goren 1986; Winterbottom & Emery 1986*; Allen & Steene 1987*; Debelius 1993*, 1998*, 1999*; Randall & Goren 1993*; Eichler & Lieske 1994*; Kuitert 1998*; Terashima *et al.* 2001*; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 12 rays; pectoral fins 17–19 rays; pelvic fins joined only at base, no pelvic frenum. LSS 68–81; TRB 21–30; nape midline naked, but sides scaly to just over opercle; ctenoid scales on body, beginning below middle of 1st dorsal fin.

Head and body pearly white to pale yellow, with 5 mostly oblique faded red-brown bands, first band begins on nape and crosses opercle, and posteriormost band indistinct and narrowest; interspaces pale, with fine pale blue spots and mottling; head with blue spots; snout dusky to blackish (darkest in Red Sea specimens); caudal fin pale. Attains 50 mm SL.



Amblyeleotris steinitzi, ~47 mm SL (Seychelles). Source: Polunin & Lubbock 1977

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; elsewhere widespread in western Pacific to Samoa.

REMARKS Commensal with the alpheid shrimp *Alpheus djeddensis*, at 2–43 m, over sand and coral-rubble.

Amblyeleotris sungami (Klausewitz 1969)

Magnus's shrimpgoby

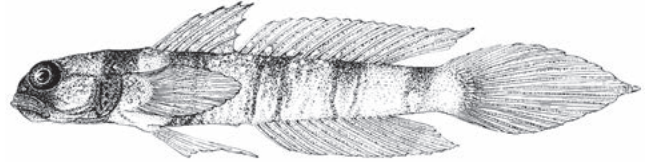
PLATES 2 & 4

Cryptocentrus sungami Klausewitz 1969: 41, Figs. 1–4 (Suakin, Sudan, Red Sea); Goren 1979.

Amblyeleotris sungami: Randall 1983*, 1995*; Goren 1986; Allen & Steene 1987*; Eichler & Lieske 1994*; Debelius 1998*; Jaafar & Randall 2009*; Freinschlag & Patzner 2012*.

Second dorsal fin and anal fin each with 1 spine, 13 rays; pectoral fins 19–21 rays; pelvic fins joined at least at base, and pelvic frenum present. LSS 100–108; TRB 26; snout profile relatively steep; predorsal area naked; ctenoid scales on body extending anteriorly only to gap between dorsal fins.

Head and body pearly whitish, with 5 slightly oblique broad orange bands; interspaces pale, with fine pale blue spots, mottling and irregular lines; snout dusky; caudal fin with short orange bar or blotch across bases of rays. Attains 58 mm SL.



Amblyeleotris sungami, 58 mm SL, holotype (Red Sea).

Source: Klausewitz 1969

DISTRIBUTION Indian Ocean (probably more widespread than currently known). WIO: Red Sea (including Gulf of Aqaba), Oman and Seychelles.

REMARKS Found on sand and rubble substrates, at 4–25 m; commensal with alpheid shrimps.

Amblyeleotris triguttata Randall 1994

Triplespot shrimpgoby

PLATES 2 & 4

?*Amblyeleotris* (*Fereleotris*) *delicatulus* Smith 1958: 152, Fig. 9, Pl. 2a (Zanzibar, Tanzania).

Amblyeleotris periophthalmus: Debelius 1993*.

Amblyeleotris sp.: Eichler & Lieske 1994*.

Amblyeleotris triguttata Randall 1994: 321, Pls. 5–9 (Yanbu, Saudi Arabia, Red Sea); Randall 1995*; Debelius 1998*; Manilo & Bogorodsky 2003; Freinschlag & Patzner 2012*.

Second dorsal fin 1 spine, 13 rays; anal fin 1 spine, 14 or 15 rays; pectoral fins 18–20 rays; pelvic fins fully joined, and pelvic frenum present. LSS 96–104; TRB 32–35; nape midline usually naked, occasionally with few scales; cycloid scales on sides of nape, extending to just over opercle; body scales cycloid anteriorly, usually becoming ctenoid below 1st dorsal fin.

Head and body pale sandy to yellowish, with 5 brown to orange-brown bands, and interspaces with irregular reticulate brown to honey-brown lines, and faint dusky vertical line sometimes in centre of each interspace; distinct curved dark brown streak from eyes to rear of jaw; dark brown to black spot just above opercle, and similar dark spot on rear of 1st dorsal-fin base; 1st spine reddish brown with small red to red-brown spot near base; dark-margined blue streaks and small spots on nape and sides of head behind eyes. Attains 67 mm SL.

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman and Red Sea to Tanzania and Zanzibar.

REMARKS Commensal with the alpheid shrimp *Alpheus bellulus*, on sandy and rubble bottoms, at 1.5–20 m. Although the holotype of *Amblyeleotris delicatulus* is in poor condition, it may represent the correct name to apply to this species.

Amblyeleotris wheeleri (Polunin & Lubbock 1977)

Burgundy shrimpgoby

PLATE 4

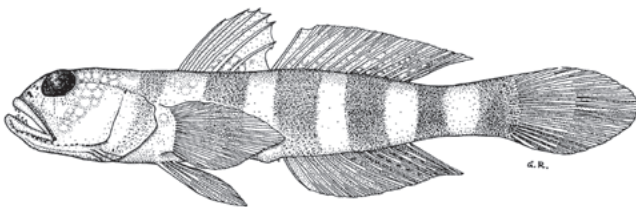
Cryptocentrus wheeleri Polunin & Lubbock 1977: 88, Figs. 16–17 (outside Passe Gionnet, Aldabra Atoll, Seychelles).

Amblyeleotris fasciatus: Allen & Steene 1987*.

Amblyeleotris wheeleri: SSF No. 240.3*; Debelius 1993*; Randall & Goren 1993*; Eichler & Lieske 1994*; Randall 1995*; Kuitert 1998*; Fricke 1999; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*.

Second dorsal fin and anal fin each with 1 spine, 12 rays; pectoral fins 18–20 rays; pelvic fins joined for at least half their length, no pelvic frenum; caudal fin rounded. LSS 50–68; TRB 18–26; predorsal scales 12–20; nape scaly to above rear edge of preopercle; ctenoid scales extend forward to below rear part of 1st dorsal fin.

Head and body whitish grey to yellowish, with 5 broad red to red-brown bars slightly wider than interspaces, 6th bar indistinct and crossing preopercle and covered with red to yellow spots; sides of head and body with scattered small blue spots; 2 bright red to crimson spots at end of jaw. Attains 75 mm SL.



Amblyeleotris wheeleri, 43 mm SL, holotype (Aldabra).

Source: Polunin & Lubbock 1977

DISTRIBUTION Indo-Pacific (widespread). WIO: Gulf of Oman, Red Sea to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Society Is.

REMARKS Associated with alpheid shrimps, usually *Alpheus ochrostriatus*, on sand patches on reef slopes and in lagoons, at 5–40 m.

GENUS *Amblygobius* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 13–18 rays; anal fin 1 spine, 12–19 rays; pectoral fins 18–22 rays; pelvic fins fused, no pelvic frenum in some species. Body scales small, cycloid or ctenoid; predorsal area naked or scaly to close behind eyes; opercle may be scaly dorsally; LSS 46–95 (usually ~50–66). Snout rounded, usually overhangs tip of jaw; prominent curved canine tooth at each side of lower jaw. Fleshy pads on upper part of gill arches (as in genus *Valenciennes*). Distinctively coloured, often very brightly so, with stripes, bands and spots; some species sexually dimorphic in colouration.

Often occur in pairs or small groups and hover just above the bottom. Most species feed by taking mouthfuls of sand and sifting out small prey and algae. Some species show geographical variation and further studies are necessary to resolve the taxonomy of this group. For example, at present, the '*Amblygobius albimaculatus* complex' contains three forms: *A. albimaculatus* from Red Sea and East Africa, *A. semicinctus* from central Indian Ocean to southeastern Africa, and *A. phalaena* from eastern Indian Ocean to central Pacific. About 17 species known from Indo-Pacific, 8 in WIO.

KEY TO SPECIES

- | | | |
|----|---|--------------------|
| 1a | Body covered with cycloid scales (except sometimes ctenoid scales behind pectoral fins) | 2 |
| 1b | Body scales ctenoid; cycloid scales on belly and pectoral-fin bases | 5 |
| 2a | Body with 2 or more longitudinal stripes; all scales cycloid ... | 3 |
| 2b | Body with 6 vertical bars, which may be half size of interspaces or very broad; head with irregular oblique bars and spots; body scales ctenoid around and under pectoral fins | <i>A. sewardii</i> |
| 3a | Caudal fin elongate and pointed; 2 distinct dark stripes along sides, often with dense black spots overlying stripe; dark blotches on dorsal midline generally present only on peduncle; 2nd dorsal fin and anal fin each with 1 spine, 14–16 rays; breast sparsely scaly | <i>A. esakiae</i> |
| 3b | Caudal fin rounded; 2 or 3 dark stripes along sides, no black spots in stripes; dark blotches along entire dorsal midline of body; 2nd dorsal fin and anal fin each with 1 spine, 13–15 rays; breast heavily scaly | 4 |

Continued ...

KEY TO SPECIES

- 4a No stripe on cheek below eyes joining dark streak along upper jaw; stripe on head behind eyes narrow, mostly straight and plain dark (in preserved specimens); anterior nostrils black to blackish; 2nd dorsal fin 1 spine, 13 or 14 rays *A. tekomaji*
- 4b Dusky stripe below eyes joined to dark or blackish streak along edge of upper jaw; stripe on head behind eyes broad, wavy, dark-margined and pale-centred (preserved specimens); anterior nostrils pale to dusky; 2nd dorsal fin usually 1 spine, 14 or 15 rays *A. nocturnus*

- 5a Body with bars or dark stripes; if stripes white, then no ocellus on dorsal fins 6
- 5b Body dark (brown or green in life), with bright white stripes; ocellus always present on 2nd dorsal fin; cycloid scales on upper part of opercle *A. hectori*

- 6a Pair of dark blotches under chin, and dark stripe from under opercle across branchiostegal rays; caudal fin with single spot near upper edge of base; few cycloid scales on lower corner of preopercle; 1st dorsal fin low with rounded margin, and without elongate spines but 5th spine longest *A. sphynx*
- 6b No dark blotches on chin, and no dark stripe on branchiostegal rays; caudal fin always with round dark spot near upper portion of base, and at least 1 small dark spot placed near edge of fin; preopercle naked 7

- 7a Females with lower sides of body with 5 or 6 dark-bordered white bars (most prominent on sides of abdomen), and 4 or 5 narrow dark bars on sides, mostly visible dorsally; males with 4 or 5 indistinct narrow dark bars on sides of body, which may be overlaid by dark and pale spots and blotches; both sexes with large dark blotch above gill opening (may be indistinct) *A. semicinctus*
- 7b Both sexes with 5 dark vertical bars on sides of body, and no separate set of dark bars on sides of abdomen; dark spot near upper part of caudal-fin base always present (away from caudal scales), and another elongate spot near upper edge of caudal fin in males (and rarely with a 3rd faint spot); large round brownish spot usually present above gill opening *A. albimaculatus*

Amblygobius albimaculatus (Rüppell 1830)

Butterfly goby

PLATES 4 & 5

Gobius albimaculatus Rüppell 1830: 135 (Massawa, Eritrea, Red Sea).

Gobius papilio Valenciennes in Cuv. & Val. 1837: 91 (Mauritius, Mascarenes); Sauvage 1891.

Gobius rubrotaeniatus Liénard in Sauvage 1891: 358 (Mauritius, Mascarenes).

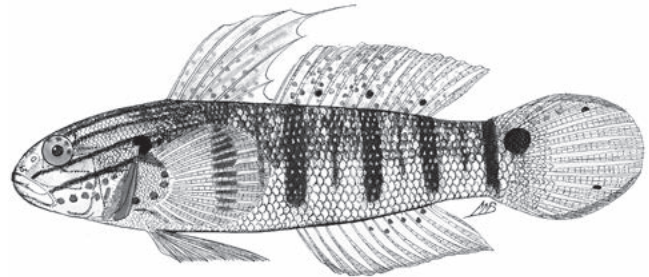
Gobius quinqueocellatus Valenciennes in Cuv. & Val. 1837: 95 (Massawa, Eritrea, Red Sea).

Gobius albomaculatus: Playfair 1867; SFSA No. 933*; Smith 1961*.
Gobius vonbondei Smith 1936: 47, Fig. 1, Pls. 3, 5 (KwaZulu-Natal, South Africa).

Amblygobius albimaculatus: Koumans 1953; Roux-Estève 1956; SFSA No. 933*; Smith & Smith 1963*; Goren 1979; Randall 1983*; Maugé 1986; SSF No. 240.4*; Debelius 1993*, 1998*; Eichler & Lieske 1994*; Randall 1995*; Fricke 1999; Terashima *et al.* 2001*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 13–15 rays; anal fin 1 spine, 12–14 rays; pectoral fins 19–21 rays. LSS 47–56; TRB 17–21; predorsal scales 21–25, reaching forward to close behind eyes and sometimes into interorbital space; upper part of opercle and pectoral-fin bases with cycloid scales.

Head and body dark brown to pale greyish or greenish brown, with 5 narrow, vertical, brown to red-brown bars, and ~4 similarly coloured broken longitudinal lines (lines oblique and broader on head); large round brownish spot usually present above gill opening; caudal fin with distinct black spot on upper portion of base; males with 3 black spots along lower half of 2nd dorsal fin. Attains 104 mm SL.



Amblygobius albimaculatus, 140 mm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, East Africa to South Africa (KwaZulu-Natal), Tanzania (Zanzibar), Madagascar, Comoros, Aldabra, Seychelles and Mauritius.

REMARKS Occurs in a range of reef habitats and especially on seagrass beds, usually in pairs, at 3–20 m.

Amblygobius esakiae Herre 1939

Esaki's goby

PLATE 5

Amblygobius esakiae Herre 1939: 306 (Koror, Palau, Micronesia); Randall 1994*.

Second dorsal fin 1 spine, 14 or 15 rays; anal fin 1 spine, 14–16 rays; pectoral fins 19 or 20 rays; caudal fin elongate and pointed. LSS 68; TRB 23; predorsal area, cheek and opercle naked, except for a few scales over opercle.

Head and body pearly whitish grey, paler ventrally, and with 2 stripes along sides: upper stripe pale red or pinkish to brownish, lower stripe brownish; both stripes scattered with blackish spots along front half of body, and stripes may reach caudal fin or fade out past midbody; sides of head with pale red to pinkish stripe from eyes and joining upper body stripe; caudal fin with oblique orange-red band dorsally. Attains 55 mm SL.



Amblygobius esakiae, 51 mm SL (Sudan). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Red Sea; elsewhere, Indonesia to Japan, Micronesia (Kosrae I.) and Solomon Is.

REMARKS Poorly known; found in estuaries, lagoons and over intertidal reef flats, to ~10 m deep.

Amblygobius hectori (Smith 1957)

Hector's goby

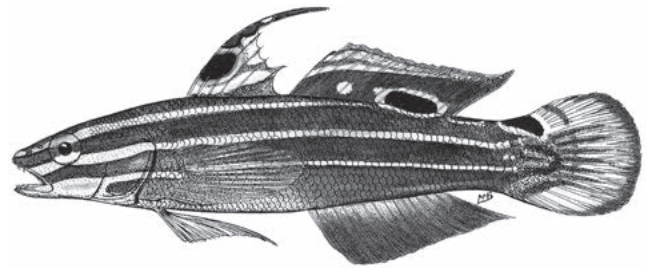
PLATES 4 & 5

Seychellea hectori Smith 1957: 726, Fig. 3 (Mahé, Seychelles); Smith 1959*; Smith & Smith 1963*; Goren 1979*.

Amblygobius hectori: Goren 1986; Winterbottom & Emery 1986*; Debelius 1993*, 1998*; Randall & Goren 1993*; Eichler & Lieske 1994*; Kuitert 1998*.

Second dorsal fin 1 spine, 15 or 16 rays; anal fin 1 spine, 14–16 rays; pectoral fins 15–17 rays; no pelvic frenum. LSS 48–54; TRB 17–19; predorsal scales 16–21, reaching nearly to eyes; cheek naked; opercle naked or with a few scales on upper part.

Head and body deep reddish brown, paler ventrally, and with 3 thin dark-margined yellow stripes on sides and 1 stripe along dorsal midline; 1st dorsal fin with yellow-margined black spot, and 2nd dorsal fin with similar larger spot towards rear, and similar small spot on dorsal part of caudal-fin base; stripes on snout sometimes red. Attains 52 mm SL.



Amblygobius hectori, 49 mm TL (Seychelles). Source: Smith 1957

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Tadjoura (Djibouti), Arabian Sea, Comoros, Chagos, Seychelles and Maldives; elsewhere in western Pacific to Fiji.

REMARKS Found at 5–20 m, among corals and patch reefs, picking at plankton rather than sifting through sand as do most species in the genus. Requires taxonomic review as this species may belong in a separate genus (*Koumansetta* Whitley 1940).

Amblygobius nocturnus (Herre 1945)

Pyjama goby

PLATES 4 & 5

Yabotichthys nocturnus Herre 1945: 3 (near San José, Busuanga I., Philippines).

Ctenogobius klausewitzi Goren 1978: 193, Fig. 2 (El Tur, Gulf of Suez, Red Sea); Dor 1984.

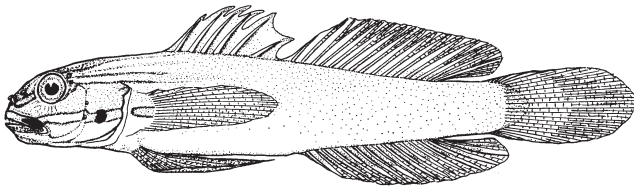
Amblygobius klausewitzi: Goren 1986.

Amblygobius nocturnus: Allen & Steene 1987*; Debelius 1993*, 1998*; Randall *et al.* 1994*; Randall 1995*; Anderson *et al.* 1998; Heemstra *et al.* 2004.

Amblygobius nocturna: Kuitert 1998*.

Second dorsal fin and anal fin each with 1 spine, 13–15 rays; pectoral fins 18–21 rays. LSS 61–66; TRB 19 or 20; predorsal area, cheek and opercle naked, except some scales on sides to over opercle; pectoral-fin bases usually scaly.

Head and body whitish to pale pearly grey, with 2 dark-margined yellowish to reddish stripes on sides, and 1 broad and wavy similar stripe along dorsal midline; lowermost stripe on body usually more diffuse (indistinct in some specimens), and lower stripe on head forming blackish spot over opercle and dusky streak or spot at upper jaw; anterior nostrils pale to dusky. Attains 52 mm SL.



Amblygobius nocturnus, 52 mm SL, holotype of *Ctenogobiops klausewitzii* (Gulf of Suez). Source: Goren 1978

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Seychelles, Rodrigues and Maldives; elsewhere in western Pacific as far as Marquesas Is.

REMARKS Found in pairs or small groups hovering above substrate, in coastal lagoons or over rubble or sand bottoms near reefs, at 1–30 m.

Amblygobius semicinctus (Bennett 1833)

Whitebarred goby

PLATE 5

Gobius semicinctus Bennett 1833: 32 (Mauritius, Mascarenes).

Amblygobius albimaculatus: SFSA No. 933* [in part].

Gobius fasciatus Fourmanoir & Crosnier 1964: 22, Fig. 12 (Nosy Be, Madagascar).

Amblygobius semicinctus: Winterbottom & Emery 1986*; Allen & Steene 1987*; Randall & Goren 1993*; Kuiter 1998*; Debelius 1999*; Heemstra *et al.* 2004; Fricke *et al.* 2009.

Second dorsal fin and anal fin each with 1 spine, 13–15 rays; pectoral fins 19–21 rays; caudal fin rounded. LSS 52–57; TRB 18–22; predorsal scales 24–31, reaching almost to eyes; cheek and opercle naked.

Head and body colour variable: greenish brown to greyish brown to pale fawn, with pattern of whitish spots, patches and brownish longitudinal stripes on dorsoanterior body, ~5 darker brown stripes and bands, and blackish anus in both sexes; caudal fin with brown to reddish brown round spot near upper part of base, and 1 or 2 elongate blackish spots near upper edge and 1 similar spot near lower edge of fin (presence of these spots variable). Females with 5 or 6 black and blue-bordered white bars on lower sides of body, most prominent on side of abdomen; 2 plain white bars may be visible above anal-fin base, and ~5 narrow dark bars on sides, mostly visible dorsally, with 5th bar on caudal-fin base often barely developed. Males with 4 or 5 indistinct narrow dark bars on sides of body,

may be overlaid by dark and pale spots and blotches. Attains 94 mm SL.

DISTRIBUTION WIO: Mozambique (Bazaruto I.), Madagascar, Mascarenes, Chagos and Maldives.

REMARKS Found in a range of habitats, including harbours and seagrass beds, at 1–22 m, usually in pairs, hovering above substrate. Feeds on algal fragments and tiny crustaceans.

Amblygobius sewardii (Playfair 1867)

Seward's goby

PLATE 4

Gobius sewardii Playfair in Playfair & Günther 1867: 71 (Zanzibar, Tanzania).

Biat magnusi Klausewitz 1968: 13, Figs. 1–3 (coast of Al-Ghardaqa [Hurghada], Egypt, Red Sea) [in part].

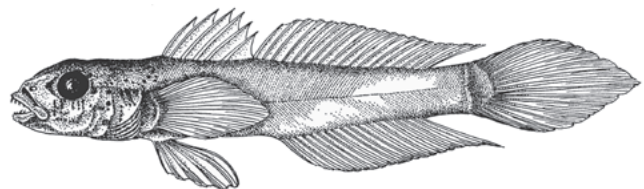
Biat sewardi: Smith 1959.

Amblycentrus magnusi: Goren 1979*.

Amblygobius magnusi: Goren 1986.

Second dorsal fin 1 spine, 16–18 rays; anal fin 1 spine, 16–19 rays; pectoral fins 19–22 rays. LSS 72–95; TRB 22–25; predorsal area mostly naked, few scales on sides over opercle; cheek and opercle naked.

Head and body very pale brownish grey, with 6–9 transverse bright bluish white bands crossing midsides of body, bands wider at base than at top; 2 or 3 bluish white oblique stripes on sides of head, and similarly coloured marks on pectoral-fin bases; side of upper lip with blackish brown spots; eyes silver with pale reddish tinge. Attains 63 mm SL.



Amblygobius sewardii, 43 mm SL, holotype of *Biat magnusi* (Red Sea). Source: Klausewitz 1968

DISTRIBUTION WIO: Red Sea, Tanzania (Zanzibar) and Mozambique.

REMARKS Found over sand in coral-reef habitats.

Amblygobius sphynx (Valenciennes 1837)

Sphinx goby

PLATE 5

Gobius sphynx Valenciennes in Cuv. & Val. 1837: 93 (New Guinea).*Gobius stagon* Smith 1947: 808 (Maputo Bay, Mozambique);

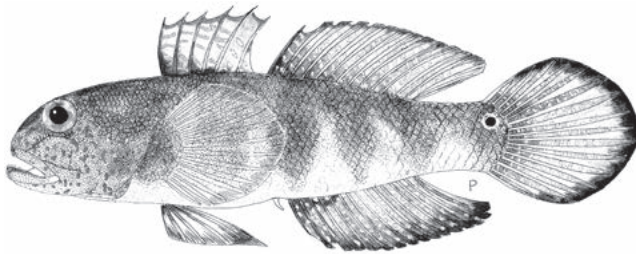
SFSA No. 932*; Smith 1961*.

Amblygobius sphynx: SFSA No. 932*; Smith & Smith 1963*; Maugé 1986;

SSF No. 240.5*.

Second dorsal fin and anal fin each with 1 spine, 13–15 rays; pectoral fins 17–19 rays. LSS 46–52; TRB 18–20; predorsal scales 18–23, reaching to close behind eyes; cheek naked; upper half of opercle scaly.

Head and body whitish grey or pale brownish grey or (usually) yellowish green, with 6 broad bars across nape and body, bars narrowing ventrally; small whitish to bluish spots and small blotches scattered over body and sides of head; eye bright orange to golden; unpaired fins covered with small bluish to greenish spots with thin dark margins; distinctive white-edged black spot on upper caudal-fin base. Attains 104 mm SL.

*Amblygobius sphynx*, 150 mm TL (S Mozambique). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Seychelles and Mauritius; elsewhere in western Pacific to Wallis and Futuna Is.

REMARKS Found on shallow coastal reefs and in estuaries, at 1–15 m, usually among rubble or in seagrass beds.

Amblygobius tekomaji (Smith 1959)

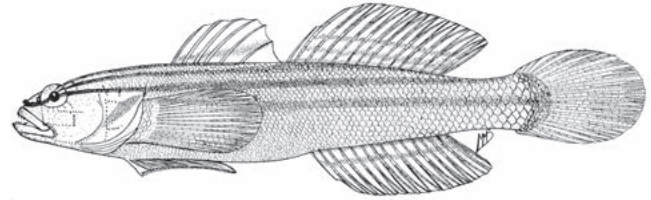
Plaincheek goby

PLATES 5 & 6

Seychellea tekomaji Smith 1959: 204, Fig. 21 (Tekomaji I., Mozambique).*Amblygobius tekomaji*: Winterbottom & Emery 1986*; Randall &Van Egmond 1994; Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 13 or 14 rays; pectoral fins 16–20 rays. LSS 62–65; TRB 19–24; predorsal scales 20, midline naked but scales reaching over opercle; cheek and opercle naked; pectoral-fin bases naked or with few scales.

Head and body whitish to cream-coloured, with orange to reddish stripe from snout and sides of head, fading below 1st dorsal fin; similar narrow, mostly straight stripe from upper edge of each eye to nape; 1st dorsal fin with yellowish stripe; 2nd dorsal fin with 2 similar stripes; no dark streak or blotch on upper jaw; anterior nostrils blackish. Attains 41 mm SL.

*Amblygobius tekomaji*, 52 mm TL, holotype (Mozambique).

Source: Smith 1959

DISTRIBUTION WIO: Mozambique, Seychelles, Rodrigues and Chagos.

REMARKS Found on sandy flats near coral reefs, at 3–22 m.

GENUS *Ancistrogobius*

Shibukawa, Yoshino & Allen 2010

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17–21 rays; pelvic fins joined, and pelvic frenum present (except 1 species with fins largely separated and no pelvic frenum). LSS 24–26; body scales ctenoid; cycloid scales on pectoral-fin bases and pre-pelvic area, variably present on nape, and present on upper part of opercle and cheek in 1 species. Sensory papillae in transverse pattern. Preopercle with 1 ventrally directed spine. Eyes large, dorsolateral. Jaws moderate, reaching to about mideye; teeth conical, in 3 or 4 rows across front and narrowing at sides of jaw. Gill opening wide, to below rear edge of preopercle. Four species, 1 in WIO.

Ancistrogobius yanoi Shibukawa, Yoshino & Allen 2010

Orangetip goby

PLATE 6

Ancistrogobius yanoi Shibukawa, Yoshino & Allen 2010: 80,

Figs. 1b, 3c, 4c, 7 (Tako-zaki Point, Iriomote-jima, Ryukyu Is., Japan).

First dorsal fin with filamentous 3rd spine, longer than 2nd spine; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17–19 rays; pelvic fins fused, and pelvic frenum present (sometimes rudimentary or absent). LSS 24–26; TRB 7–9; no scales in predorsal midline; nape mostly naked.

Head and body translucent pale grey to brownish, spotted and speckled with brown; midsides of body with row of dark brown spots interspersed with smaller spots; 1st dorsal fin banded orange and white, with black blotch at distal tip reaching to just behind 3rd spine; area beneath black blotch on 1st dorsal fin translucent or whitish (live fish). Attains 37 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea (provisionally); elsewhere in western Pacific to southern Japan, Micronesia and New Guinea.

REMARKS Found over sand-mud substrate, to ~12 m deep.

GENUS *Arcygobius* Larson & Wright 2003

First dorsal fin 6 spines, and fin triangular, with 1st or 2nd spine longest; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–19 rays; caudal fin short and rounded. Body scales ctenoid; cycloid scales on head and predorsal area to close behind eyes; LSS 22–26; opercle and preopercle scaly, preopercle scales divided into 3 rows by longitudinal rows of sensory papillae; distinctive transverse pattern of papillae on preopercle and opercle. Gill opening wide, free of isthmus to below eye. Eyes large, dorsolateral. Snout pointed; mouth terminal, chin tip anteriormost, and rear of jaws end below front half of eyes. Teeth small, mostly evenly sized in both jaws, with no large canine tooth at sides or front. Currently 1 species recognised.

Arcygobius baliurus (Valenciennes 1837)

Isthmus goby

PLATE 6

Gobius baliurus Valenciennes (ex Kuhl & Van Hasselt) in Cuv. & Val. 1837: 61 [Java, Indonesia].

Gobius atherinoides Peters 1855: 445 (Mozambique); Sauvage 1891.

Gnatholepis baliurus: Smith 1959*; Smith & Smith 1963*;

Goren 1979*, 1986; Dor 1984.

Arcygobius baliurus: Larson & Wright 2003*.

Diagnosis as for genus.

Head and body yellowish, with 4 elongate brown blotches along lateral midline, and dense dark brown to black oval spot oriented longitudinally across bases of central caudal-fin rays; dorsal portion of eye blackish, giving eyes hooded look. Attains 83 mm SL.



Arcygobius baliurus, 57 mm SL, head.
Drawn from Larson & Wright 2003

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Kenya, Mozambique and Seychelles; elsewhere to Indonesia, Philippines and Micronesia.

REMARKS Found on soft substrates.

GENUS *Asterropteryx* Rüppell 1830

Short-bodied and compact; distinctive in having 1–8 spines on posterior margin of preopercle near angle, the spines long and dagger-like or short and triangular. First dorsal fin with 6 spines, which are elongate and filamentous in a number of species; 2nd dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 7–10 rays; pectoral fins 16–20 rays; pelvic fins fused to form a disc or completely separate. Eyes set high on head. Body scales ctenoid; predorsal area scaly to behind eyes; opercle scaly; cheek naked; LSS 21–30. Gill opening extends from pectoral-fin base to under opercle. Inhabit coral reefs or adjacent rubble patches. At least 8 species throughout Indo-Pacific, 4 in WIO.

KEY TO SPECIES

- 1a Preopercle with 1–6 spines, and lowermost spine thickened and longer than other spines 2
- 1b Preopercle with 2–8 spines, and lowermost spine subequal to or smaller than spines above 3
- 2a Preopercle with only 1 long spine; mid-preopercle pore equal in size to other preopercular pores; no transverse bar under eyes, and no spots on peduncle; pelvic fins completely separate; 3rd spine of 1st dorsal fin elongate *A. ensifera*
- 2b Preopercle with 4–6 spines, 2 or 3 spines above mid-preopercle pore, and mid-preopercle pore larger than other preopercular pores; broad diffuse transverse bar under eyes, and small spot at centre of peduncle; pelvic fins connected; 4th spine of 1st dorsal fin longest, usually elongate..... *A. spinosa*

Continued...

KEY TO SPECIES

- 3a Preopercle with 2–6 spines and 1–3 spines above mid-preopercle pore; head scales largely cycloid; peduncle with large black spot, no spot on 1st dorsal fin and no bar under eyes *A. ovata*
- 3b Preopercle usually with 2–5 spines and all spines below mid-preopercle pore; head scales almost entirely ctenoid; peduncle without spot or with 2 faint spots on midline, 1st dorsal fin with basal stripe, and 3rd spine filamentous in both sexes *A. semipunctata*

Asterropteryx ensifera (Bleeker 1874)

Bluespotted rubblegoby

PLATE 7

Brachyeleotris ensifera Bleeker 1874: 375 (Kajeli, Buru I., Moluccas, Indonesia).

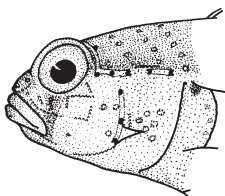
Asterropteryx monacanthus Regan 1908: 240 (Amirante Is., Seychelles).

Asterropteryx ensiferus: Smith 1958*; Smith & Smith 1963.

Asterropteryx ensiferus: Winterbottom & Emery 1986*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17–19 rays. LSS 24–25; TRB 7–9; predorsal scales 6–8, reaching to close behind eyes; rear edge of preopercle with 1 long spine; 3rd spine of 1st dorsal fin elongate in both sexes; gill opening to just under opercle.

Head and body greyish brown, with 4 generally parallel rows of bright blue evenly spaced round spots along body, but staggered rows or short additional rows of spots behind pectoral fins, and head scattered with similar spots; some blue spots on caudal fin, and sometimes on dorsal fins and anal fin. Attains 26 mm SL.



Asterropteryx ensifera, 22 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Seychelles, Réunion, Rodrigues and Chagos; elsewhere widespread to Society Is.

REMARKS Common on clean-water reefs, at 10–22 m.

Asterropteryx ovata Shibukawa & Suzuki 2007

Egg-spot rubblegoby

PLATE 7

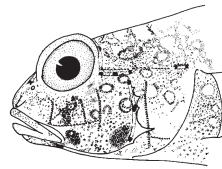
Asterropteryx sp. (= *Asterropteryx* DFH sp. 7): Winterbottom & Emery 1986*.

Asterropteryx DFH sp. 7: Winterbottom & Anderson 1997.

Asterropteryx ovata Shibukawa & Suzuki 2007: 113, Figs. 1–4 (Tanjung Kusukusu, Lembah I., Sulawesi, Indonesia).

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–20 rays. LSS 22–25; TRB 7–10; predorsal scales 4–6, cycloid; rear edge of preopercle with 3–7 short spines; 4th spine of 1st dorsal fin longest.

Head and body translucent whitish, covered with small round orange spots, most prominent along midsides of body; sometimes with brownish spots on sides of head and behind eyes; large rounded to oval black spot on caudal-fin base. Attains 32 mm SL.



Asterropteryx ovata, 26 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Chagos; elsewhere to Indonesia, Micronesia, Samoa to Society Is.

REMARKS Found on coral reefs, at 4–32 m.

Asterropteryx semipunctata Rüppell 1830

Starryfin goby

PLATES 6 & 7

Asterropteryx semipunctatus Rüppell 1830: 138, Pl. 34, Fig. 4 (Massawa,

Eritrea, Red Sea); Smith 1961; Winterbottom & Emery 1986*;

SSF No. 240.7*; Randall & Goren 1993*; Randall *et al.* 1994*;

Randall 1995*; Kuitert 1998*; Debelius 1998*; Field & Field 1998*.

Eleotris cyanostigma: Playfair 1868.

Priolepis auriga Hemprich & Ehrenberg 1899: 9, Pl. 9, Fig. 7 (Red Sea).

Eleotris semipunctatus: Günther 1877*.

?*Eleotris cyanostigma*: Kossmann & Räuber 1877.

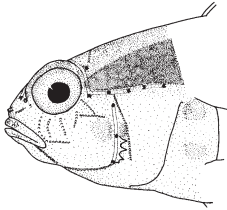
Asterropteryx semipunctatus: Smith 1958*; Smith & Smith 1963*;

Harmelin-Vivien 1976; Hoese & Winterbottom 1979; Randall 1983*.

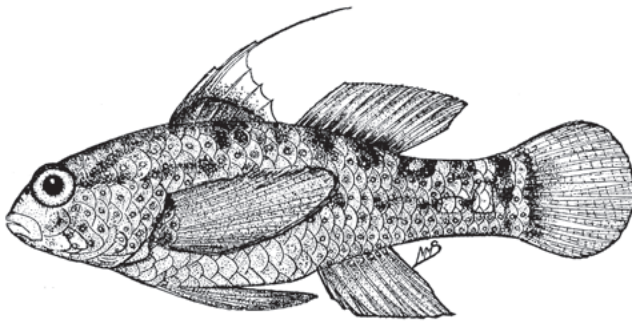
Asterropteryx semipunctata: Fricke *et al.* 2009.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–18 rays. LSS 22–25; TRB 8 or 9; predorsal scales 6 or 7, ctenoid; rear edge of preopercle with 2–9 short spines; 3rd spine of 1st dorsal fin elongate in both sexes; gill opening to below pectoral-fin base.

Head and body greyish brown, with 4–6 slightly irregular rows of small round bright blue spots along body, but rows often evenly spaced on rear half of body, and uppermost row often angled upward and back; head scattered with similar spots; 2nd dorsal, anal and caudal fins with a few rows of blue spots. Attains 51 mm SL.



Asterropteryx semipunctata, 22 mm SL (Chagos). Source: Winterbottom & Emery 1986



Asterropteryx semipunctata, 51 mm TL, male (S Mozambique). Source: Smith 1958

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf, Red Sea to South Africa (KwaZulu-Natal), Aldabra, Seychelles, Mascarenes, Chagos and Maldives; elsewhere in Pacific to Gambier Is. (Mangareva I.).

REMARKS Common over rubble near coastal reefs and in burrows or small caves, at 1–20 m. Feeds by picking out small invertebrates from sand or rubble.

Asterropteryx spinosa (Goren 1981)

Eye-bar rubblegoby

PLATES 6 & 7

Oplopomus spinosus Goren 1981: 96, Fig. 2 (Maitre I., New Caledonia).
Asterropteryx spinosus: Randall & Goren 1993*;
Randall & Van Egmond 1994.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17–19 rays; pelvic fins joined at least at base. LSS 21–24; TRB 7; predorsal scales 5, reaching to behind eyes; cheek naked; opercle with large ctenoid scales; large spine on rear edge of preopercle, with 2–4 smaller spines above it.

Head and body translucent whitish, covered with pale orange blotches and small spots, several small dusky spots

along midsides of body; head with blackish vertical bar from eyes to just below corners of mouth; blackish oblique blotch or streak behind eyes; black spot at front of 1st dorsal fin; short dark vertical line at caudal-fin base. Attains 33 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Seychelles and Maldives; elsewhere in western Pacific to Tonga.

REMARKS Prefers clear clean waters on coral reefs, at 3–15 m.

GENUS *Aulopareia* Smith 1945

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19 or 20 rays. Body scales ctenoid; predorsal area with cycloid scales; cheek naked or scaly; opercle scaly; LSS 30–39; TRB 9–12. Sensory papillae in longitudinal pattern, 2 uppermost rows may be partly joined anteriorly by groove. Unique slit-like pore behind each eye, extending back over preopercle; no anterior interorbital pore; 2 or 3 preopercle pores. Mental frenum flat or bilobed. Stout canine tooth, larger than other teeth, at each side of lower jaw, may be conspicuous and point backward. Gill opening restricted to pectoral-fin base or to just under opercle. Usually found over soft muddy bottom. The taxonomy of this group is under revision. About 12 nominal species, in Indo-Pacific, 2 in WIO.

KEY TO SPECIES

- 1a Cheek and opercle fully scaly; mental frenum bilobed; ocellate yellow spot on upper part of caudal fin *A. ocellata*
- 1b Opercle scaly dorsally, cheek naked; mental frenum flat; no ocellate yellow spot on caudal fin *A. unicolor*

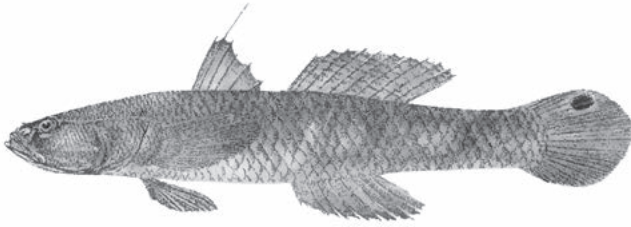
Aulopareia ocellata (Day 1873)

Ocellate slit-pore goby

Gobius ocellatus Day 1873: 107 (Mumbai, India).
Aulopareia ocellatus: Bauchot *et al.* 1991.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 7–10 rays; pectoral fins 19 or 20 rays. LSS 28–32; TRB 11 or 12; predorsal scales ~22–29, small, cycloid; interorbital space scaly; cheek and opercle covered with small cycloid scales.

Body whitish grey, with dark green spot (dusky in preserved specimens) just above pectoral-fin bases; yellow ocellate spot on upper caudal fin. Attains 108 mm SL.



Aulopareia ocellata (India). Source: Day 1876

DISTRIBUTION WIO: Oman, Iran, Pakistan (Karachi) and India (Mumbai).

REMARKS Poorly known from few specimens, trawled from soft-bottom marine habitats. Resembles *Parachaeturichthys polynema*.

Aulopareia unicolor (Valenciennes 1837)

Slit-pore goby

PLATE 6

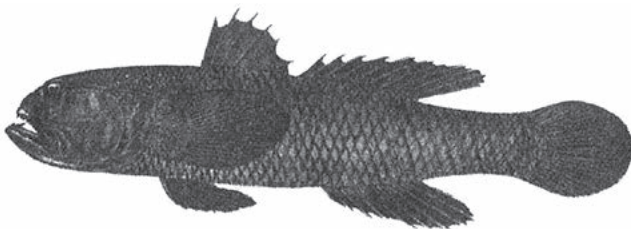
Gobius unicolor Valenciennes in Cuv. & Val. 1837: 88 (Java, Indonesia).

Gobius masoni Day 1873: 107 (Mumbai, India); Day 1876*.

Aulopareia unicolor: Bauchot *et al.* 1991.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 rays; pectoral fins 17–21 rays. LSS 24–31; TRB 9–14; predorsal scales 16–25, small, extending forward to close behind eyes; opercle with cycloid scales dorsally. Gill opening restricted to pectoral-fin base or extending to just under opercle.

Live colour unknown; freshly dead fish pale brown, with scattered whitish to bluish spots on upper half of body and a few whitish blotches around opercle, and small dark grey spot on upper part of caudal-fin base. Preserved specimens dusky; body scales may have pale iridescent spots; caudal fin with scattered dark spots. Attains at least 86 mm SL.



Aulopareia unicolor (India). Source: Day 1876

DISTRIBUTION Indo-Pacific. WIO: Strait of Hormuz (Qeshm I., Iran) and India (Mumbai); elsewhere, Thailand to China and Indonesia (Java).

REMARKS Known from few specimens, collected over soft bottom, usually mud.

GENUS *Austrolethops* Whitley 1935

First dorsal fin 6 spines; 2nd dorsal fin 14 or 15 rays; anal fin 13 or 14 rays; pectoral fins 16 or 17 rays; pelvic fins 1 spine, 4 rays, and fins completely separate. No (unsegmented) spine in 2nd dorsal fin or anal fin. Body slightly compressed, soft and flabby in appearance; head rounded; eyes small. No scales. No head pores. Sensory papillae in reduced transverse pattern. One species.

Austrolethops wardi Whitley 1935

Nude goby

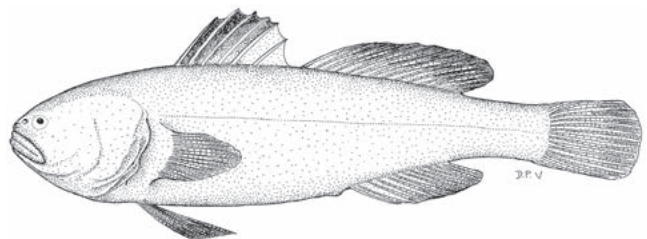
PLATE 5

Austrolethops wardi Whitley 1935: 243, Fig. 10 (Lindeman I.,

Great Barrier Reef, Australia); Smith 1958*, 1961; Smith & Smith 1963*; Hoese & Winterbottom 1979; SSF No. 240.8*.

Diagnosis as for genus.

Head and body pale pinkish brown, with silvery peritoneum partly showing through body wall; fins translucent-dusky, except pelvic fins and anterior half of 1st dorsal fin brownish black. Attains ~50–60 mm SL.



Austrolethops wardi, 40 mm SL (Kenya). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya (Shimoni) to Mozambique (Inhaca I.) and Seychelles (Aldabra); elsewhere to Philippines, Taiwan, Guam and Great Barrier Reef.

REMARKS Poorly known; some specimens have been dredged from coral rubble and may be associated with sponges, others found among coral rubble and seagrasses on coral-reef flats.

GENUS *Barbuligobius*

Lachner & McKinney 1974

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 19–21 rays; pelvic fins long, fused, and pelvic frenum low, weak. Body scales ctenoid; head, predorsal area, chest and belly naked; TRB 9 or 10. No anterior interorbital pore; sensory papillae on head in reduced longitudinal pattern, and may be papillose or formed into barbels on snout, chin and sides of head. Head depressed, rounded in dorsal profile, with many slender barbels; eyes mostly dorsal, interorbital space narrow. Gill opening restricted to just past pectoral-fin base. Occurs in coral-reef habitats. One species.

Barbuligobius boehlkei Lachner & McKinney 1974

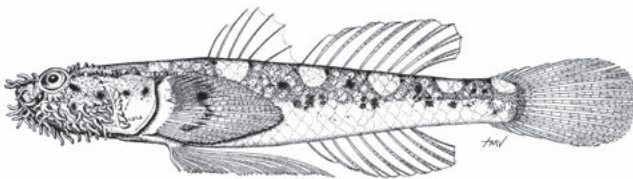
Bearded goby

PLATE 8

Barbuligobius boehlkei Lachner & McKinney 1974: 871, Figs. 1–4 (off Ch'uan-fan-shih, Taiwan); Hoese & Winterbottom 1979; SSF No. 240.10*; Winterbottom & Emery 1986*; Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Diagnosis as for genus.

Head and body white, with 6 black-edged pale brownish saddles across back, saddles ending in black or dark brown spot just above midsides of body; other tiny black to brownish spots scattered over head and upper half of body. Attains 24 mm SL.



Barbuligobius boehlkei, 30 mm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: East Africa to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Mauritius, Rodrigues and Chagos; elsewhere to Australia.

REMARKS Found over sand adjacent to rocks or coral on coral reefs; can bury itself completely in the sand.

GENUS *Bathygobius* Bleeker 1878

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–25 rays, several upper rays free from membrane. Predorsal scales usually present, and scales present or absent on sides of head; LSS 31–50. Head rounded to depressed; distinct lobed mental frenum; cheek with fleshy fold in some species; small fleshy bump below posterior nostril; sensory papillae in longitudinal pattern. Gill opening extends forward to below opercle. Vertebrae 10 + 17. Despite the name, *Bathygobius* are shallow-water species found to ~11 m deep, on coral and rocky reefs and intertidal flats (except one undescribed species known from 40–80 m). Worldwide; ~24 species recognised, plus several undescribed, 8 species in WIO.

KEY TO SPECIES

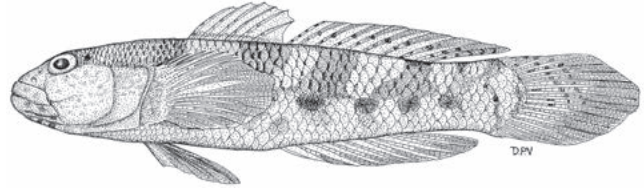
- 1a Body scales cycloid; head and body black in both sexes *B. niger*
- 1b Body scales ctenoid; head and body usually with dark bars and spots on paler background, but may be dark in males 2
- 2a Anterior nostrils usually with small flap; oculoscapular canal behind eye continuous to above end of opercle (may be discontinuous in fish <20 mm SL), and 2 pores above opercle; cheek usually with distinct fold below eye and behind upper jaw, covering part of papillae 3
- 2b No flap on anterior nostril; oculoscapular canal broken, with detached tube over opercle, and 3 pores above opercle; usually no cheek fold 6
- 3a Cheek scaly at least dorsally, and opercle scaly; predorsal scales 21–32; upper 6–9 rays of pectoral fins with free tips *B. cotticeps*
- 3b Cheek naked, and opercle scaly or naked; predorsal scales 12–20; upper 4–6 rays of pectoral fins with free tips 4
- 4a Opercle scaly dorsally; pelvic frenum with median posterior projection; males brown *B. cyclopterus*
- 4b Opercle naked; pelvic frenum without median posterior projection 5
- 5a Mandibular frenum curved, with long lateral lobes; distinct flap on anterior nostril; head distinctly depressed; males without longitudinal lines on body; dark vertical bar usually present across caudal-fin base in both sexes; breast largely naked, with only small patch of scales before pelvic fins *B. laddi*

Continued...

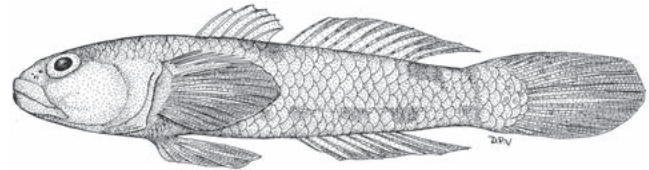
KEY TO SPECIES

- 5b Mandibular frenum with straight margin and short lateral lobes; flap on anterior nostrils often reduced (no flap in juveniles); head nearly cylindrical; males with numerous thin longitudinal lines on body; no vertical dark bar across caudal-fin base; large patch of scales in front of pelvic fins *B. meggitti*
- 6a Predorsal scales extend to above or behind rear edge of preopercle; mandibular frenum distinctly curved, with short to long free lateral lobes; body with elongate midlateral blotches (but blotches never extend ventrally from midline) and black spot behind eyes; pre-pelvic area partly scaly, rarely naked *B. cocosensis*
- 6b Predorsal scales extend almost to eyes; mandibular frenum with straight rear margin, and no lateral lobes; body with large irregularly shaped blotches extending dorsally and often ventrally from midline; pre-pelvic area mostly scaly 7
- 7a Head nearly cylindrical, snout steep in lateral view; 1st dorsal fin with broad black stripe; 3 uppermost rays of pectoral fins with free tips; dark blotches on sides extend ventrally *B. fuscus*
- 7b Head depressed, snout gently rounded in lateral view; 1st dorsal fin with dark spots forming rows (spots may merge to form narrow brown stripe close to fin base); 4 uppermost rays of pectoral fins with free tips; dark blotches on sides not extending ventrally *B. coalitus*

body; small round whitish spots over sides, tending to follow scale rows ventrally; 1st dorsal fin with brownish spots, and occasionally blackish blotch posteriorly. Attains 100 mm SL.



Bathygobius coalitus, 70 mm SL, male (Mauritius). Source: SSF



Bathygobius coalitus, 65 mm SL, female (Seychelles). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Tanzania (Zanzibar), Mozambique (Inhaca I.), South Africa (Eastern Cape), Mascarenes, Mayotte, Aldabra, Comoros, Seychelles, Chagos and Maldives; elsewhere widespread in Pacific to Marquesas Is. and Hawaii.

REMARKS Common on intertidal rocky or coral-reef flats.

Bathygobius coalitus (Bennett 1832)

Whitespotted frillgoby

PLATE 7

Gobius coalitus Bennett 1832: 166 (Mauritius, Mascarenes).

Gobius albopunctatus Valenciennes in Cuv. & Val. 1837: 57 (Mauritius, Mascarenes); Sauvage 1891*.

Gobius albopunctatus: Day 1876.

Bathygobius fuscus: Smith 1959 [in part]*.

Bathygobius albopunctatus: SSF No. 240.11*; Winterbottom & Emery 1986*; King 1996*.

Bathygobius coalitus: Randall & Goren 1993*; Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17–21 rays, upper 4 or 5 rays with free tips. LSS 31–39; TRB 13–15; predorsal scales 10–22, reaching forward to halfway between eye and margin of preopercle; breast and pectoral-fin bases scaly. No distinct cheek fold.

Body with ~5 roughly square, brown blotches along midsides, joined to dorsum by oblique bars and 4 broad saddles, and blotches do not extend down to ventral part of

Bathygobius cocosensis (Bleeker 1854)

Cocos frillgoby

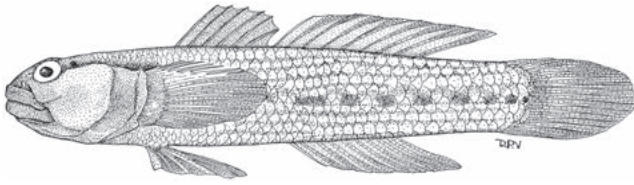
PLATE 7

Gobius cocosensis Bleeker 1854: 47 (Cocos [Keeling] Is.).

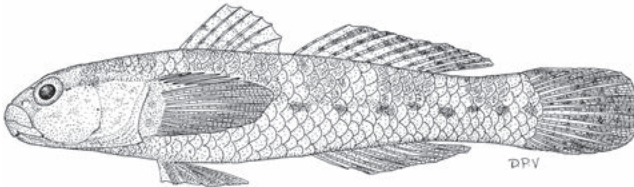
Bathygobius cocosensis: SSF No. 240.12*; Winterbottom & Emery 1986*; Randall & Goren 1993*; Randall & Van Egmond 1994*; Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8–10 rays (nearly always 9 rays); anal fin 1 spine, 8 rays; pectoral fins 17–20 rays, upper 3 or 4 rays with free tips. LSS 33–39; TRB 11–14; predorsal scales 6–14, reaching to above opercle or rear edge of preopercle; nape midline usually naked. Cheek with low fold.

Head and body greyish brown, with 5 darker brown broad saddles crossing back, joining midlateral row of small dark brown blotches or rectangular spots; lower half of body paler, with diffuse to dusky lines following scale rows; black spot behind eye, spot above opercle, and spot on opercle (just behind centre of rear edge of preopercle); males darker and plainer than females. Attains 65 mm SL.



Bathygobius cocosensis, 60 mm SL, male (South Africa). Source: SSF



Bathygobius cocosensis, 35 mm SL, female (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: East Africa to South Africa (Transkei region), Madagascar, Seychelles, Mascarenes and Chagos; elsewhere widespread from Cocos (Keeling) Is. to Pitcairn Is.

REMARKS Found on coral reefs and in intertidal zone and lagoons.

Bathygobius cotticeps (Steindachner 1879)

Scaly-cheek frillgoby

PLATE 7

Gobius cotticeps Steindachner 1879: 137, Pl. 1, Fig. 2 (Society Is., French Polynesia).

Bathygobius fuscus: Winterbottom 1976 [in part].

Bathygobius cotticeps: Hoese 1986*; Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 rays; pectoral fins 21–25 rays, upper 5–9 rays with free tips. LSS 35–40; TRB 15–18; predorsal scales 21–32, reaching forward to eyes; opercle scaly dorsally; few scales on preopercle in African specimens. No distinct cheek fold.

Head and body pale to dark brown, with 2 narrow dark brown bands crossing nape, and 3 broad dark brown bands or saddles crossing back; interspaces may be quite pale, and dorsal saddles become indistinct mottling and spotting on lower half of body; 2 dark brown spots over opercle and 1 spot just behind eye; 1st dorsal fin may have black blotch at rear. Attains 105 mm SL.



Bathygobius cotticeps, 105 mm TL (South Africa). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (Transkei region), Réunion and Rodrigues; elsewhere widespread to Pitcairn Is. and Hawaii.

Bathygobius cyclopterus (Valenciennes 1837)

Spotted frillgoby

PLATES 7 & 8

Gobius cyclopterus Valenciennes *in* Cuv. & Val. 1837: 59 (Carteret Harbour, Lambom I., New Ireland, Papua New Guinea).

Bathygobius cyclopterus: Goren 1978*, 1979*; Randall 1983*; Hoese 1986*; Randall & Goren 1993*; Fricke 1999.

Bathygobius crassiceps: Randall & Van Egmond 1994*.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19 rays, upper 2–4 rays with free tips. LSS 31–37; TRB 12–14; predorsal scales 10–20, reaching forward to eyes; opercle scaly dorsally; breast mostly scaly; pectoral-fin bases scaly. Cheek with distinct fold.

Body pale to dusky, may appear faintly covered with narrow lines following scale rows; indistinct brownish saddles over dorsum; 6 or 7 narrow horizontal blotches along midsides; black spot behind eye, and 2 or 3 less distinct blackish spots over opercle; 1st dorsal fin dusky basally, with blackish blotch posteriorly (more pronounced in males). Attains 60 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea (including Gulf of Aqaba) to South Africa (KwaZulu-Natal), Seychelles, Réunion and Maldives; elsewhere in western Pacific to Samoa.

Bathygobius fuscus (Rüppell 1830)

Dusky frillgoby

PLATES 7 & 8

Gobius fuscus Rüppell 1830: 137 (Red Sea).

Gobius punctillatus Rüppell 1830: 138 (Red Sea).

Gobius nebulopunctatus Valenciennes *in* Cuv. & Val. 1837: 58 (Mauritius, Mascarenes; Red Sea).

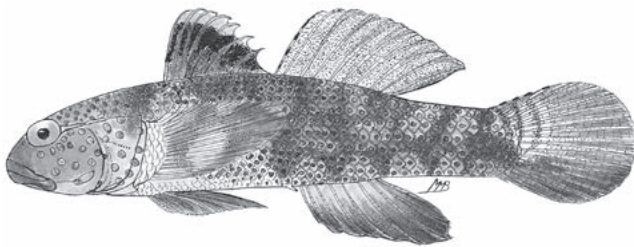
?*Gobius obscurus* Peters 1855: 441 (Mozambique).

Bathygobius fishelsoni Goren 1978: 271, Figs. 6–7 (Bilaym, Gulf of Suez, Red Sea).

Bathygobius fuscus: Koumans in Blegvad & Løppenthin 1944; Koumans 1953; SFSA No. 910* [in part]; Smith 1959* [in part]; Smith & Smith 1963* [in part]; Winterbottom 1976*; Kuronuma & Abe 1986; SSF No. 240.15*; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 16–20 rays, upper 3 rays with free tips. LSS 29–36; TRB 12–15; predorsal scales 10–19, reaching forward to midway between eyes and rear edge of preopercle, with naked area always present behind eyes. No distinct cheek fold.

Head and body pale sandy to brownish, usually with 2 broad darker saddles across back, which may extend below midsides of body, interspaces on dorsum pale; series of small dark brown spots or blotches (sometimes paired) along midsides; small dark brown to blackish spot behind eyes, and similar spot above pectoral-fin bases; lower $\frac{1}{2}$ – $\frac{3}{4}$ of 1st dorsal fin dusky to dark brown. Some specimens with dark body and pale head. Attains 70 mm SL.



Bathygobius fuscus, 55 mm TL (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific (widespread). WIO: Pakistan, Persian/Arabian Gulf, Red Sea, Kenya to South Africa (Transkei region), Madagascar, Comoros, Aldabra, Seychelles and Mascarenes; elsewhere widespread to Marquesas Is.

REMARKS Commonly occurs on intertidal reef flats, over sand and rubble in shallow water, and on soft coral or rocky reefs.

Bathygobius laddi (Fowler 1931)

Small brown frillgoby

PLATE 7

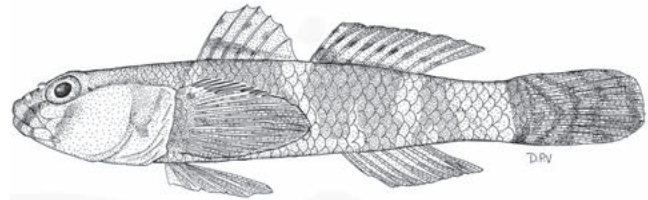
Rhinogobius laddi Fowler 1931: 362, Fig. 6 (Suva, Fiji).

Bathygobius fuscus: Smith 1959* [in part].

Bathygobius laddi: SSF No. 240.16*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 rays; pectoral fins 21–24 rays, upper 5 or 6 rays with free tips. LSS 28–32; TRB 11–14; predorsal scales 9–13, reaching to just behind rear edge of preopercle. Cheek with distinct fold.

Head and body pale brown, with 3 or 4 diffuse darker saddles over back, and distinct dark brown to greyish brown bar across caudal-fin base; sides of head mottled and spotted dark and pale brown; dark brown spot above upper rear corner of opercle; fins often heavily spotted or barred with dark brown to blackish markings. Attains 43 mm SL.



Bathygobius laddi, 30 mm SL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Mozambique (Bazaruto I.) to South Africa (Transkei region); elsewhere, Sri Lanka to Fiji.

REMARKS Inhabits shallow reefs.

Bathygobius meggitti (Hora & Mukerji 1936)

Brownlined frillgoby

PLATES 7 & 8

Ctenogobius meggitti Hora & Mukerji 1936: 30, Pl. 1, Figs. 3–4 (Maungmagan, Tavoy District, Myanmar).

Bathygobius fuscus: SFSA No. 910* [in part].

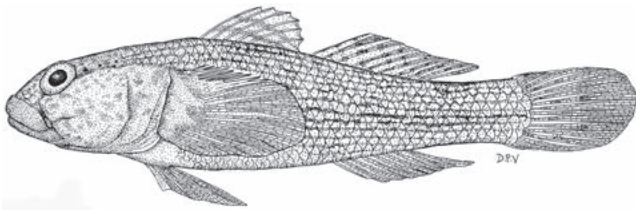
Bathygobius karachiensis Hoda & Goren 1990: 144, Figs. 1–5 (Buleji, off Karachi, Pakistan, Arabian Sea).

Bathygobius sp. 9: Hoese 1986*.

Bathygobius meggitti: Randall 1995*; Rahimian & Pehpuri 2006; Ghanbarifardi & Malek 2009.

Second dorsal fin usually 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 19–21 rays, upper 4 or 5 rays with free tips. LSS 29–37; TRB 14–19; predorsal scales 12–19, reaching forward halfway between rear edge of preopercle and rear of eyes; breast mostly scaly; pectoral-fin bases scaly. Cheeks with distinct fold.

Head and body brown, with ~5 darker (often indistinct) saddles; males with distinct longitudinal brown to dark brown lines following scale rows, on (usually) pale brown body; 1st dorsal fin plain dusky or with several rows of brown spots; distinct black spot immediately behind eyes, and 1–3 less distinct small black spots on sides of nape above rear part of preopercle, and 1–3 narrow dusky spots along nape midline. Attains 62 mm SL.



Bathygobius meggitti, 40 mm SL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Iran, Pakistan, Mozambique and South Africa (Xora River); elsewhere to Myanmar and in western Pacific to Fiji.

REMARKS Found in intertidal areas on exposed coasts.

Bathygobius niger (Smith 1960)

Black frillgoby

PLATE 8

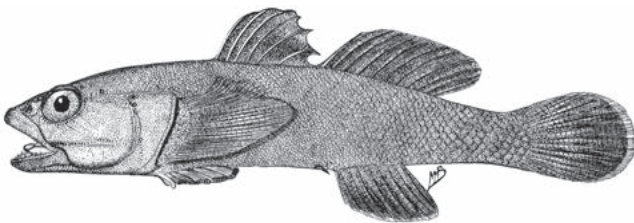
Pyosicus niger Smith 1960: 312, Fig. 13 (Bizana Coast, Pondoland [Eastern Cape], South Africa).

Bathygobius niger: Winterbottom 1976*; Hoese & Winterbottom 1979; SSF No. 240.17*; Sugiyama *et al.* 2000*.

Bathygobius smithi Fricke 1999: 502 (Bizana Coast, Pondoland [Eastern Cape], South Africa) [replacement name for *Pyosicus niger*]; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 22 or 23 rays, upper 5–7 rays with free tips. LSS 47–50; TRB 19–25; predorsal scales 10–18, reaching forward to just behind rear edge of preopercle; all scales cycloid. Cheek with low fold. Upper lip relatively pointed.

Head and body plain black; dorsal fins and caudal fin orange with grey border, anal fin grey, and pectoral and pelvic fins black. Preserved specimens generally blackish. Attains 47 mm SL.



Bathygobius niger, 40 mm TL, holotype (South Africa). Source: Smith 1960

DISTRIBUTION Indo-Pacific. WIO: South Africa (KwaZulu-Natal and Eastern Cape), Réunion, Mauritius, India and Sri Lanka; elsewhere to Indonesia and southern Japan.

GENUS *Bryaninops* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6–9 rays; anal fin 1 spine, 6–10 rays; pectoral fins 12–17 rays, a few lowermost rays usually unbranched and somewhat thickened; skin covering pelvic-fin spines thickened and forming lobes, pelvic fins cup-like, and pelvic frenum nearly always folded to form anterior-facing pocket. LSS 19–69; nape naked. Two separate interorbital canals; 2 pairs of interorbital pores, usually with interconnecting canal above rear edge of eye. Most species with at least 1 canine tooth at midsides of lower jaw; upper jaw with outer row of large teeth generally restricted to front of jaw. Tongue tip usually bilobed or trilobed. Gill opening extends from upper pectoral-fin base to below pectoral-fin base or to under eye. Sixteen species, 8 in WIO.

KEY TO SPECIES

- | | | |
|----|--|-----------------------|
| 1a | Curved canine tooth at midsides of lower jaw, jaw rounded in ventral view, and rows of different-sized sharp curved teeth present | 2 |
| 1b | No curved canine tooth at midsides of lower jaw, jaw somewhat triangular in ventral view, and rows of even-pointed upright teeth present, mostly towards sides of jaw; LSS 31–37, body usually partly scaly, scales reaching at most to below dorsal-fin spines 2–4; snout very short (~26% HL) [commensal on <i>Porites</i> or <i>Millepora</i>] | <i>B. ridens</i> |
| 2a | Pectoral-fin rays unbranched at all body sizes; gill opening extends to below posterior edge of eye; internal colour bars rarely visible, and ventral half of body deep violet-red in life, dark to dusky in preservative | <i>B. erythroptus</i> |
| 2b | Some pectoral-fin rays always branched (except in juveniles <11 mm TL); extent of gill opening variable; faint or dark internal bars usually visible, or else head and body compressed and eyes lateral | 3 |
| 3a | Pelvic frenum flat and without forward-facing pocket or fold; pelvic-fin spines flattened, with surrounding skin forming flat lobes [commensal on sponges] | <i>B. spongicolus</i> |
| 3b | Pelvic frenum with forward-facing pocket or fold; pelvic-fin spines short and with fleshy lobes | 4 |
| 4a | Pectoral fins 13 (rarely 12 or 14) rays; gill opening extends to lower pectoral-fin base or slightly further forward [commensal on <i>Antipathes</i> black corals] | <i>B. tigris</i> |
| 4b | Pectoral fins 14–17 (rarely 13) rays; extent of gill opening variable | 5 |

Continued...

KEY TO SPECIES

- 5a No posterior interorbital pore or pair of pores; scales on sides of body usually reaching forward only to 2nd dorsal-fin origin; TRB 1 or 2; head and body compressed *B. natans*
- 5b Posterior interorbital pore or pores usually present; scales on sides usually reaching forward to behind pectoral fins; TRB 9–14; head somewhat depressed 6
- 6a Gill opening restricted, extending to lower edge of pectoral-fin base and occasionally reaching to below rear edge of preopercle 7
- 6b Gill opening wider, extending to rear edge of eye or at least past rear edge of preopercle; pelvic fins usually cup-like and do not reach anus *B. loki*
- 7a Body with golden-brown to brown bars in life, generally remaining distinct in preserved specimens; head depth at least 50% HL; scalloped grooves along lower edge of preopercle *B. yongei*
- 7b Body with brownish orange to red bars in life, usually indistinct in preserved specimens; head depth <50% HL; no scalloped grooves but occasionally slight indentations along lower edge of preopercle *B. amplus*

Bryaninops amplus Larson 1985

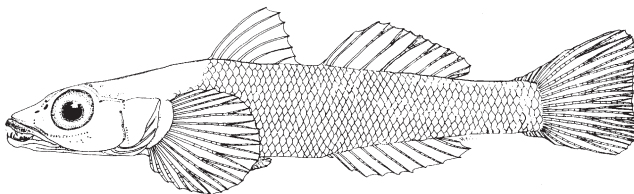
Single-whip goby

PLATES 8 & 9

Bryaninops amplus Larson 1985: 66, Figs. 5–6 (lagoon off Palfrey I., Lizard I., Great Barrier Reef, Australia); Anderson *et al.* 1998; Kuiter 1998*.

Second dorsal fin and anal fin each with 1 spine, 6–9 rays; pectoral fins 14–17 rays, lower 2–4 rays unbranched and thickened towards tips. LSS 37–69 (average 53); TRB 5–17 (average 13). Gill opening extends slightly past pectoral-fin base. Tongue tip usually trilobed.

Alive, body mostly transparent but lower half fawn to golden; bright silvery white line along vertebral column, and at least 6 internal orange bars. Attains 46 mm SL.



Bryaninops amplus, 29 mm SL, female (Australia). Source: Larson 1985

DISTRIBUTION Indo-Pacific. WIO: South Africa (KwaZulu-Natal), Madagascar, Seychelles and Maldives; elsewhere to southern Japan (Ogasawara Is.), northern Australia and Hawaii.

REMARKS Commensal on gorgonian seawhips, especially *Juncella*, near coral reefs, at 4–70 m.

Bryaninops erythrops (Jordan & Seale 1906)

Fire-coral goby

PLATE 9

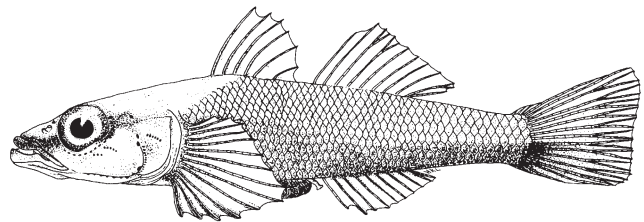
Chaenogobius erythrops Jordan & Seale 1906: 404, Pl. 37, Fig. 3 (Pago Pago, Tutuila I., American Samoa).

Bryaninops erythrops: Larson 1985*; Winterbottom & Anderson 1997.

Tenacigobius erythrops: Winterbottom & Emery 1986.

2nd dorsal fin and anal fin each with 1 spine, 7–9 rays; pectoral fins 13–16 rays, nearly always all unbranched. LSS 34–49 (average 40); TRB 7–12. Small-sized and short-bodied, with large eyes. Gill opening reaching to at least rear edge of eye. Tongue tip trilobed.

Dorsal half of body transparent, with white line above vertebral column; ventral half of body dark purplish brown, and internal red bars barely visible; eyes silver to pale gold, with violet-red rim. Attains 18 mm SL.



Bryaninops erythrops, 17 mm SL (Australia). Source: Larson 1985

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Aden and Chagos; elsewhere in western Pacific to Samoa.

REMARKS Commensal on branching colonies of *Millepora* fire-coral and massive stony corals *Porites lutea* and *P. cylindrica*, in shallow lagoons, at 3–22 m.

Bryaninops loki Larson 1985

Gorgonian whipgoby

PLATES 8 & 9

Bryaninops loki Larson 1985: 81, Figs. 13–14 (on drop-off between Bird I. and South I., Lizard I., Great Barrier Reef, Australia); Winterbottom & Anderson 1997; Kuiter 1998*; Anderson *et al.* 1998*.

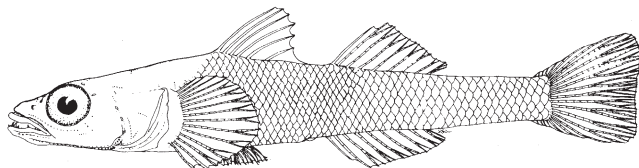
Tenacigobius n. sp. A: Winterbottom & Emery 1986*.

?*Bryaninops discus* Suzuki, Bogorodsky & Randall 2012: 2, Figs. 1–3 (Saunders Reef, Suakin Archipelago, Sudan, Red Sea).

Second dorsal fin and anal fin each with 1 spine, 7–9 rays; pectoral fins 13–17 rays, lower 2 or 3 rays unbranched, sometimes thickened at tips; pelvic fins usually cup-like, but

may form more flattened disc. LSS 33–53; TRB 6–12. Relatively slender-bodied. Gill opening wide, usually to below rear edge of eye, and may reach past rear edge of preopercle. Tongue tip trilobed.

Head and body transparent, lower half of body orange, fawn or pinkish; 6 internal red-brown bars arising from vertebral column may be visible; sometimes with dense black spot on lower caudal-fin base, which may form part of red-brown to brown stripe along peduncle. Attains 26 mm SL.



Bryaninops loki, 23 mm SL, female (Australia). Source: Larson 1985

DISTRIBUTION Indo-Pacific. WIO: Red Sea (Sudan), Gulf of Aden (Seven Brothers Is.), South Africa (KwaZulu-Natal), Chagos and Maldives; elsewhere in Pacific to Gambier Is. (Mangareva I.).

REMARKS Elusive; commensal on gorgonian seafans and seawhips, and occasionally on black corals, at 6–45 m. *Bryaninops discus* from the Red Sea may represent the same species.

Bryaninops natans Larson 1985

Purple-eyed hovering goby

PLATES 8 & 9

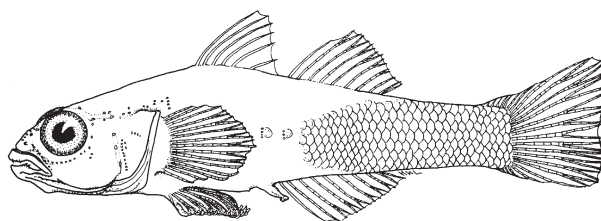
Bryaninops natans Larson 1985: 77, Figs. 10–12 (Lizard I. lagoon, Palfrey I., Great Barrier Reef, Australia); Debelius 1993*, 1998*; Goren & Dor 1994; Randall & Van Egmond 1994; Winterbottom & Anderson 1997; Anderson *et al.* 1998*; Field & Field 1998*; Kuitert 1998*; Herler & Hilgers 2005*.

Tenacigobius HKL sp. 2: Winterbottom & Emery 1986.

Tenacigobius n. sp. B: Winterbottom & Emery 1986*.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14–17 rays, all or most rays unbranched. LSS 19–40 (average 31); TRB 1–6; body naked anteriorly. Eyes large, lateral; interorbital space wide, without canal connecting posterior interorbital pores. Gill opening reaches to below rear edge of eye. Tongue trilobed.

Head and body transparent, with internal bright yellow pigment over throat and abdomen; distinctive violet-red eyes. Attains 19 mm SL.



Bryaninops natans, 19 mm SL, female (Australia). Source: Larson 1985

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Seychelles, Chagos and Maldives; elsewhere in western Pacific to Kapingamarangi Atoll (Micronesia).

REMARKS Associated with large thickets of *Acropora* staghorn coral, in small to large schools which usually hover just above the coral, at 7–27 m.

Bryaninops ridens Smith 1959

Porites goby

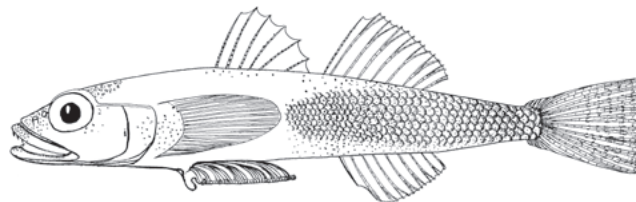
PLATES 8 & 9

Bryaninops ridens Smith 1959: 216, Fig. 34, Pl. 12h (Pinda, Mozambique); Larson 1985*; Winterbottom & Emery 1986; Goren & Dor 1994; Winterbottom & Anderson 1997; Anderson *et al.* 1998; Herler & Hilgers 2005*.

Labulogobius bentuviai Goren 1984: 78, Fig. 4a–c (Marsa Barecha, Sinai, Egypt, Red Sea).

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 8 rays; pectoral fins 13–15 rays, lower 2 or 3 rays unbranched. LSS 25–37 (average 33); TRB 4–10; body naked anteriorly. Gill opening variable, from rear edge of preopercle to rear edge of eye. No canine tooth at sides of lower jaw. Tongue tip usually blunt, sometimes trilobed.

Body translucent pale grey-green; golden to red eyes, and red line from each eye to around snout. Attains 18 mm SL.



Bryaninops ridens, 20 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea to Mozambique, and Chagos to Maldives; elsewhere in Pacific to Marquesas Is.

REMARKS Commensal on large *Porites* coral knolls, and sometimes on large colonies of *Millepora* fire-coral, at 6–11 m.

Bryaninops spongicolus

Suzuki, Bogorodsky & Randall 2012

Sponge whipgoby

PLATE 8

Bryaninops spongicolus Suzuki, Bogorodsky & Randall 2012: 6, Figs. 4–7 (Wingate Reef, Sudan, Red Sea).

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15 rays, lower 3 rays unbranched (not upper 3 rays as in original description). LSS 52; TRB 11. Gill opening wide, to below centre of eye. Snout and jaws long and slender; tongue tip trilobed.

Head and body transparent, lower half of body orange to red; 6 short internal red bars arising from vertebral column may be visible; red to dark orange stripe from upper lip to along cheek and joining body colour; lips and part of snout yellow. Attains at least 24.5 mm SL.

DISTRIBUTION Known only from the holotype in the Red Sea.

REMARKS Resembles *B. dianneae* from Fiji, but differs slightly in colour pattern (both species appear to be rare). Commensal on several species of sponges (as observed from photographs), at 12–23 m.

Bryaninops tigris Larson 1985

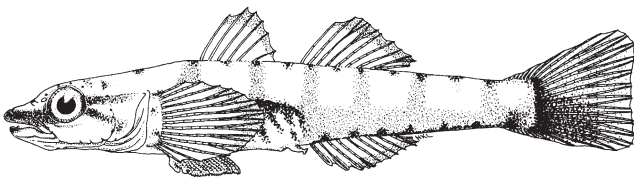
Blackcoral goby

PLATES 9 & 10

Bryaninops tigris Larson 1985: 70, Figs. 7–8 (Lizard I., Great Barrier Reef, Australia); Randall 1995*; Winterbottom & Anderson 1997; Anderson *et al.* 1998*; Debelius 1998*, 1999*; Kuitert 1998*.
Tenacigobius n. sp. C: Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 12–14 rays, lower 3 or 4 rays unbranched and thickened. LSS 32–59 (average 47); TRB 8–12. Slender-bodied. Gill opening restricted to pectoral-fin base; lower margin of preopercle fleshy and may be scalloped. Tongue tip bilobed or trilobed.

Body transparent dorsally and golden-brown ventrally; ~12 orange to gold-brown internal bars (mimicking polyps of black coral); eyes golden-red. Attains 25 mm SL.



Bryaninops tigris, 25 mm SL, male (Australia). Source: Larson 1985

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Oman (Muscat), Mozambique (photograph), Chagos and Maldives; elsewhere from Indonesia to Society Is.

REMARKS Commensal in groups on *Antipathes* black coral, at 5–53 m.

Bryaninops yongei (Davis & Cohen 1969)

Seawhip goby

PLATES 9 & 10

Cottogobius yongei Davis & Cohen 1969: 752, Figs. 1, 4–6 (Darvel Bay, Borneo, Malaysia).

Tenacigobius yongei: Larson & Hoese 1980*.

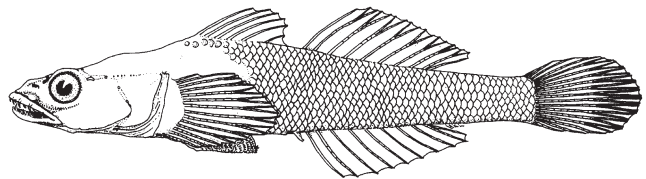
Bryaninops yongei: Larson 1985*; Goren & Dor 1994; Anderson *et al.* 1998; Field & Field 1998*; Kuitert 1998*; Herler & Hilgers 2005*.

Bryaninops erythropterus: Randall 1994*.

Bryaninops yongei: Debelius 1993*, 1999*; Eichler & Lieske 1994*.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7–10 rays; pectoral fins 13–17 rays, lower 3–6 rays unbranched and thickened toward tips. LSS 26–58 (average 40); TRB 3–16. Stocky-bodied, with lower margin of preopercle scalloped around 3 or 4 short grooves. Gill opening restricted to pectoral-fin base. Tongue tip usually trilobed.

Head and body translucent, with ~6 internal brown, golden or reddish bars (mimicking seawhip polyps); vertebral column and abdomen silvery white to golden; eyes bright gold to red-gold. Attains 30 mm SL.



Bryaninops yongei, 23 mm SL (Borneo).

Source: Larson & Hoese 1980, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (Sodwana Bay), Amirante Is. (Seychelles), Mauritius and Maldives; elsewhere from Ryukyu Is. to Rapa Iti.

REMARKS Commensal on antipathid whipcoral *Cirripathes anguina*, usually in adult pairs, at 6–40 m.

GENUS *Cabillus* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14–20 rays, and no rays free from membrane; pelvic frenum low or absent. Head strongly depressed, with pores and longitudinal pattern of sensory papillae. Eyes large. Gill opening restricted to pectoral-fin base. Mandibular frenum not bilobed. Tongue tip bilobed or concave. LSS 23–29; predorsal midline scaly or naked. Genus often confused with *Bathygobius*. This group requires additional research. At least 8 species, 5 in WIO.

KEY TO SPECIES

- 1a Predorsal scales 7–9, extending to margin of preopercle 2
- 1b No predorsal scales, or only 1 or 2 scales just before 1st dorsal fin 3
- 2a Pectoral fins 17 rays; predorsal scales 8 or 9; anterior nostrils long; body depth 4.4–5.1 in SL *C. macrophthalmus*
- 2b Pectoral fins 18–20 rays; predorsal scales 7; anterior nostrils short; body depth 5.8–6.5 in SL *C. nigrostigmus*
- 3a Caudal fin with 2 large scales with distinctly enlarged ctenii, and scales placed above and below base *C. nigromarginatus*
- 3b Scales above and below caudal-fin base without enlarged ctenii 4
- 4a Pre-pelvic area naked or with single scale at base of pelvic fins; narrow blackish bar at caudal-fin base, often with short central mark; 1–3 blackish spots on 1st dorsal-fin base *C. tongarevae*
- 4b Pre-pelvic area heavily scaly; oblique angular black spot at mid-caudal-fin base; no blackish spot on 1st dorsal-fin base, but small dusky spot may be present at base of 5th spine of fin *C. lacertops*

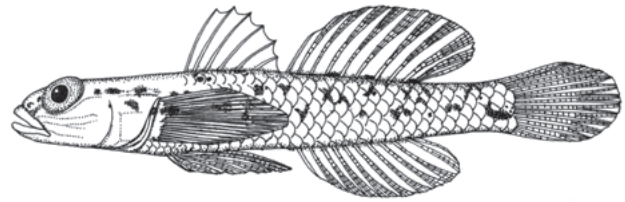
Cabillus lacertops Smith 1959

Lizard cabillus PLATE 10

Cabillus lacertops Smith 1959: 207, Fig. 26 (Pinda, Mozambique); Winterbottom & Emery 1986*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17 or 18 rays; pelvic frenum low (easily damaged; missing in holotype). LSS 27–28; TRB 9; head and nape naked. Tongue tip bilobed, concave or truncate.

Head and body yellowish white, with scattered small brown and pearly white spots; elongate dark spot below eye, diffuse brown spot at 1st dorsal-fin base, and similar spot at mid-caudal-fin base; all fins pale. Attains at least 31 mm SL.



Cabillus lacertops, 35 mm TL, holotype (N Mozambique). Drawn from Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Mozambique, St Brandon Shoals, Seychelles and Chagos; elsewhere to Great Barrier Reef.

REMARKS Known from few specimens, collected from coral-reef lagoon, at 12–15 m.

Cabillus macrophthalmus (Weber 1909)

Big-eye cabillus PLATE 10

Quisquilius macrophthalmus Weber 1909: 156, Fig. 101 (bay at Djampeah I., Indonesia).

Cabillus sp.: Heemstra *et al.* 2004 [in part]; Kovačić & Bogorodsky 2013*.

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17 rays; pelvic frenum low. LSS 25–29; TRB 7 or 8; sides of head naked; nape with 8 or 9 scales reaching forward to rear edge of preopercle. Tongue tip bilobed.

Head and body pale, with broad brownish saddle from nape to rear of 1st dorsal fin, and several indistinct dark-edged saddles across dorsum; 1st dorsal fin with dusky tip and dark basal band; diffuse brownish to blackish bar at caudal-fin base. Attains 25 mm SL.

DISTRIBUTION Indo-Pacific (range uncertain). WIO: Gulf of Aqaba (Red Sea) and Seychelles; elsewhere, Indonesia to New Caledonia.

REMARKS Known from few specimens trawled near coral reefs; found at 9–400 m.

Cabillus nigromarginatus

Kovačić & Bogorodsky 2013

Black-edge cabillus PLATE 10

Cabillus sp.: Heemstra *et al.* 2004.

Cabillus nigromarginatus Kovačić & Bogorodsky 2013: 181, Figs. 1–3 (Grand Baie, Rodrigues, Mascarenes).

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 rays; pectoral fins 18–20 rays; pelvic fins fused, and pelvic frenum low. LSS 23 or 24; TRB 6 or 7; head naked; predorsal midline naked or with few scales before 1st dorsal fin; 2 large scales with prominent ctenii above and below caudal-fin base. Tongue tip bilobed.

Head and body yellowish white, with 3 dark-edged irregular saddles across dorsum, oval to vertical dark brown blotch at caudal-fin base, and similar blotches and spots on sides of nape and behind eyes; cheek below eye covered with dark speckles; 1st dorsal fin pale. Attains 25 mm SL.

DISTRIBUTION Known only from the type specimens collected from Rodrigues.

REMARKS Found on coral reefs at 18–21 m.

Cabillus nigrostigmus Kovačić & Bogorodsky 2013

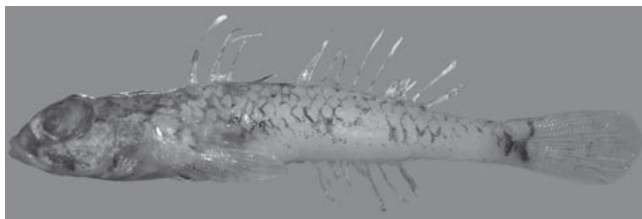
Black-spot cabillus

PLATE 10

Cabillus nigrostigmus Kovačić & Bogorodsky 2013: 186, Figs. 5–7 (Sharm el-Sheikh, Sharm el-Moya Bay, Egypt, Red Sea).

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17 rays; pelvic frenum low. LSS 27–30; TRB 7; head and nape naked; no scales with enlarged ctenii at caudal-fin base. Tongue tip bilobed.

Head and body whitish, becoming yellowish ventrally, with 3–5 irregular dark brown partly joined saddles or bars crossing dorsum, a row of pearly white spots along midsides (live fish); cheek below eye with brownish pigment and scattered darker small spots; 1st dorsal fin with distinct black tip and elongate blackish blotch at posterior base of fin; blackish brown vertical bar at caudal-fin base, followed by S-shaped dark bar. Attains 42 mm SL.



Cabillus nigrostigmus, 38 mm SL, female holotype (Red Sea).

© SV Bogorodsky

DISTRIBUTION Known only from two specimens collected from the Red Sea.

REMARKS Taken from a sandy lagoon at 1–6 m.

Cabillus tongarevae (Fowler 1927)

Tongareva cabillus

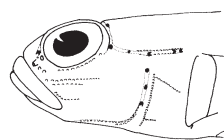
PLATE 10

Glossogobius tongarevae Fowler 1927: 27, Fig. 4 (Tongareva I. [Penrhyn I.], Cook Is.).

Cabillus tongarevae: Winterbottom & Emery 1986*; Randall & Goren 1993; Fricke 1999.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–18 rays; pelvic fins fully to partly fused, and pelvic frenum low. LSS 23–25; TRB 9 or 10; head and predorsal midline naked. Tongue tip bilobed.

Head and body whitish, with brown, black or bright white spots and blotches, forming indistinct row along midsides of body; distinct brown mark surrounded by pearly white under eye; 1st dorsal fin with large blackish patch near base; caudal fin with narrow vertical blackish bar along bases of rays. Attains 34 mm SL.



Cabillus tongarevae, 24 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Aldabra, Réunion, Chagos and Maldives; elsewhere in western and South Pacific to Cook Is.

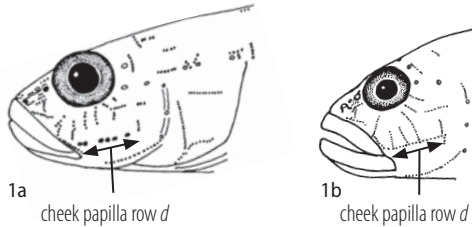
REMARKS Collected from ~1 m deep in tidepools and lagoons.

GENUS *Caffrogobius* Smitt 1900

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–14 rays; anal fin 1 spine, 8–12 rays; pectoral fins 16–23 rays, uppermost few rays free from membrane in some species. Head cylindrical to slightly compressed; lateral canals and pores present; sensory papillae in distinctive transverse pattern; mental frenum poorly developed. Body scales ctenoid; cycloid scales usually present on breast, belly and pectoral-fin bases; predorsal area usually naked; sides of head naked; LSS 31–66; TRB 9–23. Gill opening restricted to pectoral-fin base. Vertebrae 27. Most species with colour pattern that includes narrow vertical bars and blotches. Usually found in intertidal zone or estuaries. Seven nominal species, all from WIO; 6 recognised here.

KEY TO SPECIES

- 1a Papilla row *d* on cheek short, broken into 3 or 4 groups of large papillae; black spot usually present at rear of 1st dorsal fin; predorsal area naked 2
- 1b Papilla row *d* on cheek longer, unbroken, with 10–20 or more small, close-set papillae; 1st dorsal fin with rows of dark spots or with 2 or 3 dark bands; predorsal area naked or scaly 3



- 2a LSS 30–38; 2nd dorsal fin 1 spine, 9–11 (usually 10) rays; at least upper half of head and body with fine dark spots, sides of body with elongate dark blotches or pairs of dark spots *C. saldanha*
- 2b LSS 36–45; 2nd dorsal fin 1 spine, 10–12 (usually 11) rays; sides of body with elongate dark blotches and dusky vertical bars, upper half of body mostly with elongate blotches and lines, few if any distinct dark spots *C. agulhensis*
- 3a Second dorsal fin 1 spine, 9 or (usually) 10 rays; no flap on anterior nostrils; predorsal midline usually naked (or with 1–3 scales) *C. natalensis*
- 3b Second dorsal fin 1 spine, 10–14 (usually 11–13) rays; flap on anterior nostrils present or absent; predorsal midline naked or scaly 4
- 4a Second dorsal fin 1 spine, 12–14 (usually 13) rays; anal fin 1 spine, 10–12 (usually 11) rays; LSS 51–66; predorsal area naked *C. caffer*
- 4b Second dorsal fin 1 spine, 10–12 (usually 11) rays; anal fin 1 spine, 9–11 (usually 10) rays; LSS 33–63; predorsal area scaly or naked 5
- 5a Predorsal midline with 0–5 scales; pectoral fins 19–23 (usually 21 or 22) rays *C. nudiceps*
- 5b Predorsal midline with 6–18 scales; pectoral fins 17–19 (usually 18 or 19) rays *C. gilchristi*

Caffrogobius agulhensis (Barnard 1927)

Agulhas goby

PLATE 12

Gobius agulhensis Barnard 1927: 71 (False Bay, St Sebastian Bay, Mossel Bay, and off East London, South Africa); SFSA No. 924*; Smith 1961*.

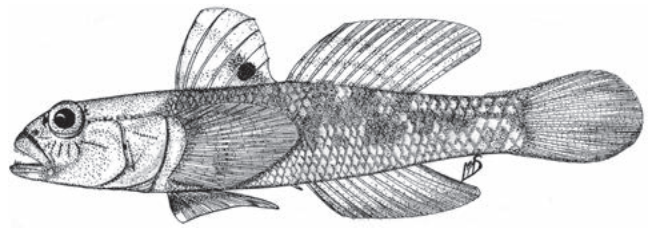
Coryphopterus agulhensis: Smith 1960, 1961.

Nematogobius agulhensis: Hoese & Winterbottom 1979.

Caffrogobius agulhensis: SSF No. 240.19*; Goren 1996*.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9–11 rays; pectoral fins 20–22 rays, upper 2 or 3 rays with free tips. LSS 36–45; TRB 11–13; predorsal area and breast naked; belly midline naked in young fish. Anterior nostrils with short flap.

Head and body yellowish, with 5 or 6 broad saddles, and 3–5 elongate dark blotches along midsides of body; both dorsal fins with 2 or 3 rows of small dark spots, and usually 1 larger black spot at rear of 1st dorsal fin; adult males with dusky to blackish branchiostegal membranes, pelvic fins and anal fin. Attains 75 mm SL.



Caffrogobius agulhensis, 75 mm SL (South Africa). Source: SFSA

DISTRIBUTION WIO: South Africa, from Eastern Cape (East London) to False Bay (Cape Point).

REMARKS Found in rocky coastal areas and off river mouths, at 15–75 m.

Caffrogobius caffer (Günther 1874)

Banded goby

PLATE 12

Gobius caffer Günther 1874: 453 (Port Elizabeth, Eastern Cape, South Africa).

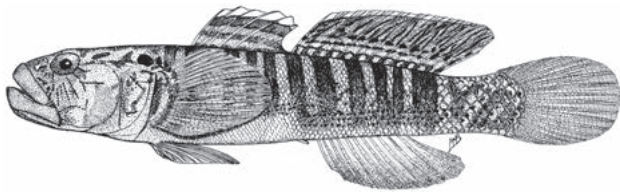
Coryphopterus dubius Smith 1959: 210, Fig. 30 (Mahé, Seychelles); Smith & Smith 1963*.

Coryphopterus caffer: Smith 1960*; Smith & Smith 1966*.

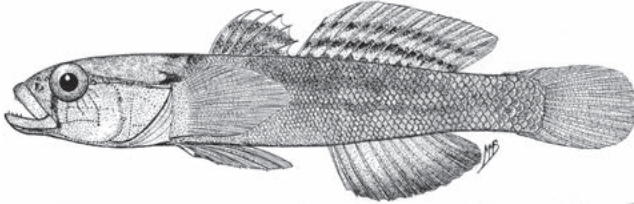
Caffrogobius caffer: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.20*; Branch *et al.* 1994; Goren 1996*; Heemstra & Heemstra 2004.

Second dorsal fin 1 spine, 12–14 rays; anal fin 1 spine, 10–12 rays; pectoral fins 19–21 rays, tips not free. LSS 53–63; TRB 17–23; predorsal midline naked, but sides may be scaly to above opercle; pectoral-fin bases and breast scaly, but breast with small naked patch. Anterior nostrils with short square flap.

Head and body yellowish to pale brown, with 8–12 vertical dark bars on body; 1st dorsal fin dark, with 2 or 3 pale stripes (including margin); large males may be almost black. Attains 123 mm SL.



Caffrogobius caffer, 120 mm TL (South Africa). Source: Smith 1960



Caffrogobius caffer, 35 mm TL, holotype of *Coryphopterus dubius* (Seychelles). Source: Smith 1959

DISTRIBUTION WIO: South Africa (Cape Point) in southeastern Atlantic, to Mozambique (Maputo Bay); possibly Seychelles (type locality for *Coryphopterus dubius* may be in error).

REMARKS Common in rocky and sandy intertidal pools and on shallow rocky reefs.

Caffrogobius gilchristi (Boulenger 1898)

Prison goby

PLATE 12

Gobius gilchristi Boulenger 1898: 3 (Brak River, Mossel Bay, Western Cape, South Africa).

Gobius nudiceps: Boulenger 1916 [in part]; Smith 1961*.

Acentrogobius multifasciatus Smith 1959: 199, Fig. 13 (Mozambique I., Mozambique).

Coryphopterus multifasciatus: Smith 1960*.

Gobius multifasciatus: Smith 1975.

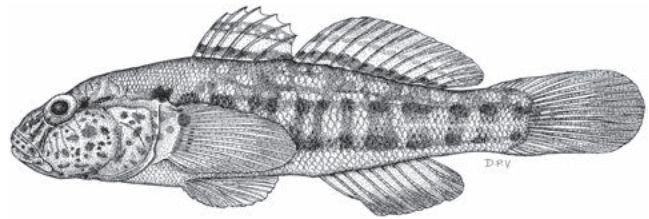
Caffrogobius multifasciatus: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.21*; Branch *et al.* 1994.

Caffrogobius nudiceps [in part]: Hoese 1986.

Caffrogobius gilchristi: Goren 1996*; Whitfield 1998*; Heemstra & Heemstra 2004*.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 17–19 (usually 18 or 19) rays, tips not free. LSS 43–52; TRB 14–17; predorsal area scaly to at least above opercle, midline may be naked or scaly; pectoral-fin bases scaly; breast partly scaly. No flap on anterior nostrils.

Head and body yellowish to pale brown, with 9–15 irregular vertical dark lines or narrow bars on body, often arranged in pairs, or bars may be broken in centre, forming 2 irregular stripes; dark blotch above rear corner of opercle; pectoral-fin bases dusky (specimens from Cape Point area may have pale bar along bases of rays). Attains 150 mm SL.



Caffrogobius gilchristi, 59 mm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: Mozambique (Olifants River) to South Africa (Durban Bay to Table Bay).

REMARKS Found mostly in estuaries and occasionally in rocky tidepools.

Caffrogobius natalensis (Günther 1874)

Baldy

PLATE 12

Gobius natalensis Günther 1874: 453 (Durban, KwaZulu-Natal, South Africa).

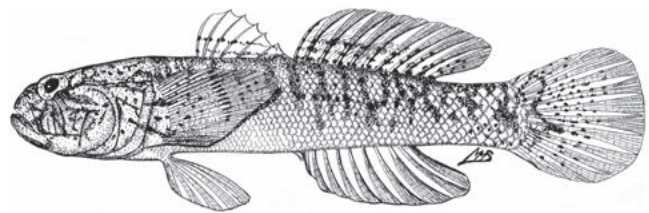
Gobius melanocephalus: SFSA No. 926.

Coryphopterus natalensis: Smith 1960*.

Caffrogobius natalensis: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.22*; Goren 1996*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8–10 rays; pectoral fins 18–20 rays, tips not free. LSS 39–48; TRB 10–15; predorsal midline usually naked, or with 1–3 scales; pre-pelvic area with triangular patch of cycloid scales; pectoral-fin bases with cycloid scales. Anterior nostrils without flap.

Body with short dark bars anteriorly, breaking up into spots and mottled patches posteriorly; blackish round blotch above pectoral-fin bases; head with dark spots. Attains 97 mm SL.



Caffrogobius natalensis, 95 mm TL (South Africa). Source: Smith 1960

DISTRIBUTION WIO: South Africa (KwaZulu-Natal to Knysna, Western Cape).

REMARKS Inhabits estuaries and coastal lagoons.

Caffrogobius nudiceps (Valenciennes 1837)

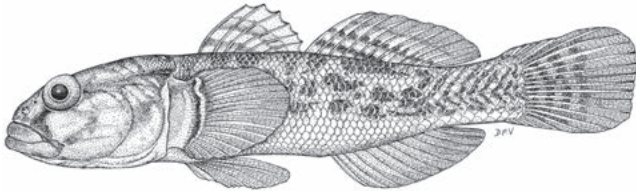
Bare-head goby

PLATE 12

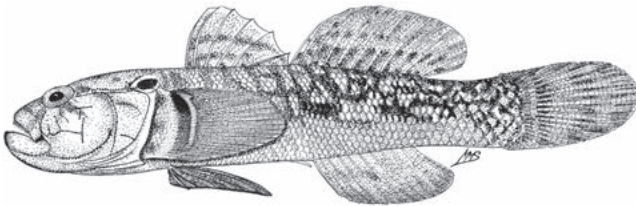
Gobius buccatus Valenciennes in Cuv. & Val. 1837: 60 [voyage of Peron].
Gobius nudiceps Valenciennes in Cuv. & Val. 1837: 65 (Cape of Good Hope, South Africa); Boulenger 1916 [in part]; SFSA No. 927*.
Gobius capensis Castelnau 1861: 55 (Cape of Good Hope, South Africa).
Coryphopterus nudiceps: Smith 1960*.
Caffrogobius nudiceps: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.23* [in part]; Branch *et al.* 1994*; Whitfield 1998*; Heemstra & Heemstra 2004.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 19–23 (usually 21 or 22) rays, tips not free. LSS 33–66 (west-coast fish have higher scale counts); TRB 20–22; predorsal scales 0–5, reaching sides to above opercle; pectoral-fin bases and rear part of pre-pelvic area with cycloid scales. Anterior nostrils normally with short flap (absent in some specimens).

Head and body brownish yellow, with indistinct narrow bars and mottling on sides, and round black spot above pectoral-fin bases; most conspicuous mark is wide yellow band across bases of pectoral-fin rays, with dark border anteriorly on fin base (markings more intense dorsally). Attains 135 mm SL.



Caffrogobius nudiceps, 68 mm SL (South Africa). Source: Whitfield 1998



Caffrogobius nudiceps, 80 mm (South Africa). Source: Smith 1960

DISTRIBUTION Southern Africa: Namibia (Walvis Bay) in southeastern Atlantic, to South Africa (East London, Eastern Cape) in WIO.

REMARKS Found in estuaries, on rocky reefs and in tidepools. Under ICZN Recommendation 24A, as first reviser, the name *Caffrogobius nudiceps* should remain because *Gobius buccatus* has not been specifically used for this species or any other since 1837.

Caffrogobius saldanha (Barnard 1927)

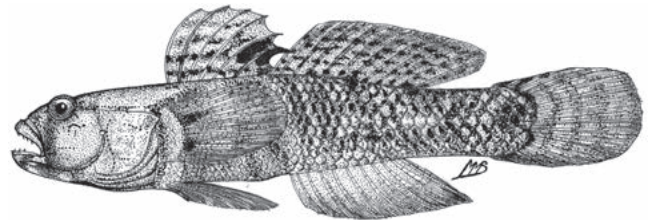
Comma-fin goby

PLATE 12

?*Gobius olivaceus* Castelnau 1861: 55 (Cape of Good Hope, South Africa) [name preoccupied].
Gobius saldanha Barnard 1927: 72 (Saldanha Bay, South Africa); Winterbottom 1976*.
Ctenogobius cloatus Smith 1960: 302, Fig. 1 (Knysna, South Africa); Smith & Smith 1966*.
Monishia saldanha: Smith 1960.
Bathygobius saldanha: SFSA No. 912*.
Ctenogobius saldanha: Talbot & Penrith 1965*.
Nematogobius saldanha: Hoese & Winterbottom 1979; Maugé 1986.
Caffrogobius saldanha: SSF No. 240.24*; Miller 1990.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 19–22 rays, tips of upper 5–7 rays free. LSS 30–38; TRB 9–12; predorsal midline naked; pectoral-fin bases with cycloid scales (may be embedded); pre-pelvic area naked in juveniles. Anterior nostrils with short to elongate flap.

Head and body pale yellowish brown, darker dorsally, with ~3 broken rows of dark brown to blackish spots in short, straight, slightly offset or slightly oblique pattern; 1st dorsal fin yellowish, with 2 or 3 rows of dark spots or 2 or 3 dark stripes, and blackish to dark grey-blue spot at rear of fin; males may have 8–12 indistinct pale grey vertical bars along midsides of body. Attains 87 mm SL.



Caffrogobius saldanha, 85 mm TL, holotype of *Ctenogobius cloatus* (South Africa). Source: Smith 1960

DISTRIBUTION South Africa, from Saldanha Bay (Western Cape) in southeastern Atlantic, to Xora River mouth (Eastern Cape) in WIO.

REMARKS Common in tidepools and estuaries, to ~7 m deep.

GENUS *Callogobius* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–10 rays; anal fin 1 spine, 6–9 rays; pectoral fins 15–20 rays; pelvic fins relatively small, and pelvic frenum variably developed (fin membranes thin and fragile) or absent. Body robust to slender

and compressed; head usually depressed, with distinctive series of raised fleshy ridges of prominent papillae (papillae may be quite long); fleshy ridges forming square rows on chin; no barbels, although some fleshy papillae on head may be quite long. Oculoscaphular canal and pores variable and may be reduced in number or absent in some species, and juveniles may lack sensory head pores which later develop as they grow. Mouth terminal, oblique to steeply oblique. Scales characteristically with central circular field with lines radiating outward; LSS 20–53. Colour pattern usually mottled and banded (although bands may be difficult to distinguish). This genus is in great need of revision. About 40 nominal species, in Indo-Pacific, at least 10 in WIO.

KEY TO SPECIES

- | | | |
|----|---|-------------------------|
| 1a | No head pores at all life stages | 2 |
| 1b | Head pores present, except absent in small juveniles (~14 mm SL) of some species | 3 |
| 2a | LSS 33–41 | <i>C. darkae</i> |
| 2b | LSS 23–26 | <i>C. winterbottomi</i> |
| 3a | Scales on sides of body ctenoid extending anteriorly up to gap between dorsal fins; LSS usually <40; body with or without dark oblique bands | 4 |
| 3b | Scales on sides of body mostly cycloid, and any ctenoid scales restricted to sides of peduncle; LSS 38–53 (usually 38–42); 2 broad dark brown oblique bands across body | <i>C. bifasciatus</i> |
| 4a | Body generally dark with rows of pale spots or dark lines along sides, but no dark bars or blotches contrasting with plain brown to mottled pattern | 5 |
| 4b | Body with dark brown bars or blotches on sides, usually contrasting with yellowish to pale brown background | 6 |
| 5a | Body yellowish brown, with 7 or 8 irregular dark lines along sides; caudal fin slender, pointed; 1st dorsal fin rounded, without elongate spines | <i>C. dori</i> |
| 5b | Body dark brown, with rows of white spots; caudal fin broad and rounded; 1st dorsal fin pointed, and spines may be elongate | <i>C. maculipinnis</i> |
| 6a | No preopercular pores; 2nd dorsal fin 1 spine, 7–10 rays; anal fin 1 spine, 7 or 8 rays | 7 |
| 6b | Preopercular pores present, may be small and close-set; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 6 or 7 rays | <i>C. plumatus</i> |

Continued...

KEY TO SPECIES

- | | | |
|----|--|-------------------------|
| 7a | Pelvic fins partly or completely joined by membrane; pelvic frenum present or absent; body colour variable, may include contrasting dark bands | 8 |
| 7b | Pelvic fins separate, only very small membrane joining bases of 5th rays; no pelvic frenum; body colour yellowish brown to dark brown, with irregular darker blotches and bars, but without contrasting dark bands | <i>C. flavobrunneus</i> |
| 8a | Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7 or 8 rays; LSS 27 or 28; oblique bands crossing body not always in contrast with background colour, and no brown lines along sides | 9 |
| 8b | Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 rays; LSS 24; body white to yellowish, with strongly contrasting brown to black oblique bars, and 8 or 9 brown lines along sides in adults | <i>C. amikami</i> |
| 9a | Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; LSS 27–32; pelvic fins partly joined by membrane; no pelvic frenum; body brownish, with 2 broad, irregular brown bands; juveniles with strongly contrasting colour pattern | <i>C. sclateri</i> |
| 9b | Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7 or 8 rays; LSS 23–25; pelvic fins joined (membrane fragile, often torn); pelvic frenum reduced; body yellowish, with ~4 irregular brownish bands, not contrasting strongly with background colour; juveniles not dissimilar from adults in colour pattern | <i>C. centrolepis</i> |

Callogobius amikami Goren, Miroz & Baranes 1991

Clown goby

PLATES 10, 11 & 12

Callogobius amikami Goren, Miroz & Baranes 1991: 300, Figs. 1–2 (Eilat, Israel, Red Sea); Debelius 1993*, 1998*; Randall 1995*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 rays; pectoral fins 18 rays; pelvic fins reach anus, and pelvic frenum well-developed. LSS 24; TRB 9; predorsal scales 8, cycloid; body scales mostly cycloid, with ctenoid scales only posteriorly from below front part of 2nd dorsal fin. Rear portion of oculoscaphular canal over opercle absent; no preopercular pores.

Head and body white, with dark brown oblique bars, extending onto unpaired fins; 8 or 9 narrow brown lines run length of body in adults; fins with dark brown bands, with orange streaks and blotches in centres of bands; 2 oblique dark bars on head, 1 bar from eye to snout tip and 1 bar from eye to lower rear edge of opercle. Juveniles with brighter colours and darker narrower oblique bars, and longitudinal lines on body not developed. Attains 28 mm SL.

DISTRIBUTION WIO: Gulf of Aqaba (Red Sea) and Gulf of Oman (off Muscat).

REMARKS Active at night, hides among coral rubble well away from coral growth; found at 4–8 m.

Callogobius bifasciatus (Smith 1958)

Doublebar goby

PLATES 11 & 12

Mucogobius bifasciatus Smith 1958: 146, Fig. 7 (Pemba I., Tanzania); Goren 1979*.

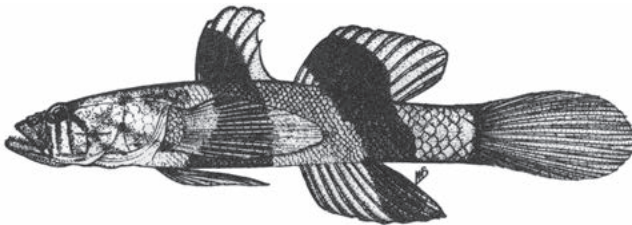
Callogobius liolepis: Smith 1958* [in part?].

Callogobius clarki (non Goren 1978): Goren 1979, 1986.

Callogobius bifasciatus: Randall *et al.* 1994 [in part]; Randall 1995*; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–18 rays; pelvic fins separate, no pelvic frenum. LSS 42–53; TRB 16; predorsal scales 17–23, small, cycloid; body scales usually all cycloid, some specimens with a few ctenoid scales on peduncle. Rear portion of oculoscapular canal over opercle absent; no preopercular pores.

Head and body yellowish to pale brown, occasionally mottled with pale and brownish spots and blotches, and with 2 broad brown bands on body: 1 band from 1st dorsal fin onto abdomen, and 1 band from anterior part of 2nd dorsal fin obliquely towards rear of anal fin (these brown bands may be mottled and their margins indistinct); narrow dark bar from rear of eyes obliquely across opercle. Attains 56 mm SL.



Callogobius bifasciatus, 30 mm TL, holotype (N Mozambique).

Source: Smith 1958

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, Tanzania to South Africa (Aliwal Shoal), and Rodrigues.

REMARKS Found in coral and rocky rubble to muddy reef habitats, at 1.5–17 m. This species has been confused with *C. clarkae*.

Callogobius centrolepis Weber 1909

Cycloid goby

PLATE 11

Callogobius centrolepis Weber 1909: 157 (Tandjong Lajar, Bawean I., Sulawesi, Indonesia); Winterbottom & Emery 1986; Randall & Anderson 1993; Randall & Goren 1993*; Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 17 rays; pelvic fins joined, and pelvic frenum present (except reduced or absent in Chagos specimens). LSS 22–25; TRB 8 or 9; predorsal scales 8–10, large, cycloid; body scales ctenoid to below rear of 1st dorsal fin; cycloid scales on head, pectoral-fin bases and breast. Rear portion of oculoscapular canal absent; no preopercular pores.

Preserved specimens yellowish, with ~4 irregular dark bars across body, head dusky with 1 oblique dark bar from eye to lower jaw and 1 bar from rear of eye across preopercle; distinct dark brown papillose ridges on head; dorsal, anal and caudal fins mostly blackish, and with rows of pale spots which may coalesce into 1 or 2 whitish bands. Attains 40 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Chagos and Maldives; elsewhere, Indonesia to Samoa.

REMARKS Poorly known; found in lagoons and on drop-offs, at 5–32 m. This may not be the correct name to apply to the Indian Ocean form.

Callogobius clarkae (Goren 1978)

Clark's goby

PLATE 11

Drombus clarki Goren 1978: 200, Fig. 6 (El Tur, Sinai coast, Gulf of Suez, Red Sea).

Callogobius clarki: Goren 1979, 1986.

Callogobius bifasciatus: Randall *et al.* 1994 [in part].

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16 rays; pelvic fins joined, thin pelvic frenum present. LSS 39–41; TRB 13–15; predorsal scales 14 or 15, small, cycloid; body scales usually all cycloid, some ctenoid scales on peduncle only. Rear portion of oculoscapular canal over opercle absent; no preopercular pores.

Head and body yellowish to pale brown, sometimes mottled with pale and brownish spots and blotches; 2 irregular brown bands on body: first from 1st dorsal fin onto abdomen, second from anterior part of 2nd dorsal fin obliquely towards rear of anal fin. Attains 80 mm SL.

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Found among shallow coral and rocky rubble and in muddy reef habitats. This species has been confused with *C. bifasciatus*.

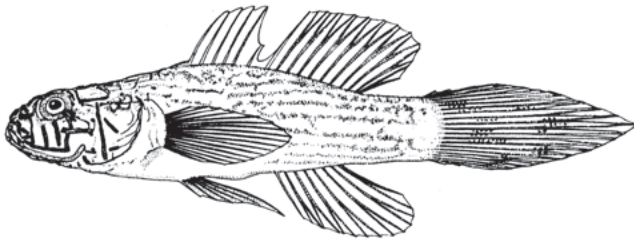
Callogobius dori Goren 1980

Dor's goby

Callogobius dori Goren 1980: 210, Figs. 1–4 (Suakin, Sudan, Red Sea); Dor 1984; Delventhal *et al.* 2016.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 7 rays; pectoral fins 18 rays; pelvic fins fused, reaching anus, and pelvic frenum well-developed. LSS 24 or 25; TRB 9 or 10; predorsal scales 9–11, cycloid; body scales ctenoid back from 2nd dorsal-fin origin. Rear portion of oculoscapular canal absent; preopercular pores 3.

Preserved specimens with yellowish brown head and body, and 7 or 8 irregular longitudinal lines on sides; fins plain. Attains 32 mm SL.



Callogobius dori, 35 mm SL, holotype (Sudan). Source: Goren 1980

DISTRIBUTION WIO: Red Sea and Seychelles.

REMARKS Probably more widespread in WIO.

Callogobius flavobrunneus (Smith 1958)

Slimy goby

PLATES 11 & 12

Mucogobius flavobrunneus Smith 1958: 145, Pl. 2c, Fig. 6 (Pinda, Mozambique); Smith & Smith 1963*; Clark 1968.

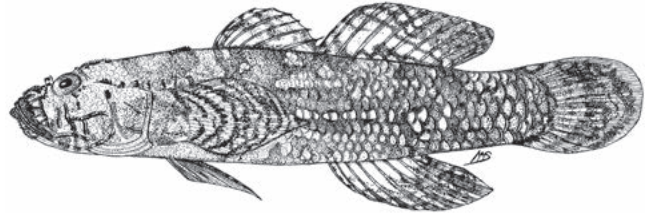
Callogobius hasseltii: Roux-Esteve & Fourmanoir 1955; Smith 1955.

Callogobius flavobrunneus: Goren 1979; Hoese & Winterbottom 1979; SSF No. 240.25*; Winterbottom & Emery 1986*; Winterbottom & Anderson 1997; Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 rays; pectoral fins 15–18 rays; pelvic fins separate, but with small amount of membrane at bases of 5th rays, and no pelvic

frenum. LSS 33–40; TRB 12–17; predorsal scales 13–17, cycloid; body scales ctenoid from below gap between 1st and 2nd dorsal fins. Rear portion of oculoscapular canal absent; no preopercular pores.

Head and body yellowish brown, with broken or irregular oblique brownish bands and blotches (usually 3 or 4 bands discernible across sides), and sometimes with whitish spots and mottling in interspaces (colour pattern variable). Attains 67 mm SL.



Callogobius flavobrunneus, 67 mm TL (N Mozambique). Source: Smith 1958

DISTRIBUTION WIO: Red Sea, Tanzania (Zanzibar), Mozambique (Bazaruto I.), Aldabra, Seychelles, Mascarenes, St Brandon Shoals, Chagos and Comoros.

REMARKS Found on sand-rubble bottom in shallow lagoons, to ~10 m deep.

Callogobius maculipinnis (Fowler 1918)

Ostrich goby

PLATES 11 & 12

Drombus maculipinnis Fowler 1918: 69, Fig. 27 (Philippines).

Drombus irrasus Smith 1959: 211, Pl. 10e, Fig. 31

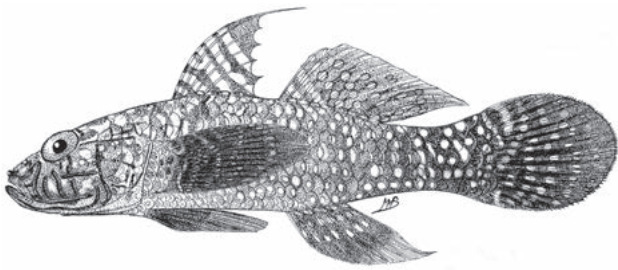
(Conant Reef, Mahé, Seychelles); Smith & Smith 1963*.

Callogobius irrasus: Goren 1979*; Hoese & Winterbottom 1979.

Callogobius maculipinnis: SSF No. 240.26*; Winterbottom & Emery 1986*; Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 16–19 rays; pelvic fins fused, and pelvic frenum well-developed. LSS 20–27; TRB 8–10; predorsal scales 6–8. First dorsal fin pointed, 1st spine longest and usually filamentous. Separate oculoscapular canal over opercle; preopercle pores 3.

Head and body dark brown, with rows of white spots (sometimes indistinct); black fleshy papillose ridges on head; 1st dorsal fin brown, with 3–5 irregular whitish lines, and other fins dark brown with white spots. Attains 75 mm SL.



Callogobius maculipinnis, 50 mm TL, holotype of *Drombus irrasus* (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Tanzania to Mozambique (Bazaruto I.), Seychelles, Mauritius and Chagos; elsewhere, Indonesia to Marshall Islands.

REMARKS Found in lagoon habitats, to ~7 m deep.

Callogobius plumatus (Smith 1959)

Feather goby

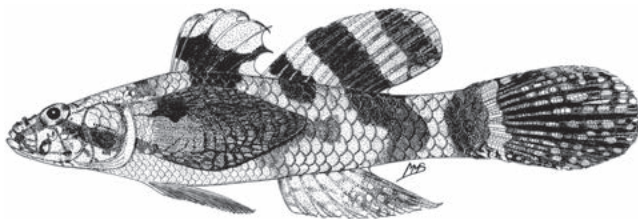
PLATES 12 & 13

Drombus plumatus Smith 1959: 212, Fig. 32 (Cape Delgado, Mozambique); Smith & Smith 1963*.

Callogobius plumatus: SSF No. 240.27*; Randall *et al.* 1994*; Randall 1995*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 18–20 rays; pelvic fins fused, and pelvic frenum low and thin. LSS 23–32; TRB 8–10; predorsal scales 6–12, cycloid. No oculoscapular canal over opercle; preopercle pores 3, closely set.

Head and body whitish, with brown to blackish oblique bars: first bar broad, running from 1st dorsal-fin base across upper sides, second bar narrower and reaching from end of 2nd dorsal fin to centre of peduncle, and sometimes an additional incomplete bar from 2nd dorsal-fin origin; dorsal fins with broad yellowish brown bands. Attains 41 mm SL.



Callogobius plumatus, 50 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Kenya to South Africa (Aliwal Shoal), Tanzania (Zanzibar), Seychelles, Réunion and Rodrigues; elsewhere to Micronesia, Kiribati and Tonga.

REMARKS Found on coral reefs, at 5–25 m.

Callogobius sclateri (Steindachner 1879)

Sclater's goby

PLATE 12

Eleotris sclateri Steindachner 1879: 157 (Society Is., French Polynesia).

Metagobius sclateri: Smith 1956.

Callogobius sclateri: Hoese 1986*; Winterbottom & Emery 1986*;

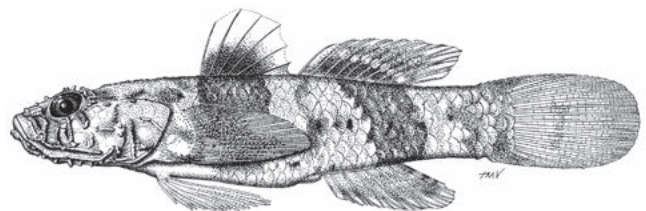
Randall & Anderson 1993; Randall & Goren 1993*; Randall & Van Egmond 1994; Winterbottom & Anderson 1997; Fricke 1999; Heemstra *et al.* 2004.

?*Callogobius* sp. 3: Winterbottom & Emery 1986; Winterbottom & Anderson 1997.

?*Callogobius* sp.: Randall & Anderson 1993; Randall & Goren 1993*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 16 or 17 rays; pelvic fins partly joined by membrane, no pelvic frenum. LSS 27–32; TRB 9; predorsal scales 12 or 13, cycloid. No oculoscapular canal over opercle; no preopercle pores.

Head and body pale greyish brown to whitish background, with irregular broad brown bands and mottling; darkest band from front half of 1st dorsal fin to abdomen, a similar slightly diagonal brown band from mid-2nd dorsal fin to rear of anal fin, and an irregular to broken brown band across caudal-fin base; head and upper part of body with additional brown mottling and bars, usually including vertical brown bar from eye across cheek; juveniles with strongly contrasting colour pattern. Attains 40 mm SL.



Callogobius sclateri, 35 mm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (Sodwana Bay), Aldabra, Seychelles, Mascarenes, Chagos and Maldives; elsewhere widespread to Society Is.

REMARKS Found in lagoon reef and rubble habitats, including shallow tidepools, to ~35 m deep. A probable new species resembling *C. sclateri* is included in this diagnosis, pending revision of the genus.

Callogobius winterbottomi Delventhal & Mooi 2013

Flap-headed goby

PLATE 13

Callogobius winterbottomi Delventhal & Mooi 2013: 158, Figs. 1–5
(Mohéli Bay, Mohéli, Comoros).

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 16 or 17 rays; pelvic fins mostly joined by membrane, and pelvic frenum present. LSS 23–26; TRB 9; predorsal scales 10 or 11, cycloid. No sensory pores on head.

Head and body pale brown, with broad vertical brown band from 1st dorsal fin to above belly, diagonal broad brown band from mid-2nd dorsal fin to rear of anal fin, and vertical narrow brown band across caudal-fin base; head and upper part of body with indistinct brownish markings, especially on fleshy raised papillae ridges. Attains at least 38 mm SL.

DISTRIBUTION WIO: South Africa (Aliwal Shoal) and Comoros.

REMARKS Known from few specimens, collected from coral-reef drop-offs and caves, at 9–28 m.

GENUS *Coryogalops* Smith 1958

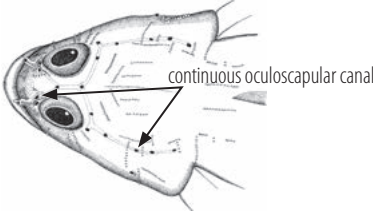
First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–12 rays; anal fin 1 spine, 8–10 rays; pectoral fins 16–23 rays, tips of upper rays free, and rays may be filamentous in some species; pelvic fins fused and forming disc with pelvic frenum present, or fins completely separate and pelvic frenum absent. Head depressed; mandibular frenum present, but reduced in some species. No cheek fold. Head pores present; oculoscapular canal usually complete, may be broken over opercle; transverse pattern of sensory papillae. LSS 26–47; TRB 8–17; predorsal midline usually naked. Gill opening restricted to pectoral-fin base; 1st gill arch partly to fully bound by membrane to inside of opercle. At least 11 species, all marine and restricted to tropical to warm-temperate waters of WIO.

KEY TO SPECIES

- 1a Pelvic fins nearly completely separate to base; pelvic-fin rays joined by thin membrane and appear feathery; no pelvic frenum *C. anomolus*
1b Pelvic fins fused, and rays not feathery in appearance; pelvic frenum present 2

Continued ...

KEY TO SPECIES

- 2a Small tentacle on upper rear margin of eyes *C. bulejiensis*
2b No tentacle on upper margin of eyes 3
- 3a Pectoral-fin bases with several rows of scales, and chest occasionally with scales *C. sordidus*
3b Pectoral-fin bases naked, and chest always naked 4
- 4a Oculoscapular canal continuous to over top of opercle, not broken above preopercle margin; head and body dark brown to blackish, with indistinct barring *C. bretti*
- 
- 4b Oculoscapular canal discontinuous, broken into long anterior portion (over preopercle) and short posterior portion (over opercle); head and body not blackish 5
- 5a No separate canal or pores over opercle; no flap or lappet on anterior nostrils *C. ocheticus*
5b Short, separate canal and 2 pores over opercle; flap or lappet may be present on anterior nostrils 6
- 6a First dorsal fin with dark brown or black blotch anteriorly near base, may be partly within a short dark brown stripe 7
6b First dorsal fin without black or dark brown blotch anteriorly ... 8
- 7a LSS 39–41; TRB 16–17; black blotch on 1st dorsal fin between spines 1–3 *C. monospilus*
7b LSS 33–35; TRB 9; dark brown blotch on 1st dorsal fin mostly between spines 2–3 *C. pseudomonospilus*
- 8a LSS 38–47; upper 5 or 6 pectoral-fin rays free from membrane *C. adamsoni*
8b LSS 30–36; upper 7–8 or 2–3 pectoral-fin rays free from membrane 9
- 9a Second dorsal fin 1 spine, 10 or 11 rays; pelvic disc rounded 10
9b Second dorsal fin 1 spine, 12 rays; pelvic disc slightly emarginate *C. guttatus*
- 10a Pectoral fins 22–24 rays, and upper 7 or 8 rays free from membrane; LSS 31–34 *C. william*
10b Pectoral fins 15–19 rays, and upper 2 or 3 rays free from membrane; LSS 30–33 *C. tessellatus*

Coryogalops adamsoni (Goren 1985)

Adamson's coryogalops

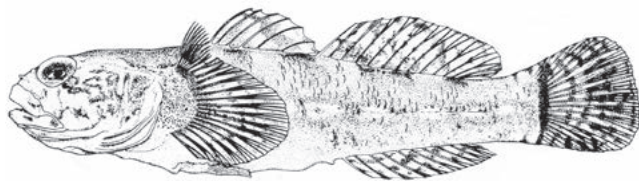
PLATE 14

Monishia adamsoni Goren 1985: 3, Figs. 1a, 2, 4a (cove west of Sindh, Pakistan, Arabian Sea).

Coryogalops adamsoni: Randall *et al.* 1994; Randall 1995*; Rahimian & Pehpuri 2006.

Second dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 19–22 rays, upper 5 or 6 rays free from membrane; pelvic fins fused, and pelvic frenum present. LSS 38–47; TRB 10 or 11; head, predorsal area, chest, belly and pectoral-fin bases naked. Jaws reach to below mideye. First gill arch partly bound ($\sim\frac{1}{3}$) by membrane to opercle.

Body and head fawn to whitish, and mottled with 5 irregular dark brown bars across back, which split and interconnect on midsides of body; 1st dorsal fin with broad oblique dark brown stripe and white fin margin; dark brown bar across caudal-fin base, which may join 2 brown spots on upper and lower edges of fin. Attains 47 mm SL.



Coryogalops adamsoni, 35 mm SL, holotype (Pakistan). Source: Goren 1985

DISTRIBUTION WIO: Persian/Arabian Gulf and Pakistan.

REMARKS Found in rocky and rubbly tidepools and shallow sandy to silty coastal areas, to ~ 3 m deep.

Coryogalops anomolus Smith 1958

Feathery-fin coryogalops

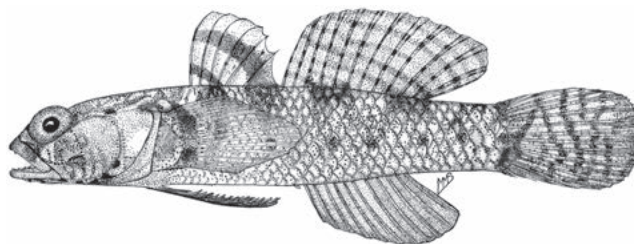
PLATES 13 & 14

Coryogalops anomolus Smith 1958: 144, Fig. 5 (Zanzibar, Tanzania); Dor 1984; Randall 1995*; Heemstra *et al.* 2004.

Coryogalops sufensis Goren 1979: 92, Figs. 1–2 (Ras Gara, Gulf of Suez, Sinai, Egypt, Red Sea); Dor 1984; Goren & Spanier 1985; Goren & Dor 1994; Randall *et al.* 1994*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15–19 rays, and upper 2 or 3 rays free from membrane; pelvic fins separate at base, rays appear feathery, no pelvic frenum. LSS 28–34; TRB 9–11; head, predorsal area, chest and pectoral-fin bases naked. First gill arch mostly bound by membrane to opercle.

Body whitish to yellowish white, with fine brown and blackish bars and speckles: series of narrow brown bars across nape and upper body, and ~ 7 small brown spots on sides of body; head may have dark brown blotches and mottling; several dark spots along branchiostegal membrane; 1st dorsal fin translucent yellowish, with 2 brown-bordered whitish stripes; 2nd dorsal fin and caudal fin translucent yellowish, with fine bands of brown and white. Attains 40 mm SL.



Coryogalops anomolus, 33 mm TL, holotype (Tanzania). Source: Smith 1958

DISTRIBUTION WIO: Persian/Arabian Gulf, Oman, Red Sea, East Africa to South Africa (St Lucia), Tanzania (Zanzibar) and Madagascar.

REMARKS Occurs over silty sand, rubble or seagrass beds, at 1–16 m.

Coryogalops bretti Goren 1991

Dark coryogalops

PLATE 13

Coryogalops bretti Goren 1991: 3, Figs. 1–5 (Kwelera Estuary, Eastern Cape, South Africa).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 10 rays; pectoral fins 18 or 19 rays, upper 4 rays free from membrane; pelvic fins fused, and pelvic frenum low. LSS 32 or 33; TRB 15; head, predorsal area, chest and pectoral-fin bases naked; belly scales cycloid. First gill arch marginally ($\sim\frac{1}{10}$) bound by membrane to opercle.

Head and body dark brownish, with some indistinct dark barring; ocellate black blotch across bases of upper pectoral-fin rays; 1st dorsal fin with narrow red margin, fin dusky ventrally; 2nd dorsal fin with 2 or 3 rows of small reddish spots; anal fin plain blackish; caudal fin pale yellowish. Attains 39 mm SL.



Coryogalops bretti, 39 mm SL (South Africa). Source: Goren 1991

DISTRIBUTION Known only from two type specimens collected from South Africa. Possibly Mauritius but the record is not yet verified.

REMARKS Taken from brackish water.

Coryogalops bulejiensis (Hoda 1983)

Tentacled coryogalops

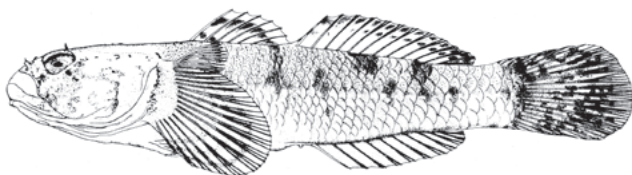
PLATE 14

Monishia bulejiensis Hoda 1983: 111, Fig. 1 (off Karachi, Pakistan, Arabian Sea); Goren 1985*.

Coryogalops bulejiensis: Goren 1991; Randall 1995*.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 9 rays; pectoral fins 20–22 rays, upper 4–6 rays free from membrane; pelvic fins fused, and pelvic frenum present. LSS 31–38; TRB 9–12; head, predorsal area, chest and pectoral-fin bases naked; belly scales cycloid, but belly midline naked. Small fleshy tentacle on upper rear edge of eye. First gill arch partly (~½) bound by membrane to opercle.

Head yellowish brown, with white and brown spotting and mottling; upper half of body greyish to pale brownish, with ~5 greyish brown saddles across back; white stripe with row of ~8 dark spots or short thin bars along midsides of body; basal quarter of pectoral fins with 2 vertically aligned dark spots; dark vertical bar at caudal-fin base. Attains 32 mm SL.



Coryogalops bulejiensis, 32 mm SL (Pakistan). Source: Goren 1985

DISTRIBUTION WIO: Oman and Pakistan.

REMARKS Found in shallow tidepools, in rocky rubble habitat, to ~2.5 m deep.

Coryogalops guttatus Kovačić & Bogorodsky 2014

Orange-spotted coryogalops

PLATE 13

Coryogalops guttatus Kovačić & Bogorodsky in Kovačić, Bogorodsky & Mal 2014: 518, Figs. 1–2 (Farasan I., Farasan Archipelago, Saudi Arabia, Red Sea).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 17 rays, upper 3 free from membrane;

pelvic fins fused, slightly emarginate, with low pelvic frenum. No tentacle on upper rear edge of eyes. LSS 33–35; TRB 9 or 10; head, predorsal area and pectoral-fin bases naked; breast with cycloid scales posteriorly; belly scales cycloid; body scales ctenoid.

Head and body pale brownish, with indistinct narrow bars and blotches along sides, and most scales on sides with small dark orange spot; head with indistinct small brown spots and mottling; 2 dark brown spots on lower part of opercle near preopercle margin; lower part of pectoral fins with 2 vertically aligned dark oval spots; small dark brown spot at centre of caudal-fin base. Attains 25 mm SL.

DISTRIBUTION Known only from the type specimens collected from the Red Sea.

REMARKS Taken from coral patch in a lagoon, at 1–1.5 m.

Coryogalops monospilus Randall 1994

Single-spot coryogalops

PLATE 14

Coryogalops monospilus Randall 1994: 326, Fig. 1, Pl. 10 (Fahaheel, Kuwait, Persian/Arabian Gulf); Randall 1995*.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 18–21, upper 3–4 rays free from membrane; pelvic fins fused, and pelvic frenum present. LSS 39–41; TRB 16–17; predorsal area partly scaly; head, chest, and pectoral-fin bases naked; belly scales cycloid. First gill arch slightly bound by membrane to opercle.

Head and body red-brown, body spotted and irregularly banded, and white ventrally; oblique whitish bar from rear of eyes to rear of jaws; distinct black spot on anterior part of 1st dorsal fin; blackish triangular spot at caudal-fin base. Attains 41 mm SL.



Coryogalops monospilus, 41 mm SL (Kuwait). © JE Randall, Bishop Museum

DISTRIBUTION Known only from two specimens collected from the Persian/Arabian Gulf.

REMARKS Taken from sandy-bottomed rocky tidepool, a few centimetres deep.

Coryogalops ocheticus (Norman 1927)

Canal coryogalops

PLATE 13

Gobius ocheticus Norman 1927: 381, Figs. 92–93 (Suez Canal); Chabanaud 1932.

Pomatoschistus (Ninnia) ocheticus: De Buen 1930.

Coryphopterus ocheticus: Smith 1959*; Dor 1984.

Monishia ochetica: Miller 1988*.

Cabillus anchialinae Klausewitz 1975: 204, Figs. 2–4 (Ras Muhammad, Sinai, Egypt, Red Sea).

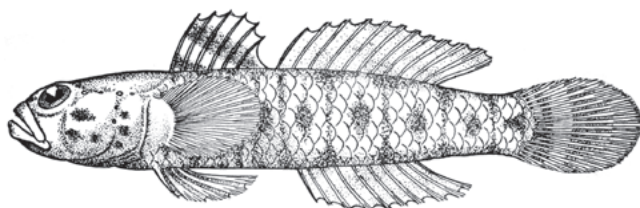
Monishia anchialinae: Goren 1979*; Dor 1984.

Coryogalops ochetica: Goren 1991.

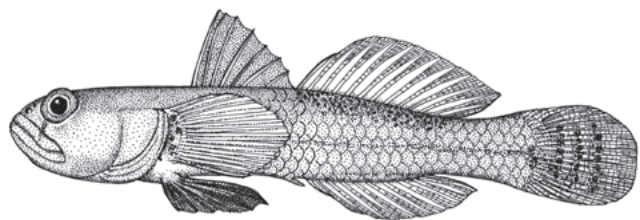
Coryogalops ocheticus: Goren & Dor 1994.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–18 rays, upper 2 rays partly free from membrane; pelvic fins fused, and pelvic frenum present. LSS 23–31; TRB 8–10; predorsal area, head, chest and pectoral-fin bases naked. First gill arch mostly bound by membrane to opercle.

Preserved specimens yellowish to brownish, with darker reticulation, mottling and series of dark saddles across back; 5 or 6 small dark blotches on sides; 2 dark oblique dark bands cross 1st dorsal fin; 2nd dorsal fin and other fins relatively plain. Attains 54 mm SL.



Coryogalops ocheticus, holotype (Suez Canal). Source: Norman 1927



Coryogalops ocheticus, 33 mm SL, holotype of *Cabillus anchialinae* (Red Sea). Drawn from photograph and radiograph in Klausewitz 1975

DISTRIBUTION WIO: Red Sea and established in Suez Canal.

REMARKS Occurs in a range of shallow habitats, such as coastal lagoons and bays with sand, algae and *Halophila* seagrass, on coral reefs and over coral and stony rubble, to ~5 m deep.

Coryogalops pseudomonospilus

Kovačić & Bogorodsky 2014

PLATE 15

Brown-spot coryogalops

Coryogalops pseudomonospilus Kovačić & Bogorodsky in Kovačić, Bogorodsky & Mal 2014: 522, Figs. 3–4 (Al Khuraybah, Saudi Arabia, Red Sea).

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 16 or 17 rays, upper 2 free from membrane; pelvic fins fused, with well-developed pelvic frenum. No tentacle on upper rear edge of eyes. LSS 33–35; TRB 9; head, predorsal area, chest and pectoral-fin bases naked; belly scales cycloid, but ventral midline naked.

Alive, body yellowish, with dark brown blotches joined by 6–8 indistinct dark bars and ~6 blackish spots along mid-sides; head mostly dark brown, with pale band from lower margin of eye to rear of mouth; 1st dorsal fin with squarish dark brown blotch, suffused with black, crossing near bases of 2nd and 3rd membranes and partly joined to first spine; caudal-fin base with dark central blotch extending in broad V onto fin rays. Attains 21.5 mm SL.

DISTRIBUTION Known only from type specimens collected from the Red Sea.

REMARKS Taken from coral patch in a lagoon, at 7–8 m.

Coryogalops sordidus (Smith 1959)

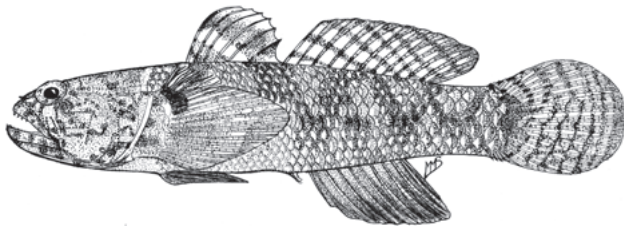
Epaulette coryogalops

Monishia sordida Smith 1959: 206, Fig. 25 (Inhaca I., Mozambique); Smith 1960*; Hoese & Winterbottom 1979; Goren 1985*; SSF No. 240.60*.

Coryogalops sordida: Goren 1991.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 9 rays; pectoral fins 21–23 rays, upper 5 rays partly free from membrane; pelvic fins fused, and pelvic frenum present. LSS 32–36; TRB 10–13; predorsal area, head and usually chest naked; pectoral-fin bases and belly scales cycloid. First gill arch with small amount of membrane anteriorly, partly binding arch to opercle. Small mental frenum present.

Head and body brownish, with darker irregular mottling and oblique bars across back; upper pectoral-fin bases with blackish blotch; 2nd dorsal fin and caudal fin banded with thin dark lines. Attains 52 mm SL.



Coryogalops sordidus, 45 mm TL, holotype (S Mozambique).
Source: Smith 1959

DISTRIBUTION WIO: Kenya (Malindi) to Mozambique (Inhaca I.).

REMARKS Found in shallow coastal waters.

Coryogalops tessellatus Randall 1994

Tessellate coryogalops

PLATE 14

Coryogalops tessellatus Randall 1994: 328, Fig. 2, Pls. 10–11
(Ras Hayan, Bahrain, Persian/Arabian Gulf); Randall 1995*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15–19 rays, upper 2 or 3 rays free from membrane; pelvic fins fused, and pelvic frenum present. LSS 30–33; TRB 11; head, predorsal area, chest and pectoral-fin bases naked; belly scales cycloid. Very little membrane binding 1st gill arch to opercle. Anterior nostrils with thin tentacle. Low mental frenum present.

Head and upper half of body brownish grey, with fawn dorsal saddles and fawn and blackish mottling, and midsides with row of elongate blackish spots; lower half of body whitish, with scale margins outlined in black; row of round black spots along rear edge of opercle to underside of head. Attains 35 mm SL.



Coryogalops tessellatus, 33 mm SL (Bahrain). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf to Oman.

REMARKS Occurs on sand, rubble and seagrass, in shallow protected habitats, to ~6 m deep.

Coryogalops william (Smith 1948)

Bare-belly coryogalops

PLATE 14

Bathygobius william Smith 1948: 340, Fig. 2 (Xora River mouth, Eastern Cape, South Africa); SFSA No. 911*; Smith 1961*.

Monishia william: Smith 1959*; Winterbottom 1976*; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.61*.

Coryogalops william: Goren 1991.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9 rays; pectoral fins 22–24 rays, upper 7 or 8 rays partly free from membrane; pelvic fins fused, and pelvic frenum present. LSS 31–34; TRB 11–14; predorsal area, head, chest and pectoral-fin bases naked; belly partly scaly (midline may be naked). Small tentacle on anterior nostrils. Distinct mental frenum present. First gill arch partly bound by membrane to opercle.

Body brownish, with 4–6 irregular dark bars across back, and irregular dark blotches along sides; 2 oblique dark bands on 1st dorsal fin; dark brown, deep V-shaped to lunate mark at caudal-fin base. Attains 44 mm SL.



Coryogalops william, 60 mm TL, holotype (South Africa). Source: Smith 1948

DISTRIBUTION WIO: Mozambique (Inhaca I.) to South Africa (Eastern Cape).

REMARKS Occurs in shallow rocky or rubble habitats, in fresh, brackish or marine water.

GENUS *Croilia* Smith 1955

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 12 rays; pectoral fins 13–15 rays; pelvic fins united, and thin pelvic frenum present. Dorsal fins often partly connected basally; first elements of 2nd dorsal fin and anal fin segmented (no spines). Head and body compressed. Head pores present, but no anterior interorbital pore; papillae on head in longitudinal pattern. No scales. One species, which greatly resembles *Parkraemeria* from the Pacific, and a review of these genera is needed.

Croilia mossambica Smith 1955

Naked burrowing goby

PLATE 15

Croilia mossambica Smith 1955: 108, Fig. 1 (Polela Lake, near Inharrime, Mozambique); SFSA No. 904a*; Smith 1961*; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.29*; Skelton 1993*; Stiassny & Raminosoa 1994; Whitfield 1998*.

Diagnosis as for genus.

Body translucent in life, with brownish spots and short vertical lines on sides, and dark bar from eyes to rear end of jaws; males with oblique reddish bars on caudal fin, and females with horizontal blotch on lower edge of caudal fin. Attains 60 mm SL.



Croilia mossambica, 45 mm SL, holotype (South Africa). Source: SSF

DISTRIBUTION WIO: South Africa (Izotsha Bridge, KwaZulu-Natal), southern Mozambique (Sandlundlu) and Madagascar.

REMARKS Rare, but can be locally abundant. Known only from coastal lakes and estuaries; inhabits burrows in clean, fine sandy shallows. Often lives in association with the sandprawn *Callianassa kraussi*, feeding on worms and other tiny, slow-moving benthic organisms.

GENUS *Cryptocentroides* Popta 1922

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11–13 rays; anal fin 1 spine, 10–13 rays; pectoral fins 14–17 rays. Body elongate. Sensory papillae in longitudinal pattern; low fleshy ridge on predorsal midline (practically absent in WIO species), but ridge not extending forward to eyes. Gill opening to pectoral-fin base or to below opercle. LSS 67–90; body scales all cycloid, or some ctenoid scales present only posteriorly on body; predorsal area and sides of head naked. Probably 4 species in Indo-Pacific, 1 in WIO.

Cryptocentroides arabicus (Gmelin 1789)

Arabian crested goby

PLATE 15

Gobius anguillaris (*non* Linnaeus 1758): Forsskål 1775 [misidentification]. *Gobius arabicus* Gmelin (ex Forsskål) 1789: 1198 (Jeddah, Saudi Arabia, Red Sea).

Gobius bimaculatus Valenciennes (ex Ehrenberg) in Cuv. & Val. 1837: 108 (Massawa, Eritrea, Red Sea).

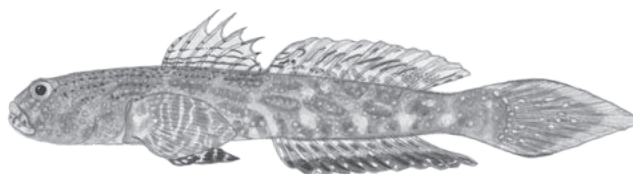
Flabelligobius arabicus: Smith 1959*.

Amblycentrus arabicus: Goren 1979*.

Cryptocentroides arabicus: Randall *et al.* 1994*; Randall 1995*; Rahimian & Pehpuri 2006; Ghanbarifardi & Malek 2009.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 15–17 rays. LSS 71–90; TRB 24–29; all body scales cycloid.

Head and body greenish grey; body with series of irregular oblique brown bars and saddles, interspersed with small round bluish white spots, and anterodorsal part of head and body peppered with small red-brown and black dots. Attains 76 mm SL.



Cryptocentroides arabicus (Oman).

DISTRIBUTION WIO: Red Sea to Persian/Arabian Gulf and Iran.

REMARKS Found over soft substrate in marine habitats, at <1 m.

GENUS *Cryptocentrus* Valenciennes 1837

First dorsal fin 6 spines, and fin origin behind pelvic-fin insertions; 2nd dorsal fin 1 spine, 9–12 rays; anal fin 1 spine, 8–11 rays; pectoral fins 16–19 rays. Body scales typically cycloid, but if scales ctenoid then 2nd dorsal fin and anal fin each with 1 spine, 9 or 10 rays; predorsal area scaly or naked; LSS 47–102. Mouth large, jaws reaching to or beyond eyes. Chin with 2 parallel rows of papillae: lower horizontal row extends backwards from vertical row. Gill opening narrow, extends to below rear edge of preopercle, or well before it. Occur throughout Indo-Pacific, and commensal with burrowing alpheid shrimps. About 40 species, greatly in need of revision; 9 species in WIO.

KEY TO SPECIES

- 1a All body scales cycloid, except juveniles may have ctenoid scales on peduncle only 3
- 1b Rear half of body with ctenoid scales, and cycloid scales anteriorly only 2
- 2a Nape, breast and pectoral-fin bases scaly; body scales almost entirely ctenoid; sides of body with ocellated spots *C. strigiliceps*
- 2b Midline of nape and breast and pectoral-fin bases naked; body scales ctenoid posteriorly, and scales under 1st dorsal fin cycloid; midsides of body with rounded spots in indistinct bars *C. caeruleomaculatus*
- 3a Anal-fin position displaced backward, its origin below 5th element of 2nd dorsal fin; pelvic fins short, reaching halfway down belly; body elongate *C. malindiensis*
- 3b Anal fin in normal position, its origin below 3rd element of 2nd dorsal fin; pelvic fins long, reaching to near or beyond anus; body not elongate 4
- 4a Small anteriorly oriented spine on lower edge of opercle; body with 8 or 9 purplish brown vertical bands; head with small pale blue and blackish spots *C. cryptocentrus*
- 4b No small anteriorly oriented spine on lower edge of opercle; colour pattern not as above 5
- 5a Body with 7–9 oblique brown bands and narrow pale interspaces; blue-edged black spot below each dorsal fin, and head with distinct blue-edged red or pink spots *C. caeruleopunctatus*
- 5b If oblique brown bands present on body, other colour markings not as above 6
- 6a Gill opening wide, reaching forward to well in front of rear edge of preopercle; predorsal midline naked 7
- 6b Gill opening moderate, reaching only to below rear edge of preopercle; predorsal midline scaly 8
- 7a Body brownish, with 5 diffuse brown bands; 1st dorsal fin with 1 or 2 black spots anteriorly; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays *C. filifer*
- 7b Body pale with blue spots and no brown bands; 1st dorsal fin with blue oval ocellus at base; 2nd dorsal fin and anal fin each with 1 spine, 11 rays *C. pretorius*
- 8a Predorsal area scaly to behind eyes; breast and pectoral-fin bases scaly; 8 or 9 brown vertical bands on body, and oblique dark band across opercle; upper part of head and body with moderate-sized blue spots *C. lutheri*
- 8b Predorsal area scaly to over preopercle; breast scaly, but pectoral-fin bases naked; 4 or 5 broad dark bands over pale body, and head and upper part of body covered with fine blue spots *C. fasciatus*

Cryptocentrus caeruleomaculatus (Herre 1933)

Blue-spotted shrimpgoby

PLATES 14 & 15

Mars caeruleomaculatus Herre 1933: 22 (tidal flats at Jolo, Sulu Is., Philippines).*Cryptocentrus culionensis*: Polunin & Lubbock 1977.*Cryptocentrus caeruleomaculatus*: Allen & Steene 1987*.*Cryptocentrus strigiliceps*: Eichler & Lieske 1994*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16 or 17 rays. LSS 59; TRB 18–24; predorsal scales cycloid, but midline naked; breast and pectoral-fin bases usually naked; ctenoid scales reach forward to just below rear of 1st dorsal fin. Gill opening to just behind rear edge of preopercle.

Head and body pale greyish to yellowish, with ~9 broad diffuse greyish brown bands, most bands on body with rounded blackish midlateral spot; small blue round spots scattered over head and body; blue spots on head clustered around pinkish to reddish oblique streaks and blotches; anal fin with 4–7 black and white vertical to oblique streaks. Attains 60 mm SL.

*Cryptocentrus caeruleomaculatus*, 60 mm SL (Sri Lanka).

© JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique and Seychelles; elsewhere to Andaman Sea, Indonesia, Philippines, Micronesia, Solomon Is. and northern Australia.

REMARKS Associated with an alpheid shrimp; inhabits burrows in silty reef or mangrove habitats, to ~3 m deep. The Indian Ocean form may differ from the Philippines form, but this needs confirmation.

Cryptocentrus caeruleopunctatus

(Rüppell 1830)

Blue-and-red spotted shrimpgoby

PLATE 14

Gobius caeruleopunctatus Rüppell 1830: 134 (Massawa, Eritrea, Red Sea).

Gobius pavoninus Valenciennes (ex Ehrenberg) in Cuv. & Val. 1837: 112 (Massawa, Eritrea, Red Sea).

Gobius coeruleopunctatus: Klunzinger 1871.

Smilogobius singaporensis: Roux-Esteve 1956.

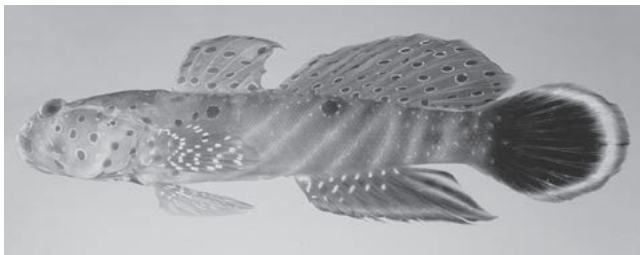
Cryptocentrus caeruleopunctatus: Smith 1959*; Klausewitz 1960*;

Goren 1979*; Randall 1983*; Debelius 1993*, 1998*;

Eichler & Lieske 1994*; Field & Field 1998*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16 or 17 rays. LSS 75–94; TRB 27–35; predorsal scales 0–6, mostly embedded; breast and pectoral-fin bases naked; body scales cycloid. Gill opening to just below rear edge of preopercle.

Head and body pale fawn to greyish, paler anteriorly, with 7–9 oblique brown bands, much wider than interspaces, and bands may become less oblique posteriorly; head with blue-margined pink to reddish spots and blotches; both dorsal fins covered with blue-ocellated red spots; 1 blue-edged black spot on upper body below each dorsal fin; caudal fin dark brown to blackish, with submarginal yellow band and red margin. Attains 97 mm SL.



Cryptocentrus caeruleopunctatus, 90 mm SL (Gulf of Aqaba).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Red Sea and Kenya.

REMARKS Commensal with an alpheid shrimp, often *Alpheus ochrostriatus*, on sand and coral rubble bottoms, at 5–23 m.

Cryptocentrus cryptocentrus (Valenciennes 1837)

Eightbanded shrimpgoby

PLATE 14

Gobius cryptocentrus Valenciennes in Cuv. & Val. 1837: 111, Pl. 346 (Massawa, Eritrea, Red Sea); Klunzinger 1871.

Cryptocentrus meleagris Ehrenberg in Valenciennes 1837: 111 (Massawa, Eritrea, Red Sea).

Cryptocentrus octofasciatus Regan 1908: 241, Pl. 29, Fig. 2 (Diego Garcia Atoll, Chagos Archipelago).

Cryptocentrus octofasciatus: SFSA No. 914*; Smith 1959, 1961*.

Cryptocentroides cryptocentrus: Smith 1959*.

Cryptocentrus cryptocentrus: Klausewitz 1960*; Smith & Smith 1963*;

Hoese & Winterbottom 1979; Randall 1983*; SSF No. 240.30*;

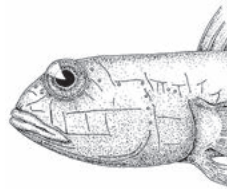
Winterbottom & Emery 1986*; Allen & Steene 1987*; Debelius 1993*;

Winterbottom & Anderson 1997.

Cryptocentrus lutheri: Debelius 1999*.

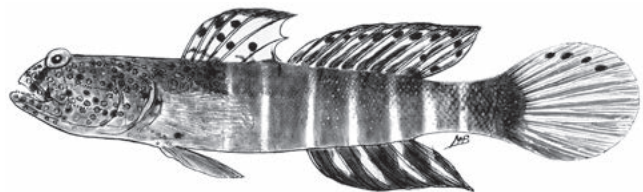
Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–18 rays. LSS 70–95; TRB 26–35; predorsal scales 0–18, reaching forward to above rear edge of preopercle (specimens from African coast), or nape midline naked (specimens from islands); breast naked or with small patch of scales before pelvic fins; pectoral-fin bases with scattered scales. Small anteriorly oriented spine on lower edge of opercle. Gill opening to below rear of preopercle.

Head and body greyish white, darker on back and nape; body with 7–10 broad purplish brown vertical bands, with narrow whitish interspaces; head and back with small round blue spots, and sides of head with scattered round dark reddish to black spots; 1st dorsal fin pale, scattered with small black spots; anal fin purplish brown, with ~5 vertical to oblique whitish streaks. Attains 100 mm SL.



Cryptocentrus cryptocentrus, head showing papillae and pores (Seychelles).

Source: Polunin & Lubbock 1977



Cryptocentrus cryptocentrus, 100 mm TL (Seychelles). Source: Smith 1959

DISTRIBUTION WIO: Red Sea, Tanzania to South Africa (KwaZulu-Natal), Aldabra, Seychelles, Mauritius and Chagos.

REMARKS Associated with alpheid shrimps, mostly in lagoon habitats, at 2–28 m.

Cryptocentrus fasciatus (Playfair 1867)

Black shrimpgoby

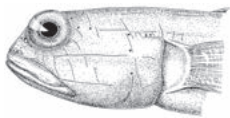
PLATE 14

Gobiosoma fasciatum Playfair in Playfair & Günther 1867: 72
(Zanzibar, Tanzania).

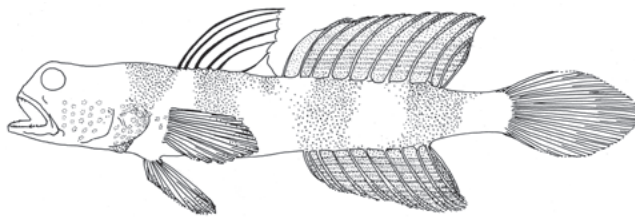
Cryptocentrus fasciatus: Klunzinger 1871; Smith 1959*; Randall & Goren 1993*; Eichler & Lieske 1994*; Randall *et al.* 1994*; Randall 1995*; Anderson *et al.* 1998*; Kuitert 1998*; Debelius 1999*; Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 17 or 18 rays. LSS 77–92; TRB 27–31; predorsal scales 25–30, reaching forward to over preopercle; breast scaly; pectoral-fin bases naked. Gill opening to rear edge of preopercle.

Head and body whitish to pearly grey, with 4 or 5 variably developed broad brown bands, often bifurcate dorsally; head and upper part of body with many fine bright blue spots or short oblique streaks; anal fin blackish, with 3–5 bright blue horizontal stripes. In less common yellow colour phase, body bars faint, but fine blue spots on body and black and blue stripes on anal fin remain distinct. Attains 95 mm SL.



Cryptocentrus fasciatus, head showing papillae and pores (Seychelles).
Source: Polunin & Lubbock 1977



Cryptocentrus fasciatus, ~126 mm TL, holotype (Tanzania).
Source: Smith 1959, drawn from stuffed half-skin by E Trewavas

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Red Sea to Mozambique, Tanzania (Zanzibar), Seychelles, Réunion, Rodrigues and Maldives; elsewhere to Indonesia, New Guinea, Australia and New Caledonia.

REMARKS Found in association with alpheid shrimps, often *Alpheus bellulus*, on sandy reef slopes, at 5–30 m.

Cryptocentrus filifer (Valenciennes 1837)

Threadfin goby

PLATE 14

Gobius filifer Valenciennes in Cuv. & Val. 1837: 106 ('Indian seas');
Bleeker 1875.

Cryptocentrus filifer: Smith 1959*; Kuronuma & Abe 1986*; Randall 1995*.
Myersina filifer: Winterbottom 2002; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 18 rays. LSS 79–100; TRB 30; predorsal midline naked; all scales cycloid. First dorsal fin tall, spines 2–4 longest and filamentous.

Head and body pale brownish, with 5 broad diffuse brown bands, narrower than interspaces, which may have 1 or 2 indistinct narrow brown bars; sides of head with many small white to bluish white spots; 1 or 2 elongate black spots near front of 1st dorsal-fin base. Attains 130 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Pakistan, Mauritius and Réunion; elsewhere to Indonesia, Philippines and southern Japan.

REMARKS Found on sandy to silty-sand substrates, to ~23 m deep.

Cryptocentrus lutheri Klausewitz 1960

Luther's shrimpgoby

PLATE 14

Cryptocentrus lutheri Klausewitz 1960: 154, Pl. 21, Fig. 6 (Sarad-Sarso I., Farasan Is., Saudi Arabia, Red Sea); Goren 1979*; Randall 1983*, 1995*; Allen & Steene 1987*; Debelius 1998*; Field & Field 1998*.
Amblyeleotris lutheri: Eichler & Lieske 1994*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 17–19 rays. LSS 98–102; TRB 29; predorsal scales ~23, reaching to behind eyes; breast and pectoral-fin bases scaly. Gill opening to below rear edge of preopercle.

Head and body pale brownish to yellowish grey, with 8 or 9 brown vertical bars along sides, and interspaces on anterior part of body often yellow; bright blue spots scattered over dorsum; oblique brown band may cross from nape over opercle; moderate-sized round dark-edged blue spots on head; chin dark; dorsal-fin spines and rays pink, with red to dark pink spot below tip of each 2nd dorsal-fin ray. Attains 95 mm SL.



Cryptocentrus lutheri, 63 mm SL (Bahrain). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Oman, Red Sea, Kenya, Tanzania and Mauritius.

REMARKS Commensal with alpheid shrimps, such as *Alpheus bellulus*, at 4–28 m.

Cryptocentrus malindiensis (Smith 1959)

Chocolate shrimpgoby

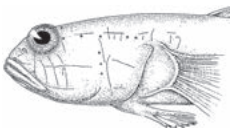
PLATE 15

Iotogobius malindiensis Smith 1959: 195, Fig. 6 (Malindi, Kenya).

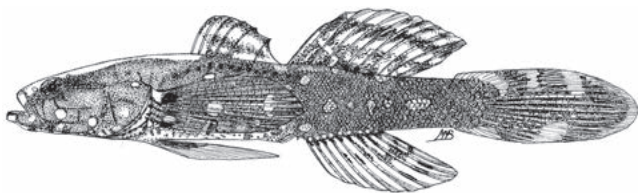
Cryptocentrus malindiensis: Polunin & Lubbock 1977.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16 rays. LSS 79; TRB 22; nape midline scaly (except may be naked in juveniles). Gill opening reaches forward to rear edge of preopercle. Diagnostic displaced position of anal fin, its origin below 5th element of 2nd dorsal fin. Body elongate; 1st dorsal fin very low, with rounded to blunt margin.

Head and body deep velvety brown, with tiny scattered white spots on sides of body and pectoral fins; broad creamy white stripe from chin over top of head to between dorsal fins; pectoral fins translucent with white spots, and all other fins deep brown with white spots. Attains 48 mm SL.



Cryptocentrus malindiensis, head showing papillae and pores (Aldabra).
Source: Polunin & Lubbock 1977



Cryptocentrus malindiensis, 26 mm TL, holotype (Kenya). Source: Smith 1959

DISTRIBUTION WIO: Kenya to South Africa (Sodwana Bay: photographs only), Aldabra, Seychelles, Réunion and Mauritius.

REMARKS Associated with alpheid shrimps, among rock and corals on fine sand, to ~2 m deep.

Cryptocentrus pretoriusi Smith 1958

Pondoland sailfin goby

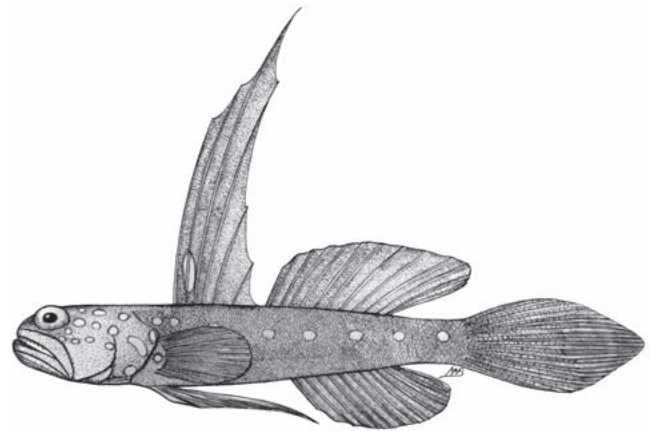
Cryptocentrus pretoriusi Smith 1958: 127, Fig. 2 (Pondoland, Eastern Cape, South Africa); SFSA No. 914a*; Smith 1960*, 1961*; SSF No. 240.31*.

?*Cryptocentrus* sp.: Hoda 1980*.

Myersina pretoriusi: Winterbottom 2002.

Second dorsal fin and anal fin each with 1 spine, 11 rays; pectoral fins 16 or 17 rays. LSS 85–96; TRB 30; head and midline of nape naked. Gill opening wide, reaching well in front of preopercle margin; membranes joined to isthmus, but not forming free fold.

Preserved specimen with irregular large blue spots on head and anteriormost part of body, and cheek and opercle with fine black speckles; pale oval spot or ocellus anteriorly on 1st dorsal-fin base. Attains at least 61 mm SL.



Cryptocentrus pretoriusi, 61 mm TL, holotype (South Africa).
Source: Smith 1959

DISTRIBUTION Known only from the holotype found in South Africa, and possibly Pakistan.

Cryptocentrus strigiliceps (Jordan & Seale 1906)

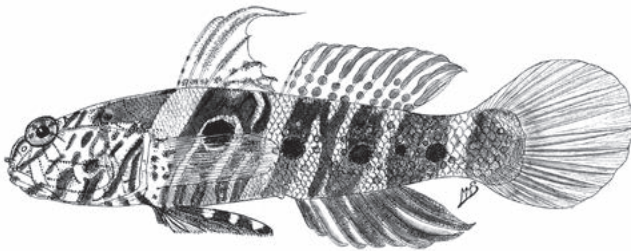
Target shrimpgoby

PLATE 14

Mars strigiliceps Jordan & Seale 1906: 408, Fig. 95 (Apia, Upolu I., Samoa).*Obtortiothagus koumansi*: SFSA No. 931a; Smith & Smith 1963*.*Cryptocentrus strigiliceps*: Hoese & Winterbottom 1979; SSF No. 240.32*; Randall 1995*; Anderson *et al.* 1998*; Kuitert 1998*; Debelius 1999*.

Second dorsal fin and anal fin each with 1 spine, 9 or 10 rays; pectoral fins 16–18 rays. LSS 47–53; TRB 17–19; predorsal scales 11–17; ctenoid scales in wedge-shaped area to below rear of 1st dorsal fin; breast and pectoral-fin bases with some cycloid scales. Gill opening to rear edge of preopercle. Sensory papillae at sides of chin in many short rows extending to preopercle.

Head and body pale greyish, with 5–7 oblique broad grey-brown to red-brown bands, dividing into narrower bands at midsides of body, and anteriormost band (on head) usually breaking up into spots and irregular streaks; sides of body with 5 or 6 black ocellate spots, anteriormost spot usually largest, and small round blue spots mostly on lower part of body. Attains 40 mm SL.

*Cryptocentrus strigiliceps*, 50 mm TL (S Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific (widespread). WIO: Oman, Red Sea, East Africa to Mozambique (Bazaruto I.), Comoros, Seychelles and Maldives; elsewhere to southern Japan, Micronesia, northern Australia and Samoa.

REMARKS Commensal with alpheid shrimps; found on sandy to silty bottoms, at 3–15 m.

GENUS *Ctenogobiops* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 11 rays; pectoral fins 18–20 rays. Body scales ctenoid, but scales cycloid on belly, sides of nape and above opercle; predorsal midline, cheek, opercle, breast and pectoral-fin bases naked; LSS 49–65; TRB 17–25. Lateral canals and pores present; sensory papillae in reduced longitudinal pattern.

Body typically whitish with diffuse brown to orange markings, and distinctive bright white spot at base of central pectoral-fin rays, and similar (usually less conspicuous) spot on pectoral-fin bases. Inhabit rubbly sand around coral reefs; commensal with alpheid snapping shrimps. Nine species, in tropical Indo-Pacific, 3 in WIO.

KEY TO SPECIES

- 1a Sides of head with broad horizontal streaks and brown spots; first spine of 1st dorsal fin longest; gill opening extending to below rear edge of preopercle *C. feroculus*
- 1b Sides of head with oblique dark-margined pale streaks and spots; second spine of 1st dorsal fin longest; gill opening extending to nearly behind eyes or rear edge of preopercle 2
- 2a Gill opening reaching well forward of rear edge of preopercle or nearly to behind eye; 2 yellow to brown oblique narrow stripes across cheek, both beginning on opercle: upper stripe ending above middle of upper jaw, and lower stripe ending at corner of jaws *C. crocineus*
- 2b Gill opening reaching forward to below or just before rear edge of preopercle; 2 or 3 stripes, 1 stripe from upper rear corner of preopercle to corners of jaws, and lower stripe from rear corner of opercle and crossing lower rear corner of preopercle *C. maculosus*

Ctenogobiops crocineus Smith 1959

Goldspotted shrimpgoby

PLATES 14 & 16

Ctenogobiops crocineus Smith 1959: 191, Pl. 11k (Mahé, Seychelles);

Smith & Smith 1963*; Lubbock & Polunin 1977*; Goren 1979*;

Randall 1983* [in part]; Dor 1984; Winterbottom & Emery 1986*;

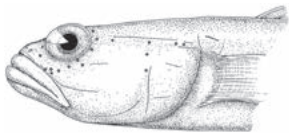
Randall & Anderson 1993; Randall & Goren 1993*; Goren & Dor 1994;

Winterbottom & Anderson 1997; Field & Field 1998*; Kuitert 1998*;

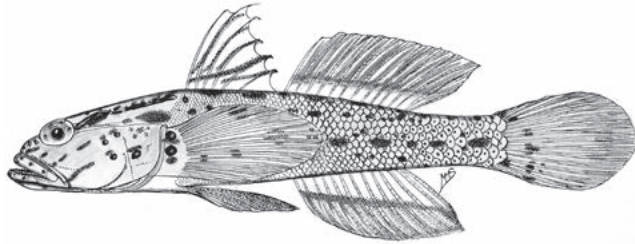
Kovačić *et al.* 2011*.*Ctenogobiops maculosus*: Randall & Van Egmond 1994*.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 11 rays; pectoral fins 18 or 19 rays. LSS 49–65; TRB 17–20. Second spine of 1st dorsal fin longest. Gill opening wide, reaching forward to well under preopercle (usually to below rear edge of eye).

Head and body whitish to fawn, with 2–4 rows of golden to golden-brown spots on body, row along midsides largest and darkest; 2 oblique rows of yellow to golden-brown streaks and spots curving across sides of head: 1st row ending above middle of upper jaw, and 2nd row ending at corner of jaws (may be 3rd short streak just rear of eyes); several bright blue spots and short streaks near eyes and on nape; no dark brown V-mark on snout. Attains 50 mm SL.



Ctenogobiops crocineus, head showing papillae and pores (Seychelles).
Source: Lubbock & Polunin 1977



Ctenogobiops crocineus, 50 mm TL, holotype (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Comoros, Seychelles, Chagos and Maldives; elsewhere in western Pacific to northern Australia.

REMARKS Commensal with an alpheid shrimp; found on shallow coral reefs in areas of sand and rubble, to ~8 m deep.

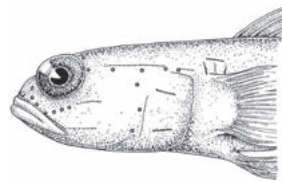
Ctenogobiops feroculus Lubbock & Polunin 1977

Pale shrimpgoby PLATES 14 & 16

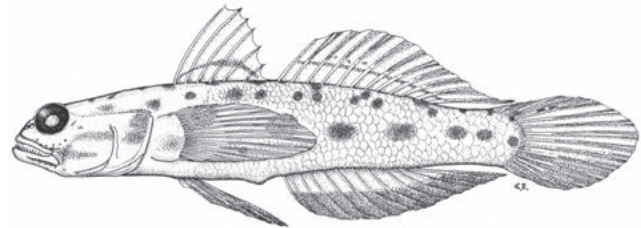
Ctenogobiops feroculus Lubbock & Polunin 1977: 509, Pl. 2, Figs. 5–6 (Île Amédée, New Caledonia); Dor 1984; Debelius 1993*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*; Goren & Dor 1994; Kuitert 1998*.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 19 or 20 rays. LSS 50–67; TRB 19–22. First spine of 1st dorsal fin longest. Gill opening extending forward to below rear edge of preopercle.

Head and body whitish to fawn, with ~3 rows of brown to dark brown spots on body, the row beginning just above pectoral-fin bases with ~7–10 spots (larger than other spots), only uppermost row of body spots clearly defined, others tend to be diffuse; sides of head with 2–4 brown to dark brown, short, broad, horizontal streaks and few rounded brown patches; brown V-mark on snout. Attains 45 mm SL.



Ctenogobiops feroculus, head showing papillae and pores (New Caledonia).
Source: Lubbock & Polunin 1977



Ctenogobiops feroculus, 34 mm SL, holotype (New Caledonia).
Source: Lubbock & Polunin 1977

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique, Seychelles and Maldives; elsewhere in western Pacific to New Caledonia.

REMARKS Commensal with alpheid shrimps, such as *Alpheus djiboutensis*, on shallow coral reefs in areas of sand and rubble, at 4–25 m.

Ctenogobiops maculosus (Fourmanoir 1955)

Brownspotted shrimpgoby PLATE 16

Cryptocentroides maculosus Fourmanoir 1955: 201 (Abu Latt, Saudi Arabia, Red Sea); Smith 1959.

Ctenogobiops maculosus: Klauswitz 1960*; Lubbock & Polunin 1977*; Goren 1979*; Karplus *et al.* 1981; Randall 1983 [in part: figure is *C. crocineus*]; Dor 1984; Eichler & Lieske 1994*; Goren & Dor 1994; Randall & Van Egmond 1994*; Field & Field 1998*.

Ctenogobius maculosus: Clark *et al.* 1968; Kovačić *et al.* 2011*.

Second dorsal fin and anal fin each with 1 spine, 11 rays; pectoral fins 17–19 rays. LSS 52–63; TRB 17 or 18. Second spine of 1st dorsal fin longest. Gill opening extends forward to rear edge of preopercle.

Head and body whitish to fawn, with 3 or 4 rows of yellowish brown spots on body, row along midsides largest and darkest; 2 or 3 oblique rows of yellow to golden-brown stripes and spots across sides of head and continuing onto nape: uppermost stripe short and runs close to rear of eye, middle stripe longest and extends to corner of jaws, and lowermost stripe crosses lower rear corner of preopercle; streaks and spots tend to be blotchy and darkest on lower part of head; narrow dark brown V-mark on snout. Attains 53 mm SL.



Ctenogobiops maculosus, 41 mm SL (Gulf of Aqaba).
© JE Randall, Bishop Museum

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Commensal with at least 7 species of alpheid shrimps, usually *Alpheus rapax*; most often found in small sand patches among dense coral growth, at 2–20 m.

GENUS *Discordipinna*

Hoese & Fourmanoir 1978

First dorsal fin 5 or 6 spines, first 2 spines thickened and elongate, fin origin over opercle margin and widely separated from 2nd dorsal fin; pectoral fins elongate, reaching back to below 2nd dorsal fin; pelvic fins fused, and membrane around spine forming a flat lobe. Head depressed, body compressed. No preopercular pores; sensory papillae on head large but few. Body scales cycloid anteriorly, with large cycloid scales on sides of predorsal area, and ctenoid posteriorly; cheek and operculum naked. Gill opening to just forward of pectoral-fin base. Two species, from Indo-Pacific coral reefs; 1 species in WIO.

Discordipinna griessingeri

Hoese & Fourmanoir 1978

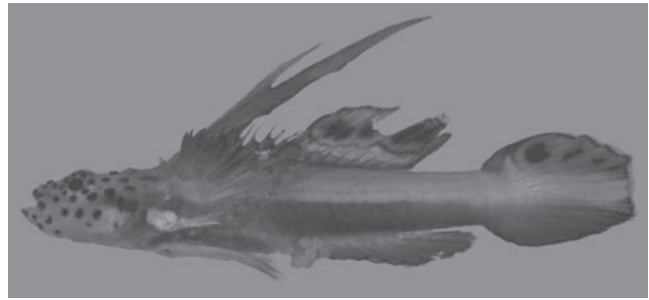
Bizarre-fin goby

PLATE 16

Discordipinna griessingeri Hoese & Fourmanoir 1978: 21, Figs. 1–4 (El Himeira, Sinai, Egypt, Gulf of Aqaba, Red Sea); Goren 1979; Dor 1984; Winterbottom & Emery 1986; Goren & Dor 1994; Winterbottom & Anderson 1997.

First dorsal fin 5 spines (spines 1–2 elongate, and second may reach back to caudal fin); 2nd dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 8 rays; pectoral fins 18 or 19 rays. LSS 22–25; predorsal midline naked.

Head and body white, with faint thin yellow lines along back, and red to blackish red stripe along lower part of body; head covered with small round black spots; unpaired fins with orange to red and yellow patterning, sometimes with dark ocelli. Attains 21 mm TL.



Discordipinna griessingeri, 17 mm SL, male, with eggs in front of anal fin (Comoros). © R Winterbottom, ROM

DISTRIBUTION Indo-Pacific. WIO: Red Sea, St Brandon Shoals, Comoros and Chagos; elsewhere, Vietnam to Marquesas Is.

REMARKS Found on rubble or sand among corals and hides in coral crevices, at 5–27 m.

GENUS *Drombus* Jordan & Seale 1905

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17 or 18 rays, none free from membrane. Characteristic transverse pattern of papillae on head, with hindmost vertical row on cheek extending past lowermost horizontal row. No lobed mental frenum. LSS 22–32; predorsal scales present or absent, and may be small or quite large. Two species complexes: the typical dark and slender *Drombus triangularis* (Weber 1909) complex, usually with pale mark dorsally on pectoral-fin bases; the other *Drombus ocyurus* (Jordan & Seale 1907) complex pale, with shorter compressed body. Inhabits intertidal coastal rocky reefs, estuaries or mangrove habitats. At least 10 species, in Indo-Pacific, in need of review; 2 species in WIO.

KEY TO SPECIES

- 1a Second dorsal fin 1 spine, 10 (rarely 9) rays; suborbital papilla row *a* continuous, not composed of short transverse rows *D. simulus*
- 1b Second dorsal fin 1 spine, 9 (rarely 10) rays; suborbital papilla row *a* composed of short transverse rows *D. key*

Drombus key (Smith 1947)

Key goby

PLATE 16

Gobius key Smith 1947: 807 (Inhaca I., Mozambique); SFSA No. 916*; Smith 1961*.

Acentrogobius triangularis: Smith 1959*, 1961*

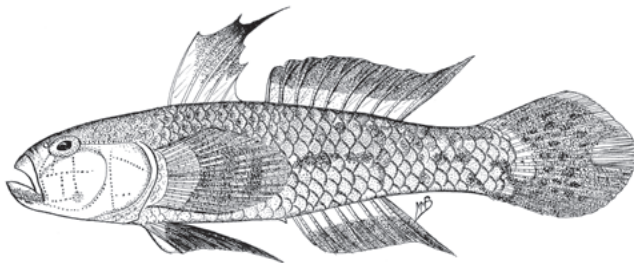
Ctenogobius key: Smith 1959*.

Drombus key: Hoese & Winterbottom 1979; SSF No. 240.33*.

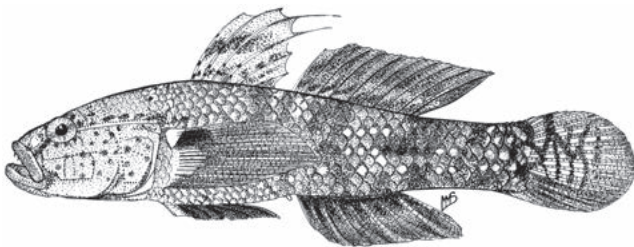
Drombus triangularis: Hoese & Winterbottom 1979; Maugé 1986.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17 or 18 rays. LSS 26–30; TRB 11 or 12; predorsal scales 13–15, small, cycloid, and extending to near eyes.

Body dark brown, with small white spots and dark blotches at least on rear part of body; black blotch on bases of several upper pectoral-fin rays, with white to yellow teardrop-shaped or triangular mark anterior to each blotch; 1st dorsal fin dark, with white or translucent margin, and a few rows of elongate white spots. Attains 60 mm SL.



Drombus key, 60 mm TL, holotype (S Mozambique). Source: SFSA



Drombus key, 60 mm TL (S Mozambique). Source: SSF

DISTRIBUTION WIO: Mozambique (Maputo Bay) and Madagascar to Seychelles.

REMARKS Inhabits shallow waters and mangroves. Resembles a small dark species of *Bathygobius*.

Drombus simulus (Smith 1960)

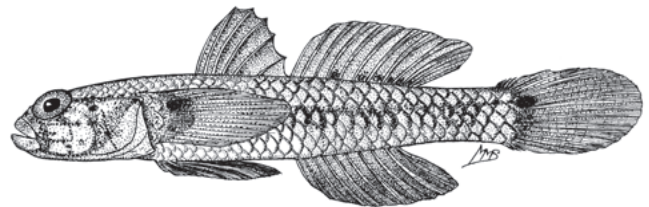
Pinafore goby

Acentrogobius simulus Smith 1960: 307, Fig. 6 (Maputo Bay, Mozambique); Maugé 1986.

Drombus simulus: SSF No. 240.34*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17 or 18 rays. LSS 30; TRB 12; predorsal scales 11, cycloid, and nearly reaching eyes. Papilla row *a* below eye distinctly continuous.

Live colour probably yellowish brown body, with darker mottling; dark mark at caudal-fin base; fins speckled. Attains 28 mm SL.



Drombus simulans, 33 mm TL (S Mozambique). Source: SSF

DISTRIBUTION WIO: Mozambique.

REMARKS Known from few specimens.

GENUS *Eviota* Jenkins 1903

First dorsal fin 5 or (nearly always) 6 spines; 2nd dorsal fin 1 spine, 7–11 rays; anal fin 1 spine, 6–10 rays; pectoral fins 13–19 (usually 15–17) rays; pelvic fins 1 spine, 4 or 5 rays (5th ray unbranched and greatly reduced if present, and other rays usually branched many times giving feathery appearance), fins separated at base by thin membrane, and no pelvic frenum. Sensory pores on head reduced. Body scales ctenoid; predorsal area and sides of head naked; LSS 23–26. Gill opening to lower pectoral-fin base. Live fish usually translucent or transparent, with complex internal and external colour bars and spots; their colour may depend on distribution, depth and habitat. Tiny fishes; inhabit coral reefs, from intertidal reef flats to deep drop-offs. At least 110 described species in Indo-Pacific, and many more yet to be described; at least 17 species in WIO.

KEY TO SPECIES

- 1a Lateral part of oculoscapular canal present over preopercle ... 2
 1b No lateral part of oculoscapular canal over preopercle 8
- 2a Second dorsal fin usually 1 spine, 9 (rarely 8) rays; anal fin usually 1 spine, 8 (rarely 9) rays; head and body with fine dark speckling, darker dorsally, and ~12–15 small dark spots along dorsal midline, and ~7 dusky to dark spots (may be subcutaneous) along ventral midline from anal fin: no other distinctive markings on body and no distinct black spot at caudal-fin base or on or above pectoral-fin bases *E. guttata*
 2b Second dorsal fin usually 1 spine, 8 rays; anal fin usually 1 spine, 7 or 8 rays; body with distinct spots and dark markings, usually including distinct dark spot at caudal-fin base or on or above pectoral-fin bases 3
- 3a Anal fin almost always 1 spine, 7 rays; head with dark spots or bars across nape; 8–10 dark spots along dorsal midline of body 4
 3b Anal fin usually 1 spine, 8 rays; head variously marked but usually lacking numerous large dark spots; dorsal midline of body with or without dark spots 5
- 4a Head covered with many large blackish spots, and usually dark bar from eyes to corners of mouth; pectoral-fin bases with 2 distinct large dark spots; dorsal midline with ~10 dark spots *E. pardalota*
 4b Top of head with small bright red or blackish spots, largest spot above opercle, and much smaller dark spots on cheek; pectoral-fin bases pale; dorsal midline with dark spots, and 6–8 narrow dark internal bars along sides *E. notata*
- 5a Fifth pelvic-fin ray absent or rudimentary, and membrane between rays reduced; either a large dark spot on centre or just above midline of caudal peduncle, or a single large dark spot on pectoral-fin bases 6
 5b Fifth pelvic-fin ray rudimentary (~1/10 length of 4th ray), and fin membrane moderately developed; distinct dark spot just before caudal-fin base; males with 2 distinct dark spots on pectoral-fin bases and dark spots scattered over nape; females with indistinct spots on pectoral-fin bases and nape *E. distigma*
- 6a Pectoral-fin bases pale; large dark spot on caudal peduncle ... 7
 6b Pectoral-fin bases with large dark spot extending onto fin rays; no dark spot on caudal peduncle *E. pseudostigma*
- 7a Dark spot on caudal peduncle rectangular, above midline; 1st dorsal fin with broad dark and pale bars *E. nebulosa*
 7b Dark spot on peduncle often diffuse and subcutaneous, placed across midline; 1st dorsal fin plain black *E. nigripinna*
- 8a Either the nasal pores or posterior interorbital pore absent (the latter sometimes present in *E. geminata*, which always lacks a supraotic pore behind the eye, unlike all other *Eviota* in the region) 9
 8b Nasal pores and posterior interorbital pore always present 11
- 9a Nasal pores present; anterior interorbital pore enlarged; no posterior interorbital pore or canal and pore over preopercle; eyes of live fish with red and brown 'clock-face' markings around pupil *E. oculopiperita*
 9b No nasal pores; other head pores not as above; eye colour of live fish not as above 10
- 10a Posterior interorbital pore present; black, irregular, W-shaped mark above pectoral-fin bases; no dark spot at caudal-fin base *E. infulata*
 10b No posterior interorbital pore; no dark mark above pectoral-fin bases; large dark spot at caudal-fin base, extending onto fin as dark streak *E. sebreei*
- 11a No supraotic pore behind eye; 5 broad dark bars on sides of body, from below 1st dorsal fin to caudal-fin base, and bars may spilt dorsally; dark blotch on pectoral-fin bases *E. geminata*
 11b Supraotic pore present behind eye; colour pattern not as above 12
- 12a Conspicuous black spot or bar at caudal-fin base 13
 12b No conspicuous black spot at caudal-fin base 14
- 13a Large black spot on 1st dorsal fin, anteriorly at base; dense rounded black spot at caudal-fin base, and caudal fin plain dusky, without dark barring *E. springeri*
 13b No large black spot anteriorly on 1st dorsal fin, but fine dark spots on fin membranes and dark band along base; dense black spot and narrow vertical bar present at caudal-fin mid-base, and caudal fin dusky to translucent, crossed by 3 or 4 dark wavy vertical to oblique bars *E. zebrina*
- 14a Several to most pectoral-fin rays branched 15
 14b Pectoral-fin rays simple, unbranched 16
- 15a Second dorsal fin almost always with 1 spine, 9 or 10 rays; anal fin may be dark but not much darker than other fins; males with at least 1 elongate dorsal-fin spine *E. prasina*
 15b Second dorsal fin almost always with 1 spine, 8 rays; anal fin black, much darker than other fins; 1st dorsal fin without elongate spines *E. indica*

Continued ...

KEY TO SPECIES

- 16a Lowest part of caudal-fin base with single small brown spot, and caudal fin plain and transparent; live fish translucent pink to reddish, with 3 yellow and/or white lines from head along body..... *E. mikiae*
- 16b Upper and lower parts of caudal-fin base each with blackish blotch or small dusky spot (may be indistinct or absent on upper part), and caudal fin dusky, with a few narrow, broken, vertical to oblique brownish bars; live fish translucent, with fine red-brown speckling and 7 narrow bars along ventral midline on rear half of body *E. sigillata*

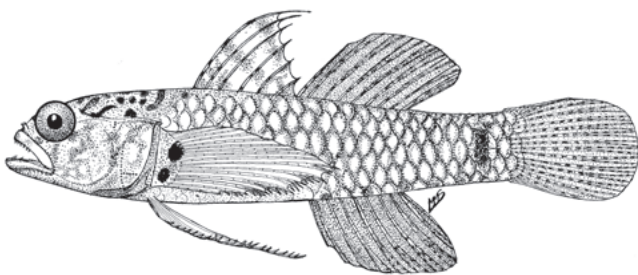
Eviota distigma Jordan & Seale 1906

Shoulderspot pygmy goby PLATES 16 & 17

Eviota distigma Jordan & Seale 1906: 389, Fig. 79 (Pago Pago, Tutuila I., American Samoa); Lachner & Karnella 1980*; Winterbottom & Emery 1986*; Heemstra *et al.* 2004; Herler & Hilgers 2005*.
Eviota stigmatopteron Smith 1958: 141, Fig. 2, Pl. 1h (Mahé, Seychelles); Smith & Smith 1963*; Dor 1984.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 14–17 rays, some rays always branched; 5th ray of pelvic fins rudimentary or small (~1/10 length of 4th ray). LSS 22–25; TRB 5 or 6. Spines 1–3 of 1st dorsal fin may be filamentous in males, first spine longest.

Head and body bluish to greenish; scale pockets darkly pigmented, giving diamond-network pattern on sides of body; caudal peduncle with intense dark subcutaneous (often square) blotch. Sexually dichromatic markings: males with distinct paired brownish black spots on pectoral-fin bases, and small round dark spots over nape and top of head; spots diffuse or absent in females. Attains 20 mm SL.



Eviota distigma, 20 mm TL, male holotype of *E. stigmatopteron* (Seychelles). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Red Sea, possibly Seychelles, Réunion, Rodrigues and Chagos; elsewhere widespread from southern Japan to Austral Is.

REMARKS Inhabits coral-reef lagoons, at 1–22 m.

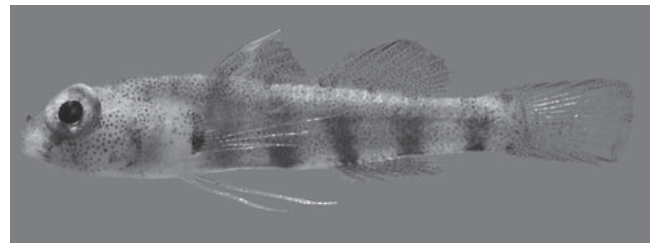
Eviota geminata Greenfield & Bogorodsky 2014

Geminate pygmy goby PLATE 16

Eviota geminata Greenfield & Bogorodsky in Greenfield, Bogorodsky & Mal 2014: 6, Fig. 4 (island off Duba, Saudi Arabia, Red Sea).

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15 rays, some rays branched; 5th ray of pelvic fins absent. Spines of 1st dorsal fin not elongate, but first spine longest. [Scale counts not recorded in original description.]

Fresh and preserved specimens with translucent yellow head and body, with series of whitish or transparent saddles along dorsum, and 5 dark bars arising from ventral midline and fading dorsally; narrow dark line from eyes to jaw and around chin, continuing through eyes as oblique red-brown band above and below pupil, and 2 or 3 dark spots along lower edge of preopercle; 6 or 7 small dark spots along dorsum, from anterior part of 1st dorsal fin to caudal-fin base; large dark spot on pectoral-fin bases. Attains 14 mm SL.



Eviota geminata, 12 mm SL (Red Sea). © SV Bogorodsky

DISTRIBUTION Known only from two type specimens, collected in the Red Sea.

REMARKS Taken from shallow coral-reef habitat, at 10–12 m.

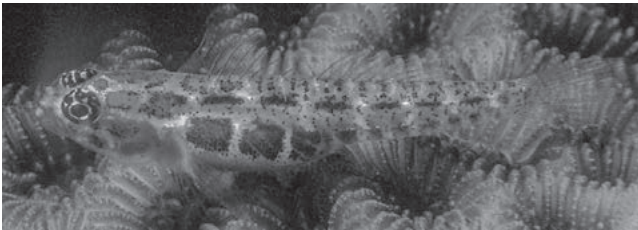
Eviota guttata Lachner & Karnella 1978

Spotted pygmy goby PLATES 17 & 18

Eviota guttata Lachner & Karnella 1978: 9, Figs. 2a, 3b, 5 (Massawa, Eritrea, Red Sea); Randall & Goren 1993*; Randall & Van Egmond 1994; Randall 1995*; Field & Field 1998*; Kuitert 1998*; Debelius 1999*; Herler & Hilgers 2005*; Greenfield & Randall 2010*.
Eviota albolineata (non Jewett & Lachner 1983): SSF No. 240.35*; Winterbottom & Emery 1986*; Randall & Goren 1993; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–18 rays, some rays always branched; 5th ray of pelvic fins small (usually $\sim\frac{1}{10}$ length of 4th ray). LSS 22–24; TRB 6 or 7. Spines 1–3 of 1st dorsal fin may be filamentous in males.

Body translucent greenish in life, with 3 distinct reddish internal spots over abdomen, and similar smaller spots along sides of head and following vertebral column; 1 elongate red blotch from opercle extending onto pectoral-fin base; fine red to red-brown speckles concentrated near dorsal midline. Attains 19 mm SL.



Eviota guttata (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, East Africa to Mozambique (Inhaca I.), Comoros, Aldabra, Seychelles (Amirante Is.), Mauritius, Rodrigues, Chagos and Maldives.

REMARKS Found on shallow coral reefs, at 1–16 m. Has been confused with *E. albolineata* from western Pacific.

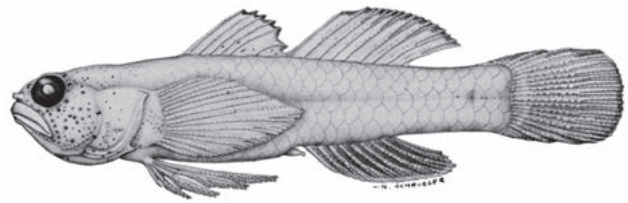
Eviota indica Lachner & Karnella 1980

Indian Ocean pygmy goby

Eviota indica Lachner & Karnella 1980: 65, Figs. 36–38 (south of Île Raphael, St Brandon Shoals); Fricke 1999; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 15–17 rays, some rays branched; 5th ray of pelvic fins rudimentary (usually $\sim\frac{1}{10}$ length of 4th ray). LSS 23–25; TRB 6 or 7. Anterior spines of 1st dorsal fin not elongate.

Preserved specimens generally with pale head and body, with \sim 6 dark subcutaneous bars along ventral midline, and generally distinct dark spot on last bar at caudal-fin base; sides of body without distinctive pattern. Attains \sim 15.5 mm SL.



Eviota indica, 15 mm SL, male holotype (St Brandon Shoals).

Source: Lachner & Karnella 1980 (by JR Schroeder)

DISTRIBUTION WIO: Mozambique Channel, Seychelles, Réunion, St Brandon Shoals and Mascarenes.

REMARKS Inhabits shallow coral reefs, to \sim 10 m deep.

Eviota infulata (Smith 1957)

Shouldermark pygmy goby

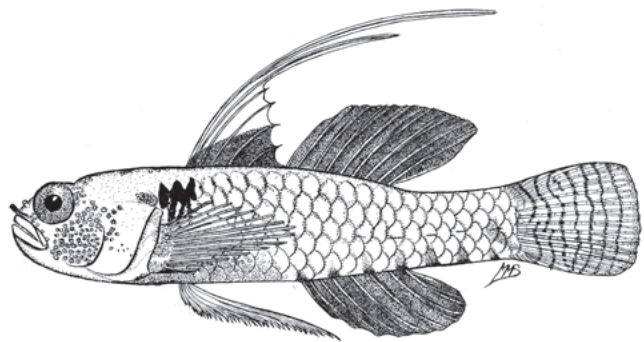
PLATE 17

Eviotops infulatus Smith 1957: 826, Fig. 4 (Mahé, Seychelles); Smith 1958*; Smith & Smith 1963*.

Eviota infulata: Lachner & Karnella 1980*; Winterbottom & Emery 1986*.

First dorsal fin 5 or 6 spines; 2nd dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 13–15 rays, all unbranched; pelvic-fin rays densely fringed, and 5th ray conspicuous ($\sim\frac{1}{2}$ length of 4th ray). LSS 21–23; TRB 5 or 6. First dorsal-fin spines long and filamentous in males.

Body translucent, with conspicuous dark brown to black, usually W-shaped mark just above and behind upper pectoral-fin bases; unpaired fins red-brown to blackish. Attains \sim 19.5 mm SL.



Eviota infulata, 18 mm TL, holotype (Seychelles). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Aldabra, Seychelles, Mascarenes and Chagos; elsewhere widespread to Tuamotu Is.

REMARKS Inhabits coral reefs, to \sim 18 m deep.

Eviota mikiae Allen 2001

White-lined pygmy goby

PLATE 17

Eviota sp. A: Winterbottom & Emery 1986* (Chagos).

Eviota sp.: Randall & Goren 1993 (Maldives).

Eviota sp. 1: Kuitert 1998*.

Eviota sp. 2: Kuitert 1998*.

Eviota mikiae Allen 2001: 128, Figs. 3–4 (Weh I., Sumatra, Indonesia).

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14 rays, all unbranched; 5th ray of pelvic fins present (20–30% length of 4th ray), fin membrane reduced (but visible), and 4th ray with 5–10 branches. First dorsal fin with spines 2–3 longest but not elongate.

Body of live fish translucent pink to yellow, with silvery white or golden yellow line from eyes along midline of body; short, similarly coloured line along midline of interorbital and nape; dark red-brown streak along midventral line, from abdomen towards caudal fin; no subcutaneous spots or bars on body. Preserved specimens pale, with dark pigment along anal-fin base extending to ventral surface of peduncle; small dark spot usually present at lower part of caudal-fin base; nostril tubes blackish; short oblique stripe from lower anterior corner of eye to corner of jaw. Attains 17 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Madagascar, Comoros, Seychelles, Chagos and Maldives; elsewhere, Thailand and western Indonesia (Sumatra).

REMARKS Poorly known; usually found in small groups on large coral heads.

Eviota nebulosa Smith 1958

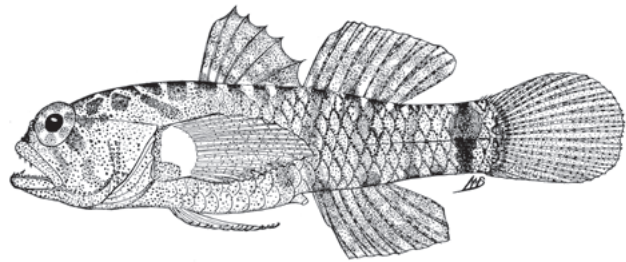
Saddletail pygmy goby

PLATE 17

Eviota nebulosa Smith 1958: 141, Fig. 3 (Pinda, Mozambique); Smith & Smith 1963; Winterbottom & Emery 1986*; Randall & Goren 1993.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 8 (usually) or 9 rays; pectoral fins 14–17 rays, lower rays usually branched; 5th ray of pelvic fins rudimentary. LSS 23 or 24; TRB 5 or 6. Spines of 1st dorsal fin never elongate.

Distinguished by upper part of pectoral-fin bases with large pale (unpigmented) blotch, and dark squarish to rectangular mark crossing at least upper half of caudal peduncle; nape markings variable, but with 5 or 6 dusky crossbars and spots; sides of head with fine speckling which may form indistinct streaks. Attains 19 mm SL.



Eviota nebulosa, 20 mm TL, male holotype (N Mozambique).

Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Aldabra, Seychelles, Chagos and Maldives; elsewhere widespread in western Pacific to French Polynesia.

REMARKS Occurs in a range of coral-reef habitats, from reef flats to drop-offs, to ~24 m deep.

Eviota nigripinna Lachner & Karnella 1980

Black-dorsal pygmy goby

PLATE 17

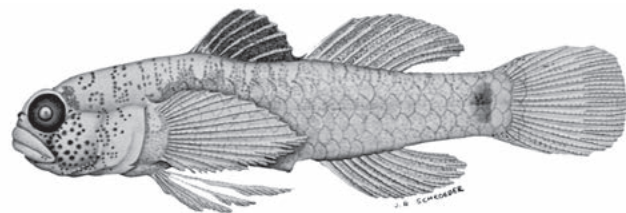
Eviota nigripinna Lachner & Karnella 1980: 37, Figs. 15, 18–19

(North I., Agaléga Is., Mauritius); Winterbottom & Emery 1986*;

Randall & Goren 1993*.

Second dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 15–18 rays, some rays branched; 5th ray of pelvic fins absent. LSS 22–24; TRB 5 or 6. First dorsal fin rounded and spines not elongate.

Body translucent to whitish, with reddish speckles on body and crossbars over nape; 1st dorsal fin plain black; blackish spot at centre of caudal-fin base. Attains 14 mm SL.



Eviota nigripinna, 12 mm SL, male (Agaléga Is.).

Source: Lachner & Karnella 1980 (by JR Schroeder)

DISTRIBUTION Islands of WIO: Comoros, Réunion, Mauritius (Agaléga Is.), Chagos and Maldives.

REMARKS Found on shallow seaward coral reefs, in 1–11 m.

Eviota notata Greenfield & Jewett 2012

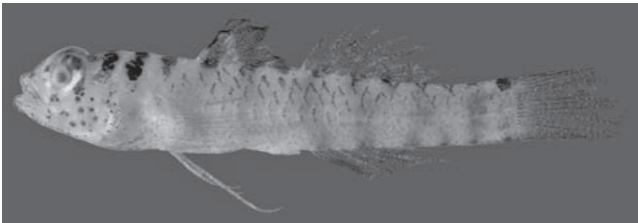
Blackspot pygmy goby

PLATE 17

Eviota sp. C: Winterbottom & Emery 1986*; Heemstra *et al.* 2004.? *Eviota melasma*: Kuitert 1998*.*Eviota notata* Greenfield & Jewett 2012: 68, Figs. 1–4 (Mahé I., Seychelles).

Second dorsal fin and anal fin each with 1 spine, 6 or 7 rays; pectoral fins 14–16 rays; 5th ray of pelvic fins rudimentary ($\sim\frac{1}{10}$ length of 4th ray), 4th ray with 5–14 branches and 1 segment between branches, and pelvic-fin membrane reduced. LSS 22 or 23. Spines of 1st dorsal fin not elongate.

Fresh specimens with yellowish head and body, 5–8 red-brown irregular bars crossing body, and small black spot at centre of last bar near caudal-fin base; snout deep yellow; head with small bright red spots, and 2 narrow red lines cross cheek below eye; nape crossed with several narrow red lines or blotchy bars, including distinct black spot above rear edge of opercle. Attains 15 mm SL.

*Eviota notata*, 15 mm SL, paratype (Chagos). © R Winterbottom, ROM

DISTRIBUTION WIO: South Africa (Sodwana Bay; Aliwal Shoal), Seychelles (Amirante Is.), Rodrigues, St Brandon Shoals and Chagos.

Eviota oculopiperita Greenfield & Bogorodsky 2014

Peppermint-eye pygmy goby

PLATE 18

Eviota oculopiperita Greenfield & Bogorodsky in Greenfield, Bogorodsky & Mal 2014: 2, Figs. 1, 3 (Al Wajh Bank, Saudi Arabia, Red Sea).

First dorsal fin with 7 spines; 2nd dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15 rays, all rays unbranched; 5th ray of pelvic fins $\sim\frac{1}{4}$ length of 4th ray, and 4th ray with 9 branches. LSS 24; TRB 7. First dorsal fin triangular, spines not elongate but 1st spine longest.

Body transparent greenish, with scales very thinly outlined in red-brown; 2 large red-brown blotches over silvery white abdomen, followed by smaller blotch above anal-fin origin, and series of 6 brownish chevrons above vertebral column;

silvery white patch on upper part of pectoral fins, partly extending onto fin, and below this a red-brown oblique band across pectoral-fin bases; 2 red-brown lines from eyes to snout, and top of snout and anterior nostrils with similar red-brown lines; iris white, with numerous short red-brown to red bars radiating from pupil (resembling clock face or red-and-white peppermint candy). Preserved specimens relatively plain, with dusky patch behind eyes, scattered melanophores on pectoral-fin bases, and dusky patches over abdomen. Attains 12 mm SL.

DISTRIBUTION WIO: northern Red Sea.

REMARKS Known only from holotype, collected from sandy slope with small coral patches, at 8–10 m.

Eviota pardalota Lachner & Karnella 1978

Leopard-spotted pygmy goby

PLATES 17 & 18

Eviota pardalota Lachner & Karnella 1978: 11, Figs. 1a, 6–7 (Sinai, Egypt, Gulf of Suez, Red Sea); Dor 1984; Randall *et al.* 1994*; Randall 1995*.*Eviota stigmapteron* [in part]: Clark 1968.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 15 or 16 rays, some rays always branched; 5th ray of pelvic fins rudimentary ($\sim\frac{1}{10}$ length of 4th ray). LSS 23 or 24; TRB 5 or 6. Anterior spines of 1st dorsal fin may be filamentous in both sexes.

Head covered with blackish orange spots; nape with 2 or 3 short blackish orange crossbars or blotches, and dorsal midline with series of 10 blackish orange spots; short dark orange curved line on most scales on sides of body; pair of blackish spots on pectoral-fin bases. Attains 19 mm SL.

*Eviota pardalota*, 17 mm SL, female holotype (Red Sea).

Source: Lachner & Karnella 1978 (by JR Schroeder)

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea and Gulf of Suez.

REMARKS Found on shallow coral reefs, at 1.5–17 m.

Eviota prasina (Klunzinger 1871)

Green pygmy goby

PLATES 17 & 18

Eleotris prasinus Klunzinger 1871: 481 (Al-Qusayr, Egypt, Red Sea).

Eviota verna Smith 1958: 139, Pl. 1j–l (Aldabra, Seychelles); Smith 1961;

Smith & Smith 1963*; Hoese & Winterbottom 1979.

Eviota prasinus: Clark 1968.

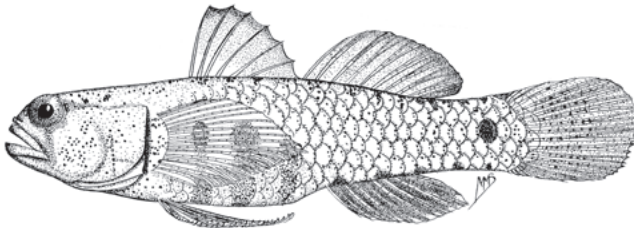
Eviota prasina: Lachner & Karnella 1978*; SSF No. 240.36*;

Winterbottom & Emery 1986*; Randall & Goren 1993*; Randall 1995*;

Heemstra *et al.* 2004; Herler & Hilgers 2005*.

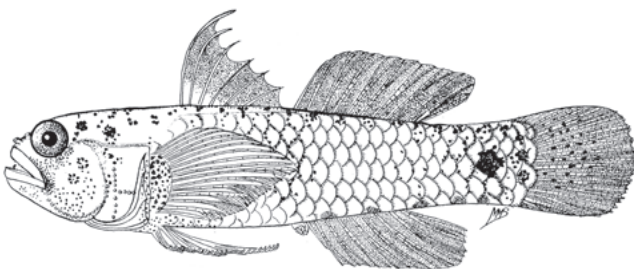
Second dorsal fin 1 spine, 8–11 rays; anal fin 1 spine, 7–9 rays; pectoral fins 14–19 rays, most branched; 5th ray of pelvic fins usually absent, rudimentary if visible. LSS 23–25; TRB 6–8. Anterior spines of 1st dorsal fin may be filamentous in males.

Body translucent green, with orange to red spots on head (2 spots behind each eye usually most prominent), and smaller spots along dorsal midline; 7 or 8 narrow reddish brown to purplish internal bars along body, and dusky spot on centre of last bar just before caudal-fin base; 2 red spots on each pectoral-fin base. Attains 31 mm SL.



Eviota prasina, 22 mm TL, female paratype of *E. verna* (WIO).

Source: Smith 1958



Eviota prasina, 23 mm TL, male holotype of *E. verna* (Aldabra).

Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman to South Africa (Aliwal Shoal), Madagascar, Aldabra, Seychelles, Mascarenes, Chagos and Maldives; elsewhere widespread throughout Indo-Pacific.

REMARKS Found on shallow coral reefs, to ~12 m deep.

Eviota pseudostigma Lachner & Karnella 1980

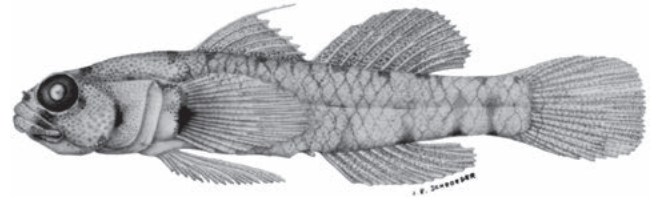
Smallspot pygmy goby

Eviota pseudostigma Lachner & Karnella 1980: 41, Figs. 7, 21–22

(near Mahé, Seychelles).

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 15–18 rays, most rays branched; 5th ray of pelvic fins rudimentary, sometimes absent. LSS 23 or 24; TRB 5 or 6. First spine of 1st dorsal fin may be elongate in males.

Head with scattered dark spots on sides; characteristic triangular to asymmetrical blackish spot at base of pectoral-fin rays; 7–9 dark spots along dorsal midline, and 4–6 dark spots along ventral midline (from anal-fin origin to caudal-fin base); no dark spot at caudal-fin base. Attains 21 mm SL.



Eviota pseudostigma, 21 mm SL, holotype (Seychelles).

Source: Lachner & Karnella 1980 (by JR Schroeder)

DISTRIBUTION Indo-Pacific. WIO: Seychelles, Comoros and Amirantes; elsewhere in western Pacific to Society Is.

REMARKS Found on isolated coral reefs. The Pacific population may be a separate species.

Eviota sebreei Jordan & Seale 1906

Red-and-white pygmy goby

PLATES 17 & 18

Eviota sebreei Jordan & Seale 1906: 390, Fig. 80 (Apia, Upolu I., Samoa);

Lachner & Karnella 1978*; Winterbottom & Emery 1986*; Debelius

1993*, 1998*, 1999*; Randall & Goren 1993*; Randall & Van Egmond

1994*; Randall 1995*; Field & Field 1998*; Kuitert 1998*; Heemstra *et al.*

2004; Herler & Hilgers 2005*.

Eviota zebreei: Goren 1986.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–17 rays, all unbranched; pelvic-fin rays densely fringed, 5th ray conspicuous (~ $\frac{2}{3}$ length of 4th ray). LSS 23 or 24; TRB 6 or 7. Anterior spines of 1st dorsal fin not elongate.

Body transparent with red-brown to maroon internal pigment, a row of small white spots along vertebral column, and another less-developed short row of similar spots on sides of head and abdomen; white-edged black spot across bases of central caudal-fin rays. Attains 21 mm SL.



Eviota sebreei, 15 mm SL (Rodrigues). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Red Sea, Seychelles, Mascarenes, Chagos, Rodrigues and Maldives; elsewhere widespread to Tonga and Samoa.

REMARKS Often found perched on coral heads, on reef slopes and drop-offs, at 6–33 m.

Eviota sigillata Jewett & Lachner 1983

Sevenbar pygmy goby

PLATE 17

Eviota sigillata Jewett & Lachner 1983: 799, Fig. 10 (south of Île Raphael, St Brandon Shoals); Winterbottom & Emery 1986*; Kuiter 1998*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 14–19 rays, all unbranched; 5th ray of pelvic fins rudimentary ($\sim\frac{1}{10}$ length of 4th ray). LSS 21–24; TRB 5 or 6. Anterior spines of 1st dorsal fin filamentous in both sexes, but longer in males.

Body translucent when live, with 11 or 12 small orange to reddish orange spots along dorsal midline; head reddish orange, from behind eyes to pectoral-fin bases, and head below eyes translucent to whitish; 7 reddish orange subcutaneous bars along ventral midline on rear half of body; 2 vertically aligned dark reddish spots on caudal-fin base. Attains 21 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Madagascar, Seychelles, St Brandon Shoals, Chagos, Maldives and Sri Lanka; elsewhere in western Pacific to Wallis and Futuna.

REMARKS Found in lagoon habitats, at 10–40 m.

Eviota springeri Greenfield & Jewett 2012

Springer's pygmy goby

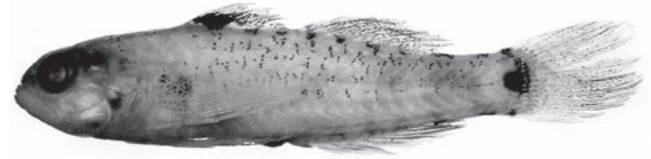
Eviota sp. B: Winterbottom & Emery 1986*.

Eviota springeri Greenfield & Jewett 2012: 71, Figs. 5–6 (lagoon on Frigate I., St Brandon Shoals).

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 rays; pectoral fin 15 or 16 rays, all unbranched; pelvic-fin rays with 4–6 branches, and 5th ray rudimentary. LSS 21 or 22;

TRB 5 or 6. Anterior spines of 1st dorsal fin not elongate.

Preserved specimens pale, with dusky edges to scales on upper half of body; \sim 10–12 small dark spots along dorsal midline, and roundish black spot at mid-caudal-fin base; pectoral-fin bases with brown blotch on dorsal half; 1st dorsal-fin base with dark to dense black spot, most distinct anteriorly; females with less-defined dark pigment. Attains 17 mm SL.



Eviota springeri, 14 mm SL, holotype (St Brandon Shoals).

© SJ Raredon, Smithsonian Institution

DISTRIBUTION WIO: Amirante Is. (Seychelles), Mauritius, St Brandon Shoals and Chagos.

REMARKS Found on shallow coral reefs, at 1–21 m.

Eviota zebrina Lachner & Karnella 1978

Zebra pygmy goby

PLATE 17

Eviota zebrina Lachner & Karnella 1978: 15 Figs. 2b, 10–11 (Curieuse I., Seychelles); Dor 1984; Winterbottom & Emery 1986*; Randall & Goren 1993*; Kuiter 1998*; Heemstra *et al.* 2004.

Eviota prasites: Debelius 1998*.

?*Eviota* sp.: Field & Field 1998*; Herler & Hilgers 2005*.

Second dorsal fin 1 spine, 7–10 rays; anal fin 1 spine, 7–9 rays; pectoral fins 14–18 rays, all unbranched; 5th ray of pelvic fins rudimentary. LSS 21–24; TRB 5 or 6. Anterior spines of 1st dorsal fin often greatly filamentous in both sexes.

Body translucent, with 10–12 brown to red-brown small spots alternating with silvery white spots along dorsal midline; vertebral column and peritoneum red-brown; 2 rows of silvery white spots and blotches on sides of head and body; caudal fin crossed with 3 or 4 wavy oblique dark bars, most intense on ventral part of fin; centre of caudal fin-base with distinct black spot and short vertical bar adjoining rear of spot. Some regional variations in colour pattern. Attains 19 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Seychelles, Mauritius, Rodrigues, Chagos and Maldives; elsewhere to New Caledonia (Loyalty Is.), Fiji and Tonga.

REMARKS Found among corals and coral rock, at 12–32 m.

GENUS *Exyrias* Jordan & Seale 1906

First dorsal fin 6 spines, often elongate and some filamentous; 2nd dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15–19 rays. LSS 30–34; predorsal scales 8–12; ctenoid scales on opercle and cheek (in 3 or 4 rows on cheek); cycloid scales on nape and isthmus. Head and body relatively deep, compressed. Mouth subterminal; isthmus broad. Teeth small and conical, tightly packed in 4 or 5 rows in both jaws, outermost teeth largest, and usually no large recurved canine tooth at bend in dentary. Gill opening to under opercle. At least 4 species, 1 in WIO.

Exyrias belissimus (Smith 1959)

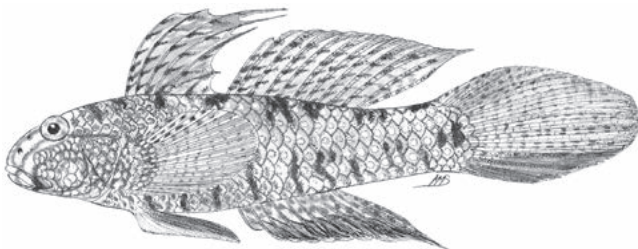
Mud reef-goby

PLATE 19

Acentrogobius belissimus Smith 1959: 202, Pl. 11a (Pinda, Mozambique); Smith & Smith 1963*; Goren 1979*; Dor 1984.
Exyrias belissimus: Hoese & Winterbottom 1979; Murdy 1985*; Winterbottom & Emery 1986*; Eichler & Lieske 1994*; Goren & Dor 1994; Winterbottom & Anderson 1997; Anderson *et al.* 1998*; Kuitert 1998*.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 10 rays; pectoral fins 17–19 rays; caudal fin long, $> \frac{1}{2}$ SL. LSS 30–34; TRB 8 or 9; predorsal scales 8 or 9. Eyes set high on head; preorbital space relatively wide.

Head and body pale brownish to whitish yellow ventrally; narrow vertical bars (partly internal), 6–8 pairs of dark blotches or irregular bands on sides, and other brownish to whitish rounded spots present overall; dorsal fins with rows of brown to reddish spots or short stripes, and spine of 2nd dorsal fin with alternating red and white bands; diffuse dark spot above pectoral-fin bases. Attains 115 mm SL.



Exyrias belissimus, 130 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique, Comoros, Seychelles, Chagos and Maldives; elsewhere, Thailand to Samoa.

REMARKS Found in shallow coral reefs habitats, including muddy reef areas and near estuaries, to ~20 m deep.

GENUS *Favonigobius* Whitley 1930

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 15–17 rays. Distinctive, more-or-less pointed snout. Sensory papillae in longitudinal pattern, but variable. LSS 24–27; predorsal area naked to fully scaly up to eyes. Gill opening moderate, reaching to about middle of opercle or restricted to pectoral-fin base. Body finely spotted and speckled. Lives on fine-grained sand in shallow estuaries, tidal sand flats, close to mangroves or along sandy beaches, and sometimes on coral reefs. About 10 species, 2 in WIO.

KEY TO SPECIES

- 1a Predorsal area naked; second spine of 1st dorsal fin never elongate; males with black spot dorsally on caudal fin, and often with black on branchiostegal membranes *F. melanobranchus*
- 1b Predorsal scales 1 or 2; second spine of 1st dorsal fin elongate, thread-like in males; males without black spot on upper part of caudal fin, and branchiostegal membranes always pale *F. reichei*

Favonigobius melanobranchus (Fowler 1934)

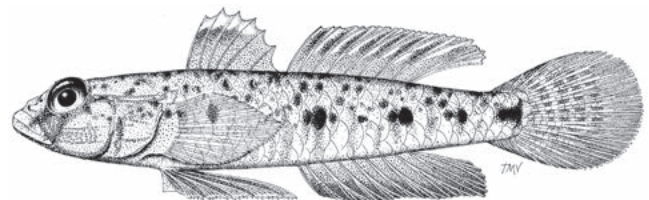
Blackthroat sandgoby

PLATE 19

Rhinogobius melanobranchus Fowler 1934: 82, Figs. 24–25 (Denpasar, Bali, Indonesia).
Acentrogobius neilli: Smith 1959 [in part].
Silhouettea chaimi Goren 1978: 197, Fig. 4 (Nabek, Sinai, Egypt, Gulf of Aqaba, Red Sea); Goren 1979*.
Favonigobius melanobranchus: SSF No. 240.37*; Randall *et al.* 1994.
Papillogobius melanobranchus: Randall 1995*; Bogorodsky *et al.* 2011*.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15–17 rays. LSS 26 or 27; TRB 7; predorsal area naked. Cheek with 5–7 irregular rows of papillae between 2 lowermost rows. Gill opening to just in front of pectoral-fin base.

Body yellowish white, with brown spots and speckling; black spot on upper edge of caudal fin present in both sexes, but less distinct in females; adult males with distinctive blackish gill membranes. Attains 46 mm SL.



Favonigobius melanobranchus, 30 mm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, Gulf of Suez and Lessepsian migrant to Mediterranean Sea, Mozambique, South Africa (Umngeni River estuary, KwaZulu-Natal) and Seychelles; elsewhere to Indonesia and northern Australia.

REMARKS Common near sandy beaches and reef flats. IUCN Red List conservation status Near Threatened.

Favonigobius reichei (Bleeker 1854)

Tropical sandgoby

PLATE 19

Gobius reichei Bleeker 1854: 509 (Pandang, Sumatra [Sumatera Barat, Indonesia]).

Gobius petersii Steindachner 1866: 781, Pl. 18, Fig. 7 (Zanzibar, Tanzania).

?*Gobius koseirensis* Klunzinger 1871: 474 (Red Sea); Smith 1959.

Gobius zanzibarensis Liénard in Sauvage 1891: 365, Pl. 41, Fig. 1 (Zanzibar [possibly Madagascar]).

Rhinogobius robinsoni Fowler 1934: 428, Fig. 13 (KwaZulu-Natal, South Africa).

Acentrogobius reichei: Smith 1959*, 1960*; Smith & Smith 1963*.

Acentrogobius neilli: Smith 1959* [in part]; Smith & Smith 1963*.

Pomatoschistus bacescui Nalbant & Mayer 1975: 237, Pl. 2,

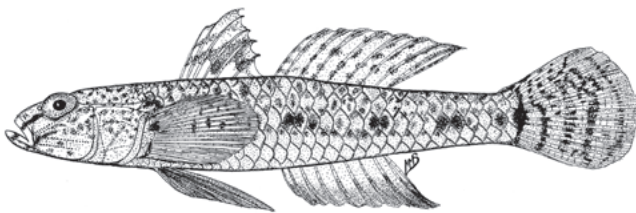
Fig. 5 (Bagamoyo, Tanzania).

Favonigobius reichei: Hoese & Winterbottom 1979; Mauge 1986; SSF No. 240.38*; Randall & Goren 1993*; Whitfield 1998*.

Papillogobius reichei: Terashima *et al.* 2001*.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 15–17 rays; LSS 25–27; TRB 8 or 9; predorsal scales 1 or 2. Second spine of 1st dorsal fin extremely elongate, thread-like in males; caudal fin rounded.

Body with small spots: sides with 4 or 5 groups of tiny spots, last spot a penduncle often paired (distinguished by no black spot on upper edge of caudal fin), and median fins spotted; paired fins pale; adult males with white gill membranes, and often dusky dorsal, anal and pelvic fins. Attains 65 mm SL.



Favonigobius reichei, 50 mm TL (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Tanzania (Zanzibar) to South Africa (KwaZulu-Natal: uncommon), Seychelles, Mauritius and Maldives; elsewhere, Indonesia to New Caledonia and Palau.

REMARKS Common in sandy areas, such as along beaches and reef flats. Relatively large-sized (adults twice the size of *F. melanobranchus*).

GENUS *Feia* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14–16 rays; pelvic fins fused, and pelvic frenum present or absent. Body scales cycloid or ctenoid; predorsal area, head, pectoral-fin bases, breast and belly naked; LSS 14–27; TRB 9–11. Head depressed, relatively broad; no lateral canal pores. Sensory papillae elongate, papillose and conspicuous; papillae on chin in 2 narrow V-shaped rows; papillae on sides of body in vertical rows. Gill opening to pectoral-fin base or under opercle. Four species, 1 in WIO.

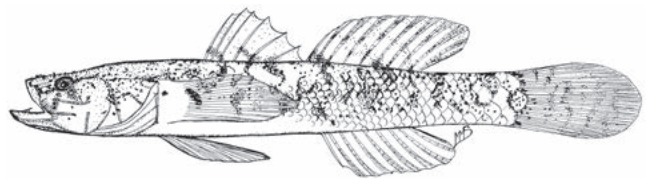
Feia nympha Smith 1959

Feia goby

Feia nympha Smith 1959: 206, Fig. 24 (Pinda, Mozambique); Lachner & McKinney 1979*; Winterbottom & Emery 1986; Randall & Van Egmond 1994; Winterbottom & Anderson 1997; Bogorodsky *et al.* 2010*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14 or 15 rays; pelvic fins joined for most their length, and pelvic frenum present but may be reduced; caudal fin rounded. LSS 14–22; TRB 9–11; scales cycloid; predorsal area and anterior half of body naked. Sensory papillae on head slender and papillose, but no distinct barbels present.

Body yellowish white, with scattered brown spots and ~7 indistinct bars or saddles on back; diffuse dark bar from eye across cheek. Attains 20 mm SL.



Feia nympha, 25 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique (Pinda), Seychelles and Chagos; elsewhere to French Polynesia.

REMARKS Occupies coral-reef crevices, at 4–16 m.

GENUS *Fusigobius* Whitley 1930

First dorsal fin 6 spines, and fin moderately tall in most species; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 7–10 rays; pectoral fins 17–20 rays; pelvic fins fully to partly joined, or entirely separate, and pelvic frenum present or absent. Body scales easily shed; predorsal area scaly or naked; cheek and usually opercle naked; LSS 23–25; TRB 7. Snout pointed; jaws moderate, nearly horizontal to slightly oblique. Sensory papillae usually in reduced transverse pattern (some species with reduced longitudinal pattern). Live fish generally translucent, with indistinct pale brown to orange spots, and usually with conspicuous pattern on 1st dorsal fin. Gill opening restricted to pectoral-fin base; 1st gill arch $\frac{1}{3}$ – $\frac{1}{2}$ bound by membrane. Usually inhabits sandy areas of coral reefs. About 11 species, 7 in WIO.

KEY TO SPECIES

- 1a Portion of oculoscapular canal immediately behind eye with 4 pores in total, and short separate tube over opercle; opercle with 1 large scale (easily lost); peduncle with narrow vertical black bar anterior to black spot at caudal-fin base ... *F. neophytus*
- 1b Portion of oculoscapular canal immediately behind eye with 3 pores, and short separate tube over opercle; opercle naked; peduncle without vertical black bar, and caudal-fin base with or without spot 2
- 2a First dorsal fin with 2 or 3 distinct black spots or blotches, joined by dark line to dorsum; pelvic frenum rudimentary or absent *F. duospilus*
- 2b First dorsal fin with 1 black spot anteriorly, other brownish or orange spots may be present, but no dark line joining black spot to base of 1st dorsal fin; pelvic frenum present, but fragile and easily torn 3
- 3a Posterior nostrils adjacent to eyes; conspicuous round black spot above pectoral-fin bases *F. humeralis*
- 3b Posterior nostrils closer to upper margin of upper lip than to eyes; no round black spot above pectoral-fin bases, but sometimes with brown to orange spot just above and behind fin bases 4
- 4a Spines 1–2 of 1st dorsal fin always longest in adults (may be subequal in small fish), and first spine greatly elongate in males; 1st dorsal fin pointed, with dusky spots, or dusky first spine and no distinct small black spot anteriorly 5
- 4b Spines 1–2 of 1st dorsal fin not elongate or filamentous in adults; 1st dorsal fin rounded, with small black spot anteriorly 6

Continued ...

KEY TO SPECIES

- 5a Pectoral fins 17 or (usually) 18 rays; in preserved specimens, dark spot at caudal-fin base not much darker than other spots on body; nape midline always naked *F. longispinus*
- 5b Pectoral fins 18–20 (usually 19) rays; in preserved specimens, black spot at caudal-fin base much darker than other spots on body; nape midline naked or scaly to behind eyes *F. inframaculatus*
- 6a Dusky-rimmed orange-yellow spots on head, body and fins when live (may remain discernible in preserved specimens); oval black spot about midway up membrane between 1st and 2nd spines of 1st dorsal fin; black spot at caudal-fin base; pectoral fins 17–19 rays *F. maximus*
- 6b Orange-yellow spots on head, body and fins when live (faded in preserved specimens); small black spot on membrane near tips of 1st and 2nd spines of 1st dorsal fin; no distinct black spot at caudal-fin base; pectoral fins 19 or 20 rays *F. pallidus*

Fusigobius duospilus Hoese & Reader 1985

Two-spot fusegoby

PLATE 19

Fusigobius neophytus africanus Smith 1959: 208, Pl. 11, Fig. F (Ibo I., Mozambique).

Fusigobius duospilus Hoese & Reader 1985: 2, Figs. 1–2

(Escape Reef, Great Barrier Reef, Australia); SSF No. 240.39*;

Winterbottom & Emery 1986*; Randall & Anderson 1993;

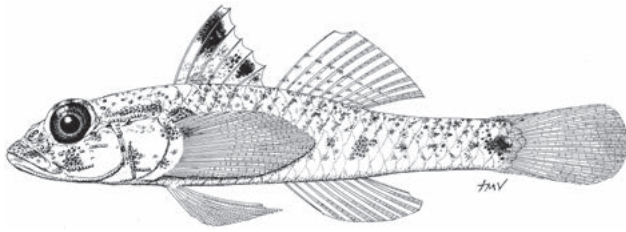
Randall & Goren 1993*; Winterbottom & Anderson 1997; Kuitert 1998*.

Fusigobius sp. A: Winterbottom & Emery 1986*.

Coryphopterus duospilus: Fricke 1999.

Second dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 17–20 rays; pelvic fins joined by fragile membrane for most length of 5th ray, which is shorter than 4th ray, and pelvic frenum rudimentary. LSS 22–25; TRB 7 or 8; predorsal midline naked; scales on side of nape extend to just over opercle. Lower half of 1st gill arch bound to opercle by membrane.

Head and body translucent (preserved specimens opaque white), with alternating silvery white and dusky areas along vertebral column; surface of body with fine dusky and orange-brown speckles (pale brown in preserved specimens); sometimes with diffuse dusky bar under eye; 2 distinct black spots on 1st dorsal fin, anterior spot may be vertically elongate, and posterior spot rounded and set between 5th and 6th spines (each black spot may break into a large and small spot); caudal-fin base with small blackish spot or triangular blotch. Attains 46 mm SL.



Fusigobius duospilus, 30 mm TL, paratype (South Africa).
Source: Hoese & Reader 1985

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (Aliwal Shoal), Comoros, Seychelles, Mauritius, Chagos and Maldives; elsewhere to Indonesia, Society Is. and Hawaii.

REMARKS Occurs on clear-water oceanic coral reefs and reef slopes, over sand, at 1–42 m.

Fusigobius humeralis (Randall 2001)

Shoulderspot fusegoby

PLATE 19

Fusigobius sp. B: Winterbottom & Emery 1986*.
Fusigobius sp. 2: Randall & Anderson 1993; Randall & Goren 1993*.
Fusigobius DFH sp. 8: Winterbottom & Anderson 1997.
Coryphopterus humeralis Randall 2001: 212, Figs. 5–6
(Embudu I., Malé, Maldives).

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–19 rays; pelvic fins usually joined (sometimes partly separate), and pelvic frenum low or absent. LSS 22–25; TRB 7 or 8; predorsal area naked, except 1 or 2 scales may be present just above opercle. Lower third of 1st gill arch bound by membrane to opercle.

Head and body whitish, with many small orange spots, and spots on head sometimes forming oblique blotches; distinct black round spot just above and slightly behind top of pectoral-fin bases; dark brown to blackish round spot centred on caudal-fin base; 1st dorsal fin with irregular orange-brown to blackish vertical to slightly oblique streak or blotch anteriorly. Attains 34 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, South Africa (Sodwana Bay), Comoros, Chagos and Maldives; elsewhere, Thailand to French Polynesia.

REMARKS Found in lagoon reef habitats, at 1–32 m.

Fusigobius inframaculatus (Randall 1994)

Innerspot fusegoby

PLATE 19

Coryphopterus inframaculatus Randall 1994: 331, Fig. 3, Pls. 12–13
(Jana I., Saudi Arabia, Persian/Arabian Gulf); Randall 1995*.

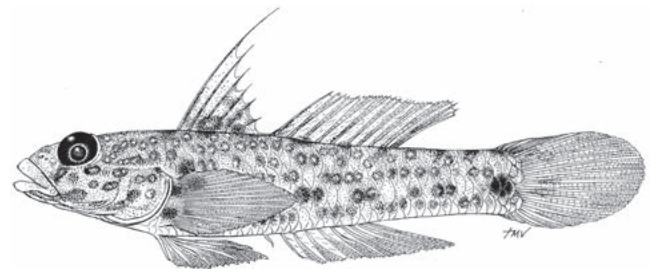
Fusigobius inframaculatus: Winterbottom & Anderson 1997*;
Anderson *et al.* 1998*; Kuitert 1998*; Debelius 1999* [in part: larger photo];
Heemstra *et al.* 2004.

Fusigobius longispinus: SSF No. 240.40* [in part].

Coryphopterus longispinus: Fricke 1999 [in part].

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 18–20 rays; pelvic fins fused to partly separate, and pelvic frenum low or very thin. LSS 22–26; TRB 7 or 8; predorsal scales 6–8, crossing nape midline to close behind eyes, or midline naked (specimens from Persian/Arabian Gulf and Oman). Spines 1–2 of 1st dorsal fin elongate, 1st spine longest (except in some juveniles) and much longer in males than in females, 4th spine $\sim\frac{3}{4}$ length of 1st spine. Lower half of 1st gill arch bound to opercle by membrane.

Head and body translucent (preserved specimens opaque white), with dark-edged orange spots, more elongate on head and forming pairs along midsides of body; 3 or 4 internal black spots may be visible through body wall; 1st dorsal fin with brown-edged orange spots, and spots along first spine often brown; dark orange to pale brown blotch on sides behind pectoral-fin bases; distinct large black spot on caudal-fin base, extending onto fin. Attains 67 mm SL.



Fusigobius inframaculatus, 62 mm SL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Kenya, Mozambique, South Africa (Aliwal Shoal), Comoros, Seychelles, Mauritius, St Brandon Shoals, Rodrigues, Chagos and Maldives; elsewhere, Thailand to Marquesas Is.

REMARKS Found over sand and sandy rubble, at 2–30 m.

Fusigobius longispinus Goren 1978

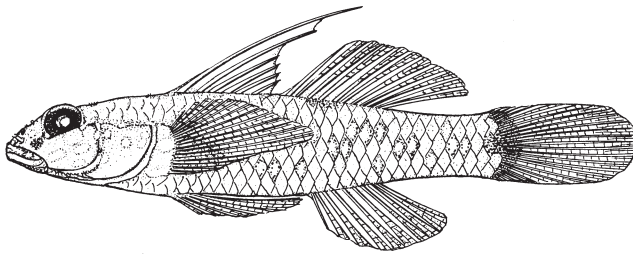
Longspine fusegoby

PLATE 19

Fusigobius longispinus Goren 1978: 201, Fig. 7 (Eilat, Israel, Gulf of Aqaba, Red Sea); Goren 1979*; Dor 1984; SSF No. 240.40 [in part]; ?Eichler & Lieske 1994*; Randall 1994*; Khalaf & Disi 1997*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 17 or 18 rays; pelvic fins fused to partly separate, and pelvic frenum greatly reduced, low and thin (may be partly covered by pre-pelvic scale) or absent. LSS 25; TRB 7; predorsal scales 6, present on sides only, nape midline naked. First spine of 1st dorsal fin elongate, second spine less so (50–70% length of first spine). Lower half of 1st gill arch bound to opercle by membrane.

Head and body translucent (preserved specimens white), with dusky-edged orange to dark yellow spots, more elongate on sides of head and forming pairs along midsides of body; 2nd dorsal fin translucent, with orange spots; dark orange to pale brown blotch on sides just behind pectoral-fin bases; brown spot on caudal-fin base, no darker than spots on body. Attains 51 mm SL.



Fusigobius longispinus, 40 mm TL, holotype (Gulf of Aqaba).
Source: Goren 1978

DISTRIBUTION WIO: Red Sea, including Gulf of Aqaba.

REMARKS Found on seaward reefs, at 9–18 m.

Fusigobius maximus (Randall 2001)

Big fusegoby

PLATE 20

Coryphopterus maximus Randall 2001: 215, Figs. 10–11
(off Dumaguete City, Negros, Philippines, Mindanao Sea).
Fusigobius maximus: Fricke *et al.* 2009.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17–19 rays; pelvic fins fused, and pelvic frenum thin but well-developed. LSS 25–27; TRB 7 or 8; predorsal area mostly naked, sides of nape with 4–7 scale rows; opercle without scales. Lower third of 1st gill arch bound to opercle by membrane.

Head and body translucent (preserved specimens white), with dark-edged dark yellow to orange spots, forming pairs along midsides of body; 3 or 4 internal black spots may be visible through body wall; 1st dorsal fin with brownish orange spots, and oval black spot between 1st and 2nd spines; dark orange to pale brown blotch on sides behind pectoral-fin bases; distinct black spot on caudal-fin base. Attains 75 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Oman, Red Sea, Madagascar, Comoros, Seychelles, Réunion (photographs only), Maldives and Sri Lanka; elsewhere to Coral Sea.

REMARKS Found over sand and rubble, at 3–23 m.

Fusigobius neophytus (Günther 1877)

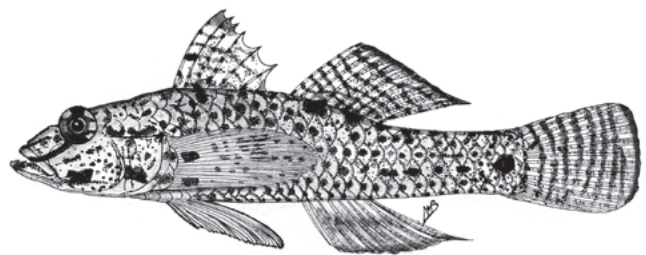
African fusegoby

PLATE 20

Gobius neophytus Günther 1877: 174, Pl. 108e (Pohnpei, Micronesia; Apia, Upolu I., Samoa; Huahine and Tahiti, Society Is.).
Fusigobius neophytus africanus Smith 1959: 208, Pl. 11f (Ibo I., Mozambique) [in part]; Smith & Smith 1963*; Goren 1979*; Dor 1984.
Fusigobius africanus: Smith 1961; Hoese & Winterbottom 1979.
Fusigobius neophytus: Goren 1986; SSF No. 240.41*; Winterbottom & Emery 1986*; Allen & Steene 1987*; Randall & Anderson 1993; Randall & Goren 1993*; Winterbottom & Anderson 1997; Kuitert 1998*.
Coryphopterus neophytus: Randall 1995*; Field & Field 1998*.
Fusigobius ?africanus: Kuitert 1998*.
Fusigobius ?neophytus: Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17–19 rays; pelvic fins fused, and pelvic frenum variably developed: may be reduced to low fold or absent. LSS 21–26; TRB 7–9; predorsal scales 5 or 6, on nape to close behind eyes, midline naked; opercle with single large cycloid scale (easily detached). Lower quarter of 1st gill arch bound to opercle by membrane.

Head and body translucent (white when preserved), with small dusky brown to dark orange spots in loose lines (spots brownish in preserved fish); small black spot between 1st and 2nd spines of 1st dorsal fin; mid-peduncle with narrow black vertical bar, and black spot on caudal-fin base. Attains 69 mm SL.



Fusigobius neophytus, 64 mm TL, holotype of *F. n. africanus* (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea, Mozambique, Comoros, Aldabra, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to southern Japan, Micronesia, New Caledonia, Tahiti and Samoa.

REMARKS Found in coral-reef lagoon habitats, at 1–20 m. Indian Ocean specimens tend to be more heavily pigmented than fish from the Pacific Ocean; further research is required to establish whether *F. africanus* is a separate, valid species.

Fusigobius pallidus (Randall 2001)

Orange-spotted fusegoby

PLATE 20

Fusigobius sp.: Allen & Steene 1987*.

Fusigobius sp. 1: Randall & Anderson 1993; Randall & Goren 1993*.

Fusigobius longispinus: Debelius 1993*, 1999*.

Fusigobius sp. 1: Kuitert 1998*.

Coryphopterus pallidus Randall 2001: 221, Figs. 16–17
(lagoon at Chesterfield Is., Coral Sea).

Fusigobius pallidus: Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 19 or 20 rays; pelvic fins joined at least halfway, and pelvic frenum low and thin. LSS 23–27; TRB 7 or 8; nape mostly naked, with 6 scale rows on sides. First dorsal fin low, margin rounded. Lower $\frac{1}{3}$ – $\frac{1}{2}$ of 1st gill arch bound to opercle by membrane.

Head and body translucent (preserved specimens whitish), scattered with small round pale orange or dark yellow spots; distinctive round black to blue-black spot between spines 1 and 2 of 1st dorsal fin. Attains ~65 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Tanzania, Comoros, Rodrigues, Mauritius and Maldives; elsewhere, Andaman Sea to New Caledonia.

REMARKS Found on reefs, over sand and rubble, at 10–48 m.

GENUS *Gladiogobius* Herre 1933

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–19 rays; pelvic fins partly joined, and no pelvic frenum. Body scales ctenoid; head and

pectoral-fin bases naked; LSS 26–28. Sensory papillae on head in transverse pattern; oculoscapular canal on sides of head mostly complete; 4 preopercular pores. Large straight spine on lower margin of preopercle, reaching back to pectoral-fin base. Narrow fleshy crest on nape midline may be developed. Gill opening to under opercle. Three species, 1 in WIO.

Gladiogobius rex Shibukawa & Allen 2007

King goby

PLATE 20

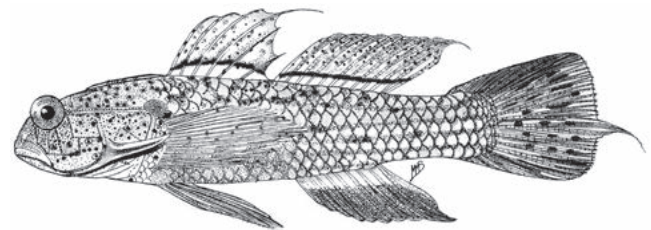
Gladiogobius ensifer: Smith 1956, 1959*; Smith & Smith 1963*;

Goren 1979*, 1986; Dor 1984; Anderson *et al.* 1998*; Kuitert 1998*.

Gladiogobius rex Shibukawa & Allen 2007: 204, Figs. 1c, 2c (Laem Phanwa, southern Phuket, Thailand).

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–19 rays; caudal fin rounded. LSS 26–28; TRB 8 or 9; head and predorsal area naked. Eyes set high on head, forming part of profile. Spines of 1st dorsal fin elongate, often filamentous.

Head and body pale greenish blue to whitish, with 4 or 5 brownish rectangular blotches along lower sides of body; scales on body with short dark streak or faint spot on rear edges; diffuse brownish to purplish brown horizontal streak through eyes, giving mask-like appearance, and sometimes another similarly coloured oblique streak on lower part of preopercle; upper lip sometimes dusky; large brown spot above pectoral-fin bases. Attains 39 mm SL.



Gladiogobius rex, 46 mm TL. Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Madagascar, Aldabra, Seychelles and Maldives; elsewhere, Thailand and Indonesia.

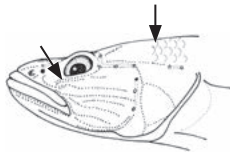
REMARKS Inhabits shallow reefs, tidal flats, estuaries or areas near stream mouths, on mud, silt or sand bottoms, to ~4 m deep.

GENUS *Glossogobius* Gill 1862

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–11 rays; anal fin 1 spine, 7–9 rays; pectoral fins 14–22 rays. Body scales ctenoid; predorsal scales 0–29, and sides of head usually naked; LSS 25–35. Head depressed; snout and jaws long. Lateral canals and pores present; oculoscapular canal present over opercle; 3 preopercle pores. TRB 7–13. Sensory papillae in longitudinal pattern (except one species); papillae in rows on cheek often doubled or proliferated. Gill opening wide, from rear edge of preopercle to below rear of eye. Tongue-tip bilobate. Found in estuarine to freshwater habitats. At least 32 species in Indo-Pacific, at least 4 in WIO. In addition, *G. ankaranensis* Banister 1994 is restricted to freshwater in Madagascar.

KEY TO SPECIES

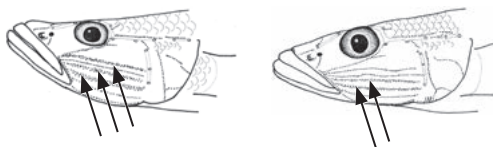
- 1a Predorsal area either naked or with up to 13 scale rows, which do not extend dorsally over preopercle; elongate dusky to black blotch on rear of 1st dorsal fin; distinct single or double dark blotch at caudal-fin base; papillae rows on cheek single, except double row directly under eye *G. callidus*



- 1b Predorsal area scaly to above preopercle or behind eyes, with 13–30 scale rows; no dusky or black spot on 1st dorsal fin posteriorly, but juveniles may have black blotch or band along fin margin; papillae rows on cheek single or double, including single or double row directly under eye 2

- 2a Predorsal scales reach to above preopercle margin but not to eyes; predorsal scales 11–17; rows of papillae on cheek as well as rows on underside of head all single 3

- 2b Predorsal scales reach to close behind eyes; predorsal scales 17–30; 2 or 3 rows of papillae on cheek as well as rows on underside of head all doubled *G. giuris*

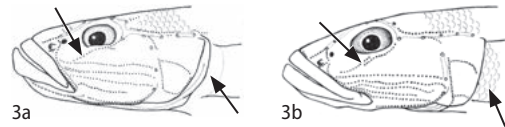


- 3a Pectoral fins 18–21 (usually 19 or 20) rays; pectoral-fin bases naked or with few cycloid scales; single row of papillae directly under each eye, but row may have additional short branch *G. tenuiformis*

Continued ...

KEY TO SPECIES

- 3b Pectoral fins 18 or 19 rays; pectoral-fin bases usually covered with cycloid scales; row of papillae directly under each eye usually broken and forming 2 overlapping rows *G. kokius*



Glossogobius callidus (Smith 1937)

River flathead goby

PLATE 20

Gobius gulosus Smith 1936: 49, Fig. 2 (Bushman's River, Alicedale, Eastern Cape, South Africa).

Glossogobius callidus Smith 1937: 197 [replacement name for *Gobius gulosus* Smith, preoccupied]; Hoese 1986.

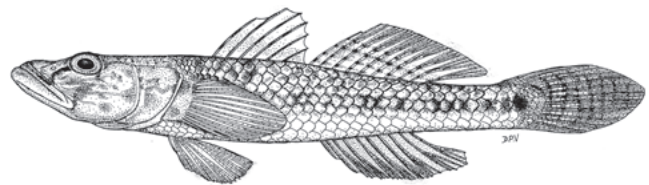
Gobius giuris: Smith 1949* [in part], 1961* [in part].

Glossogobius giuris: SFSA No. 919* [in part]; Smith & Smith 1963* [in part].

Glossogobius callidus: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.43* [in part]; Skelton 1993*; Whitfield 1998* [in part].

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–19 rays. LSS 27–32; TRB 8½–10; predorsal scales 0–15, not reaching forward to above preopercle; cheek and opercle naked. First dorsal-fin spines not filamentous. Adults often have fat-cheeked appearance.

Head and body pale brown to yellowish brown, with 7–9 narrow chevrons or X-shaped dark brown blotches along sides; 2 dark brown oblique stripes from front of eyes to jaws; moderate to large dark brown to black blotch on rear of 1st dorsal fin; elongate or double dark brown blotch at caudal-fin base. Attains 85 mm SL.



Glossogobius callidus, 56 mm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: Malawi (Lower Shire River), Mozambique (Zambezi River) to South Africa (Swartvlei system, Western Cape), Madagascar and Aldabra.

REMARKS Common; occurs in both still and moving freshwater, riverine pools, coastal rivers and estuaries, among cobble or vegetation cover. Co-occurs with *G. giuris* in Phongolo River system (South Africa). Another undescribed species from South Africa and Madagascar is confused with *G. callidus*, but it has a deeper head and body, shorter jaws, and colour-pattern differences.

Glossogobius giuris (Hamilton 1822)

Tank goby

PLATE 20

Gobius giuris Hamilton 1822: 51, 366, Pl. 33, Fig. 15 (Ganges River, India); Sauvage 1891*; SFSA No. 919* [in part]; Smith 1961* [in part]; Fricke 1999.

Gobius russelii Cuvier 1829: 244 (Puducherry, India).

Gobius catebus Valenciennes in Cuv. & Val. 1837: 76 (Yangon, Myanmar; Bengal, Puducherry and Malabar, India).

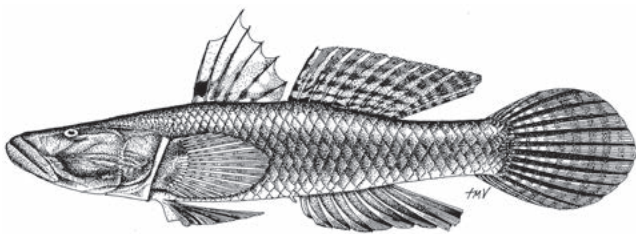
Gobius platycephalus Peters 1852: 681 (Boror, Mozambique).

Gobius grandidierii Playfair 1868: 10 (Morondava River, Madagascar).

Glossogobius giuris: SFSA No. 919 [in part]*; Smith & Smith 1963 [in part]; Hoese & Winterbottom 1979; Hoda 1980*; Maugé 1986; SSF No. 240.44*; Skelton 1993*; Keith *et al.* 1999*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7–9 rays; pectoral fins 17–22 rays. LSS 29–35; TRB 8½–11; predorsal scales 14–25, reaching forward to or just behind eyes; opercle with patch of cycloid scales dorsally; preopercle naked or with small patch of scales behind eyes in large adults. First dorsal fin of adults may have at least 2nd spine filamentous, but not greatly so.

Head and body pale brown to yellowish brown, with 4–7 rounded to elongate dark brown blotches on sides, and large dark brown triangular to elongate blotch on caudal-fin base (partly extending onto fin); 1st dorsal fin with distinct dark brown to blackish spot near base of 1st spine (small specimens <55 mm SL with black band across tips of spines or black blotch over top of fin; black pigment remains on spines only in adults). Attains 35 cm SL.



Glossogobius giuris, 23 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Pakistan, Red Sea, East Africa to South Africa (Mthatha River mouth), Madagascar, Aldabra, Seychelles and Réunion; elsewhere, east coast of India to northern Australia and Solomon Is.

REMARKS Enters estuaries and freshwater river systems far inland. Relatively large-sized. Is under review as several species are confused under this name.

Glossogobius kokius (Valenciennes 1837)

Mauritius flathead goby

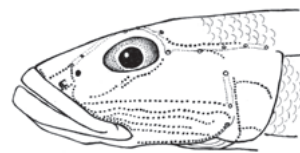
Gobius kokius Valenciennes in Cuv. & Val. 1837: 68 (Malabar and Puducherry, India; Alappuzha, India; Mauritius, Mascarenes).

Gobius filus Valenciennes in Cuv. & Val. 1837: 78 (Mauritius, Mascarenes); Smith 1959.

Glossogobius kokius: Akihito & Meguro 1975*; Maugé 1986; Fricke 1999.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–20 rays. LSS 24–33; TRB 9 or 10; predorsal scales 14–17, cycloid, and reaching to just in front of rear edge of preopercle; cheek naked; opercle naked or with very small patch of cycloid scales anterodorsally. Second spine of 1st dorsal fin longest, filamentous in males.

Head and body brownish, with darker brown spots and mottling; midsides of body with 5 dark brown X-shaped blotches (some appear doubled); 1st dorsal fin with rows of dark spots forming indistinct bands; caudal-fin base with short vertical dark bar or crescent, which may coalesce with posteriormost midside X-shaped blotch. Attains 95 mm SL.



Glossogobius kokius, 13 mm SL, syntype (Mauritius).

DISTRIBUTION WIO: certain only from Mauritius.

REMARKS Poorly known, probably often confused with *G. giuris*; two of the syntypes from India are a different species.

Glossogobius tenuiformis Fowler 1934

Natal flathead goby

PLATE 20

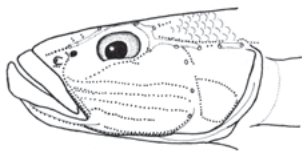
Glossogobius tenuiformis Fowler 1934: 496, Fig. 49 (St Lucia Lake, KwaZulu-Natal, South Africa).

Glossogobius giuris: SSF No. 240.44* [in part].

Glossogobius callidus: Whitfield 1998* [in part].

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 18–21 rays. LSS 28–30; TRB 9 or 10; predorsal scales 11–16, cycloid, and reaching above or just before rear edge of preopercle; cheek and opercle naked. Second spine of 1st dorsal fin filamentous.

Head and body yellowish brown to pale brown, covered in fine orange to red speckles dorsolaterally; 4–8 pairs of small dark brown vertically elongate blotches along sides, may be interspersed with smaller brown spots; 1st dorsal fin without black blotch or band distally, but irregular dusky band along base of fin may form dark spot at base of 1st spine; small dark brown blotch at caudal-fin base and 2 similar spots on base of fin may coalesce to form Y-shaped blotch. Attains 74 mm SL.



Glossogobius tenuiformis, 60 mm SL (South Africa).

DISTRIBUTION WIO: endemic to South Africa, Izotsha River mouth to Richards Bay, KwaZulu-Natal.

REMARKS Found in estuaries and freshwater. Has been confused with *G. callidus* and *G. giuris* from South African coastal rivers; a specimen resembling this species has been collected from Réunion.

GENUS *Gobiodon* Bleeker 1856

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–12 rays; anal fin 1 spine, 8–11 rays; pectoral fins 16–20 rays. Head and body compressed, sometimes quite narrow; head, body and most of fins covered with thick mucus, and the skin includes tetrodotoxin (a potent neurotoxin); no scales (except 1 species with a few scales). Teeth very small, pointed and even, but those in outer row may be somewhat enlarged; 1 or 2 pairs of large canine-like teeth behind tooth rows at front of lower jaw. No oculoscapular canal over opercle; sensory papillae

in reduced longitudinal pattern. Often brightly coloured; several species display two colour forms, which may represent distinct species. Obligate commensals among branching hard corals, especially *Acropora*. About 20 species, in Indo-Pacific, some undescribed; at least 14 species (1 of these undescribed) in WIO.

KEY TO SPECIES

- 1a Underside of head with distinct deep groove on each side of isthmus; teeth in upper jaw enlarged anteriorly, and tip of lower jaw may be fleshy and turned downward 2
- 1b No distinct groove on underside of head (except short groove may be present in *G. prolixus*); tip of lower jaw not downturned 9
- 2a Groove on underside of head bent to side anteriorly; body green when live, with distinct red spots and/or broad stripes; single row of tiny scales embedded along midsides of body *G. histrio*
- 2b Groove on underside of head straight, not bent anteriorly; colour pattern not as above; sides of body always scaleless 3
- 3a Dense black to dark brown spot at upper edge of opercular membrane 4
- 3b No dense dark spot at upper edge of opercular membrane, or fish entirely black 6
- 4a Spines 1–2 of 1st dorsal fin usually longest; live fish bright yellow to greenish yellow, with 3 or 4 vertical blue lines on head *G. citrinus*
- 4b Spines 1–2 of 1st dorsal fin usually shorter than spines 3 or 4 5
- 5a Sides of head with 2–4 pale vertical bars; dorsal- and anal-fin bases with broad white stripe (occasionally obscured by mucous coat); 1st dorsal fin low, with rounded to straight margin *G. albolineatus*
- 5b Sides of head with 4 or 5 narrow, vertical, red to orange bands; 1st dorsal fin low and rounded *G. axillaris*
- 6a Head and body plain black (preserved specimens plain dark grey), and iris black; anal-fin base relatively short, and fin usually with long anterior rays which may give it rhomboid shape *G. ater*
- 6b Head and body with observable stripes or bars (live and preserved fish), and iris golden, blue or pale; anal-fin shape not as above 7

Continued ...

KEY TO SPECIES

- 7a Upper rear edge of eye followed by 2 short oblique dusky bars with pale area between them; no vertical bars from eye crossing cheek; forehead steep, sometimes with fleshy median crest from eyes to 1st dorsal-fin origin *G. micropus*
- 7b No short dusky bars or oblique marking behind upper rear edge of eye, although vertical bars crossing cheek may be present; forehead rounded and without fleshy crest 8
- 8a Head and body plain reddish brown to purplish brown, with greenish sheen on back, and eyes pale blue (live fish); no pale stripe along dorsal- and anal-fin bases; caudal fin and 2nd dorsal fin with pale to translucent margin *G. fuscuber*
- 8b Head and body plain brown to purplish brown, with diffuse pale stripe along dorsal- and anal-fin bases; caudal fin and 2nd dorsal fin without pale margin *Gobiodon* sp.
- 9a Body covered with small rounded pale spots on dark reticulate background; head and pectoral-fin bases with narrow, vertical, blue to whitish bars; dorsal fins and anal fin with dark-edged pale stripe along bases *G. reticulatus*
- 9b No pale spots on body, or else irregular red spots and lines only on upper half of body (juveniles and subadults of *G. irregularis*); head with vertical blue lines or red bars below eyes; dorsal- and anal-fin bases without band (except with narrow bluish line in some subadults of *G. bilineatus*) 10
- 10a Head and body plain reddish brown, without any pale spots or bars except narrow pale stripe along bases of dorsal and anal fins; iris with red and blue bars; juveniles with 2 dark-margined blue bars through eye and cheek *G. bilineatus*
- 10b Body plain but for several blue to pale vertical lines crossing head and pectoral-fin bases, and may have pale stripe along dorsal- and anal-fin bases 11
- 11a Body slender (28–36% SL), head broad and profile bluntly rounded, and may have short groove on isthmus; head and body greenish to orange-brown, with 5 bluish white vertical lines crossing head and pectoral-fin bases (but never on body behind pectoral fins); may have pale stripe along dorsal- and anal-fin bases; juveniles with variable number of short wavy to straight vertical lines on sides *G. prolixus*
- 11b Body relatively deep (34–41% SL), head compressed; head with 5 or more vertical lines, and sometimes with 1 or more short vertical bars on body behind pectoral fins (adults and juveniles) 12
- 12a Adults uniformly reddish brown; juveniles and subadults with red spots and irregular short blue lines on upper half of head and body; head with 3 orange-red bars below eyes (indistinct in adults) *G. irregularis*
- 12b Body red-brown to almost blackish, with 5 to many blue lines across head and pectoral-fin bases; juveniles may also have short blue wavy to straight lines on sides (not just on upper half of body) 13
- 13a Variable number of narrow, wavy, zigzagged, forked or straight blue lines on sides (juveniles and adults), and 5–8 narrow blue lines across head and pectoral-fin bases; body and fins red-brown, greenish or yellowish; some specimens with blue stripe along dorsal- and anal-fin bases *G. rivulatus*
- 13b Body red-brown to almost blackish, and head red; 5–7 (usually 5) blue lines across head and pectoral-fin bases; juveniles may also have variable number of short blue wavy to straight lines on sides; rarely with pale stripe along dorsal- and anal-fin bases *G. quinquestrigatus*

Gobiodon albolineatus Smith 1959

Red coralgoby

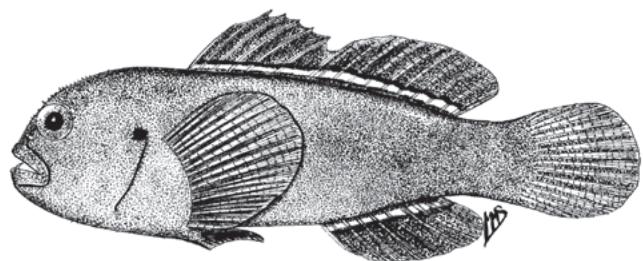
PLATE 22

Gobiodon albolineatus Smith 1959: 219, Fig. 38 (Assumption I., Seychelles); Smith & Smith 1963.*Gobiodon fulvus*: Winterbottom & Emery 1986*;
Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 18–20 rays. Head profile rounded; underside of head with straight groove between isthmus and interopercle. First dorsal fin low, margin straight or slightly rounded.

Head, body and fins brown; 2–4 pale vertical lines on sides of head, anteriormost 2 lines surrounding darker brown area from eyes to rear of jaw; dense black spot at upper rear corner

of opercle; dorsal- and anal-fin bases with dark-bordered broad white stripe. Attains 30 mm SL.

*Gobiodon albolineatus*, 30 mm TL, holotype (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Seychelles and Chagos; elsewhere, northern Australia and Solomon Is.

REMARKS Inhabits coral reefs, at 5–10 m. Resembles *G. fulvus* Herre 1927 from western Pacific, but has a differently shaped head.

Gobiodon ater Herler, Bogorodsky & Suzuki 2013

Black coralgoby

PLATE 21

Gobiodon ceramensis: Bamber 1915; Dor 1984; Goren 1986.

Gobiodon sp. 2: Herler & Hilgers 2005*.

Gobiodon ater Herler, Bogorodsky & Suzuki 2013: 314, Figs. 5–6 (Napoleon Reef, Dahab, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 rays, usually with long anterior rays and short fin base, giving fin rhomboid shape; pectoral fins 19 or 20 rays. Groove on underside of head.

Head and body plain black (live fish appear as dense black silhouettes); iris black, sometimes with narrow, dark gold outer rim. Attains 28 mm SL.



Gobiodon ater, 16 mm SL (Gulf of Aqaba). © J Herler

DISTRIBUTION Indo-Pacific. WIO: Red Sea and Maldives; elsewhere, Taiwan.

REMARKS Commensal with fine-branched *Acropora* corals; collected from shallow reef flats, at 1–1.5 m. Resembles and sometimes mistaken for *G. ceramensis* (Bleeker 1853) from western Pacific (e.g., Bamber 1915; Dor 1984; Goren 1986).

Gobiodon axillaris De Vis 1884

Redstriped coralgoby

PLATE 22

Gobiodon axillaris De Vis 1884: 448 (Banks Is., Vanuatu).

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 rays; pectoral fins 16 rays. Head greatly compressed, with rounded dorsal profile and small eyes; no groove on underside of head; enlarged teeth across front of upper jaw. First dorsal fin low, almost rectangular.

Head and body olive-brown, pinkish brown or yellowish brown; dense black spot at upper rear corner of opercle; sides of head with 3 or 4 narrow reddish bars, anteriormost bar crosses eye, posteriormost bar extends from opercular spot across front of pectoral-fin base; dorsal- and anal-fin bases with red to whitish stripe; bases of pectoral-fin rays sometimes reddish. Attains 38 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea and Socotra (off Yemen); elsewhere, Malaysia to Fiji.

REMARKS Associated with *Acropora* staghorn coral, usually on reef flats and exposed reef crests, at 1–3 m.

Gobiodon bilineatus Herler, Bogorodsky & Suzuki 2013

Two-lined coralgoby

PLATE 21

Gobiodon nr *unicolor*: Winterbottom & Emery 1986* [in part].

Gobiodon cf. *unicolor*: Winterbottom & Anderson 1997;

Heemstra *et al.* 2004.

Gobiodon sp. 1: Herler & Hilgers 2005* [in part]; Bogorodsky *et al.* 2010*.

Gobiodon bilineatus Herler, Bogorodsky & Suzuki 2013: 303, Figs. 1–2 (islands off Dahab, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8–10 rays; pectoral fins 18–20 rays. Head profile rounded; no groove on underside of head. First dorsal fin low.

Head and body plain rich reddish brown, sometimes with pale bluish stripe bordered with dull orange along dorsal- and anal-fin bases; iris red, with 2 distinctive bright blue bars; juveniles with 2 red-margined bluish bars through eye, partially extending towards cheek, and 3 or 4 thin blue lines crossing sides of head and pectoral-fin bases. Attains 36 mm SL.

DISTRIBUTION Red Sea and possibly Maldives in WIO; elsewhere, possibly Taiwan.

REMARKS Commensal with large *Acropora* corals, on reef slopes, at 1.5–12 m.

Gobiodon citrinus Rüppell 1838

Citron coralgoby

PLATE 22

Gobiodon citrinus Rüppell 1838: 139, Pl. 32, Fig. 4 (Massawa, Eritrea,

Red Sea); Smith 1959*, 1960; Smith & Smith 1963*; Hoese &

Winterbottom 1979; Randall 1983*; Kuronuma & Abe 1986;

SSF No. 240.47*; Allen & Steene 1987*; Debelius 1993*, 1998*, 1999*;

Randall & Goren 1993*; Eichler & Lieske 1994*; Randall 1995*; Field &

Field 1998*; Kuitert 1998*; Herler & Hilgers 2005*.

Gobius citrinus: Günther 1877*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–19 rays. Head profile steep; no groove on underside of head; no enlarged teeth in jaws. First dorsal fin tall, spines 1 and 2 usually longest.

Head and body usually yellow-green to bright yellow, sometimes greyish with yellow fin margins; head with 4 or 5 narrow blue bars with dusky edges; dense black spot at upper rear corner of opercle; blue stripe along dorsal- and anal-fin bases. Attains at least 50 mm SL.



Gobiodon citrinus, 51 mm SL (Gulf of Aqaba). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, East Africa to Mozambique (Maputo Bay), Madagascar, Aldabra, Seychelles, Mauritius, Réunion and Maldives; elsewhere throughout western Pacific to Austral Is.

REMARKS Found among branches of large *Acropora* tablecorals, with a whole colony of fish sometimes living within a single coral head, at 1.5–25 m.

Gobiodon fuscoruber

Herler, Bogorodsky & Suzuki 2013

Brown-red coralgoby

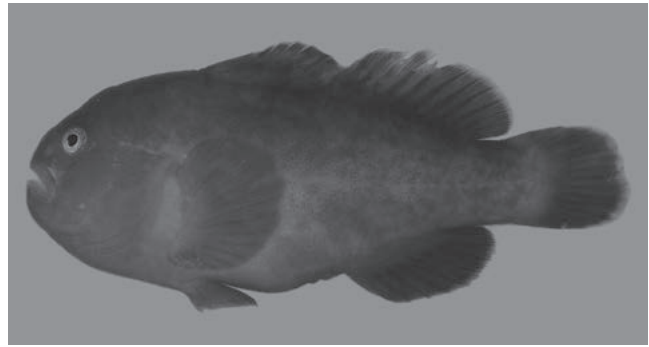
PLATES 21 & 22

Gobiodon sp. 3: Herler & Hilgers 2005*.

Gobiodon fuscoruber Herler, Bogorodsky & Suzuki 2013: 318, Figs. 7–8 (Dahab, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19 or 20 rays. Deep-bodied; head profile smoothly rounded; distinct straight groove on underside of head. Low skin fold present anteriorly along dorsal- and anal-fin bases. First dorsal fin low.

Body plain brown to purplish brown, head slightly paler and without distinct bars or spots in adults; eyes blue in life; fin margins translucent to whitish. Attains 38 mm SL.



Gobiodon fuscoruber, 37 mm SL, adult (Gulf of Aqaba). © J Herler

DISTRIBUTION Red Sea.

REMARKS Commensal with a range of corals, mostly *Acropora*, on reefs, at 3–25 m.

Gobiodon histrio (Valenciennes 1837)

Broadbarred coralgoby

PLATE 22

Gobius histrio Valenciennes (ex Kuhl & Van Hasselt) in Cuv. & Val. 1837:

132, Pl. 347 (Bantam and Java, Indonesia; Tongatapu, Tonga).

Gobiodon erythrosipilus: Marshall 1952.

Gobiodon rivulatus: Randall 1983*; Field & Field 1998*.

Gobiodon histrio: Herler & Hilgers 2005*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 rays; pectoral fins 19–21 rays. Head profile steep to rounded; groove on underside of head bent to one side at anterior end. First dorsal fin low and rounded.

Head and body green, bluish ventrally; head with 3 or 4 broad orange to reddish bars, and blackish to dark blue spot at upper rear corner of opercle; 2–6 irregular red to orange-red stripes on sides (stripes may break up into spots or be absent from lower half of body; in northern Red Sea form, the red stripes on body and head form loops and rings); fins greenish, paler toward margins; dorsal- and anal-fin bases with pale greenish to yellowish green band, bordered above with fine red spots, which may coalesce in 1st dorsal fin to form red edge on the pale band. Attains 37 mm SL.

DISTRIBUTION Red Sea; elsewhere, Indonesia to Tonga in western Pacific.

REMARKS Relies on *Acropora* corals as site for food, shelter and reproduction, and usually present as pair of adults on one coral colony.

Gobiodon irregularis Herler, Bogorodsky & Suzuki 2013

Rufous coralgoby

PLATES 21 & 22

Gobiodon nr *unicolor*: Winterbottom & Emery 1986* [in part].

Gobiodon cf. *unicolor*: Winterbottom & Anderson 1997;

Heemstra *et al.* 2004.

Gobiodon sp. 1: Herler & Hilgers 2005 [in part]*; Bogorodsky *et al.* 2010*.

Gobiodon irregularis Herler, Bogorodsky & Suzuki 2013: 309,

Figs. 3–4 (Napoleon Reef, Dahab, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 20 rays. Head profile rounded in adults, slightly pointed in juveniles; no groove on underside of head. First dorsal fin low.

Adults with plain reddish brown to brown head and body, and iris red with blue bars; juveniles and small adults greenish to brownish green, with up to 7 bluish bars crossing cheek and pectoral-fin bases, and upper half of body covered with irregular reddish lines and small red spots. Attains 32 mm SL.



Gobiodon irregularis, ~17 mm SL, subadult (Gulf of Aqaba). © J Herler

DISTRIBUTION WIO: Red Sea and Rodrigues.

REMARKS Commensal with *Acropora* corals, at 1.5–12 m.

Gobiodon micropus Günther 1861

Eyebrowed coralgoby

PLATE 22

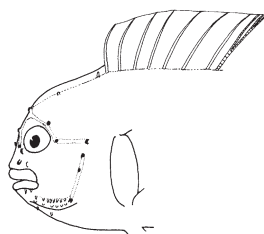
Gobiodon micropus Günther 1861: 89 ('China Seas');

Winterbottom & Emery 1986*; Winterbottom & Anderson 1997.

Gobiodon cf. *micropus*: Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 11 rays; pectoral fins 19 or 20 rays. Head profile steep; lower jaw with downward-curved tip; groove on underside of head straight. First dorsal fin completely joined to 2nd.

Body translucent orange to green, with 2 short, broad, reddish to purple oblique stripes, from above and behind eyes to 1st dorsal-fin origin. Attains 28 mm SL.



Gobiodon micropus, 28 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION WIO: Persian/Arabian Gulf (Kuwait), Mauritius, possibly Rodrigues, and Chagos.

REMARKS Inhabits coral lagoons, at 1–22 m.

Gobiodon prolixus Winterbottom & Harold 2005

Slender coralgoby

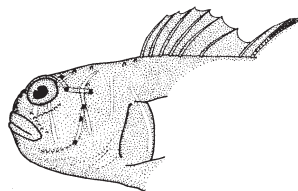
PLATE 22

Gobiodon DFH sp. 3: Winterbottom & Emery 1986*.

Gobiodon prolixus Winterbottom & Harold 2005: 583, Figs. 1–4 (Hon Mot I., Nha Trang, Vietnam); Bogorodsky *et al.* 2010*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 rays; pectoral fins 18 or 19 rays. Slender-bodied; head profile bluntly rounded; usually no groove on underside of head (but may have short groove on isthmus, depending on state of preservation). First dorsal fin rounded.

Head and body greenish to orange-brown, with 5 vertical bluish white lines crossing head and pectoral-fin bases; dorsal- and anal-fin bases sometimes with pale stripe. Attains 32 mm SL.



Gobiodon prolixus, 24 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Red Sea (Yemen), Comoros, Rodrigues and Chagos; elsewhere, Thailand to Tuamotu Is.

REMARKS Poorly known; inhabits coral lagoons, at 5–18 m.

Gobiodon quinquestrigatus (Valenciennes 1837)

Brightbanded coralgoby

PLATE 22

Gobius quinquestrigatus Valenciennes in Cuv. & Val. 1837: 134 (Tongatapu, Tonga Is.).

Gobiodon rivulatus: Smith & Smith 1963* [in part].

Gobiodon quinquestrigatus: Dor 1984; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19 or 20 rays. Head broad, with gently oblique (not steep) snout; no groove on underside of head. First dorsal fin rounded.

Body dark brown to blackish; head reddish, and no dark spot on opercle; 5–7 blue lines across head and pectoral-fin bases; juveniles may have variable number of short blue wavy to straight lines on sides of body; some specimens with pale stripe along dorsal- and anal-fin bases. Attains 35 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Oman, Red Sea, Gulf of Aden (Djibouti), Madagascar, Comoros, Seychelles and Rodrigues; elsewhere throughout Pacific to Gambier Is.

REMARKS Probably two cryptic species (pale and dark) are confused under this name; additionally, this species has been confused with *G. rivulatus*, so the true status of the species and their distributions are uncertain. Inhabits coral reefs, at 1–6 m; pairs found on a variety of *Acropora* tablecorals.

Gobiodon reticulatus Playfair 1867

Reticulate coralgoby

PLATES 21 & 22

Gobiodon reticulatus Playfair in Playfair & Günther 1867: 72, Pl. 9, Fig. 2 (Yemen, Gulf of Aden); Smith 1959*; Dor 1984; Randall 1995*; Herler & Hilgers 2005*.
Gobiodon punctatus Kossmann & Rüber 1877: 400 (Red Sea).
Gobiodon venustus Sauvage 1880: 51 (Red Sea).

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 19–21 rays. Head profile rather steep; no groove on underside of head. First dorsal fin rounded.

Head and body brownish olive to red-brown; head with 5 or 6 whitish vertical bars, and no dark spot on opercle; body with network of darker lines and fine white spots in interspaces; dorsal fins and anal fin blackish, with black-edged white to bluish stripe along bases; dorsal fins and caudal fin with pale yellow margins. Attains 43 mm SL.



Gobiodon reticulatus, 39 mm SL (Oman). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf to Oman, Gulf of Aden and Red Sea.

REMARKS Found among *Acropora* corals, at 2–33 m (usually >10 m).

Gobiodon rivulatus Rüppell 1830

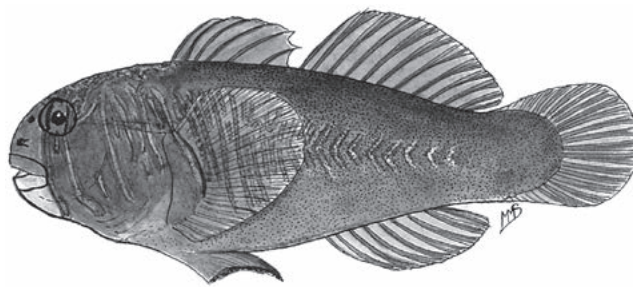
Rippled coralgoby

PLATE 22

Gobiodon rivulatus Rüppell 1830: 136 (Strait of Jubal, Gulf of Suez, Red Sea); Smith 1959*, 1961*; Smith & Smith 1963* [in part]; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.48*; Winterbottom & Emery 1986*; Anderson *et al.* 1998; Heemstra *et al.* 2004; Herler & Hilgers 2005*.
 ?*Gobiodon coryphoenula*: Sauvage 1891*.
Gobiodon virulatus: Jatzow & Lenz 1898.
 ?*Gobiodon coryphaenula*: Jatzow & Lenz 1898.
Gobiodon citrinus: Smith 1949*.
Gobiodon sp.: Randall & Goren 1993*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 18–21 rays. Head profile rounded; no groove on underside of head. First dorsal fin rounded.

Colour pattern variable, with at least 2 colour phases: a pale brown to yellowish form (usually small and less common) and a dark-bodied form. Head generally reddish, and body and fins red-brown to blackish; 5–8 narrow blue lines across head and pectoral-fin bases; no dark spot on opercle; some specimens with blue stripe along dorsal- and anal-fin bases, and variable number of short wavy, zigzagged or straight blue lines on sides of body. Two colour forms present in Red Sea: a dark red-brown form and a pale green or reddish green form. Attains 36 mm SL.



Gobiodon rivulatus, 35 mm TL (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (Sodwana Bay), Tanzania (Zanzibar), Madagascar, Seychelles, Mascarenes, Chagos and Maldives; elsewhere widespread in western Pacific to Gambier Is.

REMARKS Commensal with a wide range of *Acropora* corals, at 1.5–25 m. Has been confused with *G. quinquestrigatus*, thus the true status and distributions of these species are uncertain.

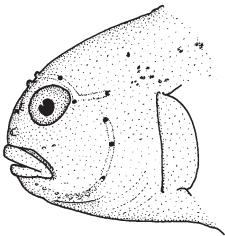
Gobiodon sp.

Plain coralgoby

Gobiodon unicolor: Winterbottom & Emery 1986* [in part];
Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19 or 20 rays. Head profile smoothly rounded; distinct straight groove on underside of head; low skin fold at least anteriorly along bases of 2nd dorsal fin and anal fin. First dorsal fin low.

Body plain brown to purplish brown, with diffuse pale stripe along dorsal- and anal-fin bases; head slightly paler and without distinct bars or spots in adults; fin margins translucent to whitish; eyes blue. Attains at least 34 mm SL.



Gobiodon sp., 26 mm SL (Chagos).
Source: Winterbottom & Emery 1986

REMARKS Commensal with mostly *Acropora* corals, at 3–25 m. Although identified as *G. unicolor* (from the western Pacific), this is probably an undescribed species at Chagos and possibly Rodrigues in WIO.

GENUS *Gobiopsis* Steindachner 1861

First dorsal fin 6 spines; 2nd dorsal fin almost always 1 spine, 10 or 11 rays; anal fin almost always 1 spine, 9 or 10 rays; pectoral fins 17–23 rays. LSS 28–60. Head broad, depressed; lower jaw protrudes; head with barbels, and fleshy horizontal fold on cheek usually bearing barbels. Lateral canals on head reduced (absent in 3 species); pores may be raised on short tubes; sensory papillae in longitudinal pattern, usually conspicuous. Gill opening restricted to pectoral-fin base or may extend to just under opercle. Colour patterns usually formed by series of dark brown bars or saddles on back. Found on coral rubble or sand and in mangroves. Fourteen species, 4 in WIO.

KEY TO SPECIES

- 1a One pair of stubby barbels on chin, and one pair of simple barbels on centre of snout (no barbels on cheek fold or beside upper jaw); anal fin 1 spine, 10 rays; no preopercular pores *G. exigua*
- 1b Barbels numerous and well-developed on sides and underside of head; anal fin 1 spine, 9 rays; preopercular pores present 2
- 2a Preopercular pore 1; preopercular canal connecting with lateral cephalic canal; scales cycloid *G. canalis*
- 2b Preopercular pores 2; preopercular canal incomplete and not connecting with lateral cephalic canal; scales cycloid or ctenoid 3
- 3a Scales cycloid, small; LSS ~50–60; row of barbel-like structures replacing papillae on anterior portion of 1st row on cheek (bordering cheek fold) *G. pinto*
- 3b Scales ctenoid, relatively large; LSS ~30–50; edge of midcheek fold with row of papillae; no barbels on rear of upper jaw, but a pair of barbels on chin *G. macrostomus*

Gobiopsis canalis Lachner & McKinney 1978

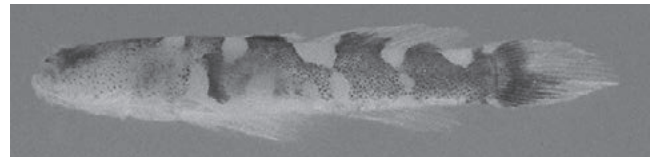
Western barbeled goby

PLATE 23

Gobiopsis canalis Lachner & McKinney 1978: 15, Pl. 9 (east of Hindarabi, Iran, Persian/Arabian Gulf); Kuronuma & Abe 1986; Randall 1995*.
Barbatogobius asanai: Koumans in Blegvad & Løppenthin 1944* [in part].

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 22 or 23 rays. LSS 50–55; TRB 23–24; predorsal scales 18–20, cycloid. Preopercular canal joins with rear portion of oculoscapular canal above opercle.

Body mottled, with indistinct dark dorsal saddles; upper part of pectoral-fin bases with dark wedge-shaped blotch. Attains 50 mm SL.



Goniopsis canalis, 14 mm SL (Oman). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Oman and southern India.

REMARKS Has been trawled from clay and sand substrates, at 13–21 m.

Gobiopsis exigua Lachner & McKinney 1979

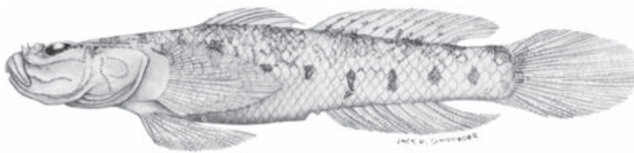
Shortbarbeled goby

PLATE 23

Gobiopsis exigua Lachner & McKinney 1979: 5, Figs. 3–4
(Abaiang Atoll, leeward reef crest, Gilbert Is., Kiribati).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 10 rays; pectoral fins 18–20 rays. LSS 30–37; TRB 13–17; predorsal scales 11–17, cycloid. Head barbels few and small, only 1 on each side of chin and pair on snout. No preopercular pores.

Head and body pale, with 6 brownish saddles across back, and 7 vertical dark blotches along midsides of body; upper part of pectoral-fin bases with diffuse dusky mark. Attains 42 mm SL.



Gobiopsis exigua, 42 mm SL, female holotype (Gilbert Is.).
Source: Lachner & McKinney 1979 (by JR Schroeder)

DISTRIBUTION Indo-Pacific. WIO: Comoros and Amirante Is. (Seychelles); elsewhere, Philippines to French Polynesia.

REMARKS Found on outer coral reefs and drop-offs, to ~20 m deep.

Gobiopsis macrostomus Steindachner 1861

Big-mouth barbeled goby

Gobiopsis macrostomus Steindachner 1861: 291, Pl. 1, Fig. 6

(Mumbai, India); Koumans 1941; Lachner & McKinney 1978*.

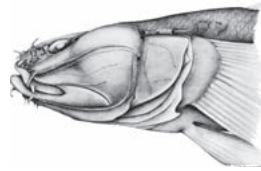
Gobius macrostoma: Günther 1861.

Gobius planifrons Day 1873: 108 (Mumbai, India).

Barbatogobius asanai: Koumans in Blegvad & Løppenthin 1944 [in part].

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 19–22 rays. LSS 36–44; TRB 16–21; predorsal scales 14–20, strongly ctenoid; cheek and opercle naked. Barbels present on snout, chin tip, and ventral surface of lower jaw.

Head and body greyish white, with ~5 brown saddles across back, and mottling and indistinct bars on sides which may join saddles; dark curved mark across bases of pectoral-fin rays, joining dark bar across upper part of fins. Attains 85 mm SL.



Gobiopsis macrostomus, 58 mm SL, male (Thailand). Source: Lachner & McKinney 1978 (by JR Schroeder)

DISTRIBUTION Indo-Pacific. WIO: India; elsewhere to Andaman Sea, Gulf of Thailand and northeastern Australia.

REMARKS Found in rocky and estuarine habitats, including mangroves.

Gobiopsis pinto (Smith 1947)

Pinto goby

PLATE 23

Abranches pinto Smith 1947: 813 (Punte Mahone, Maputo Bay, Mozambique); Smith 1949*, 1959*, 1961*.

Gobiopsis pinto: Lachner & McKinney 1978*; Hoese & Winterbottom 1979; SSF No. 240.49*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 rays; pectoral fins 20 or 21 rays. LSS 50–60; TRB 20–26; scales cycloid; predorsal scales either deeply embedded or missing in all known specimens. Cheek fold with elongate barbels.

Head and body dark brown, mottled with darker brown and indistinct dorsal saddles. Attains 51 mm SL.



Gobiopsis pinto, 44 mm SL, male (S Mozambique).

Source: Lachner & McKinney 1978 (by JR Schroeder)

DISTRIBUTION WIO: Mozambique and South Africa (Sodwana Bay to Kariega River, Eastern Cape).

REMARKS Found in tidepools and among stones in muddy areas.

GENUS *Gobius* Linnaeus 1758

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11–15 rays; anal fin 1 spine, 11–14 rays; pectoral fins 15–22 rays, at least 2 or 3 upper rays partly free from membrane. Scales ctenoid; predorsal area scaly, and rear of preopercle may be scaly; LSS 30–65. Lateral canals and pores present on head; sensory papillae in characteristic transverse pattern; chin smooth, no mental frenum, but patch of papillae on each side of chin. Anterior nostrils with variably shaped tentacle or lappet on rear

edge. Gill opening restricted to pectoral-fin base. Vertebrae 28. Relatively large-sized; mostly marine and found in warm-temperate to cool European and Mediterranean waters. About 20 species; 3 species in WIO, all as anti-Lessepsian migrants from Mediterranean Sea to northern Red Sea.

KEY TO SPECIES

- 1a LSS 32–42; 1st dorsal-fin spines elongate in males *G. niger*
- 1b LSS 46–67; 1st dorsal-fin spines not elongate in males 2

- 2a LSS 46–59; upper margin of 1st dorsal fin with broad pale band in non-breeding fish, or yellow to orange in breeding males; lower cheek papilla row *d* broken into 2 short sections (rarely continuous) *G. paganellus*
- 2b LSS 59–67; 1st dorsal fin transparent to whitish, with fine dark-brown spots and mottling, and breeding males may have narrow white band; lower cheek papilla row *d* continuous and long *G. cobitis*

Gobius cobitis Pallas 1814

Giant goby

PLATE 23

Gobius cobitis Pallas 1814: 160 (Crimea, Black Sea); Goren & Klausewitz 1978*; Goren 1979*; Dor 1984; Maugé 1986; Goren & Dor 1994.

Second dorsal fin 1 spine, 13 or 14 rays; anal fin 1 spine, 10–12 rays; pectoral fins 19–22 rays. LSS 59–67; TRB 22 or 23; predorsal scales 27 or 28; nape scaly nearly to eyes; cheeks always naked. Anterior nostrils with long and often finger-like tentacle.

Body dull greenish to brownish, covered with fine dark speckles and ~4 broad saddles across back; fins finely spotted; breeding males dark, with unpaired fins edged in white. Attains 270 mm SL.



Gobius cobitis, ~110 mm SL (Red Sea). Source: Goren & Klausewitz 1978

DISTRIBUTION Eastern Atlantic (southern England to Morocco), Black Sea, Mediterranean Sea, and anti-Lessepsian migrant to Gulf of Suez in northern Red Sea.

REMARKS Found in rocky and weedy tidepools along shallow coastal areas, to ~10 m deep. Feeds on invertebrates and green algae *Enteromorpha*. Known to hybridise with *Gobius paganellus*.

Gobius niger Linnaeus 1758

Black goby

PLATE 23

Gobius niger Linnaeus 1758: 262 (Europe; Asia); Chabanaud 1932; Tortonese 1948; Smith 1959; Dor 1984.

Second dorsal fin 1 spine, 11–13 rays; anal fin 1 spine, 10–13 rays; pectoral fins 15–20 rays. LSS 32–42; TRB 10–14; predorsal scales 16–22, midline may be naked; nape may be scaly to eyes; cheek naked. Anterior nostrils with somewhat triangular flap. Spines of 1st dorsal fin elongate to filamentous in males.

Body fawn to brownish, with 4 or 5 roughly rectangular dark brown blotches along midsides of body, and similar brown saddles and blotches over dorsum; fins finely speckled and barred darker brown to greenish brown; iris golden or golden-brown; breeding males become entirely plain black. Attains 150 mm SL.

DISTRIBUTION Eastern Atlantic (Norway to Mauritania), North Sea, Baltic Sea, Black Sea, Mediterranean Sea, and anti-Lessepsian migrant to Gulf of Suez (northern Red Sea) and Lake Timsah (Egypt).

REMARKS Occurs in a wide range of coastal habitats, such as estuaries and lagoons, over sand or mud or among seagrasses, and rarely intertidal marine areas, at 3–75 m.

Gobius paganellus Linnaeus 1758

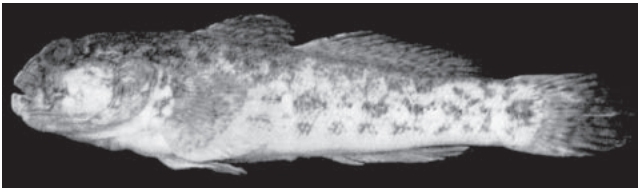
Rock goby

PLATE 23

Gobius paganellus Linnaeus 1758: 263 (Mediterranean Sea); Goren & Klausewitz 1978*; Goren 1979*; Dor 1984; Maugé 1986; Goren & Dor 1994.

Second dorsal fin 1 spine, 12–15 rays; anal fin 1 spine, 10–13 rays; pectoral fins 18–23 rays. LSS 46–59; TRB 18–21; predorsal scales 22–26; nape sometimes scaly to eyes; cheeks sometimes scaly in upper rear corner. Anterior nostrils with long flap-like or finger-like tentacle.

Body dull fawn to brownish, with darker brown mottling and series of blotches along midsides of body; breeding males dark, with broad orange to yellow margins on unpaired fins. Attains 145 mm SL.



Gobius paganellus, ~45 mm SL (Red Sea). Source: Goren & Klausewitz 1978

DISTRIBUTION Temperate waters of eastern Atlantic (Scotland to Senegal), Black Sea, Mediterranean Sea, and anti-Lessepsian migrant to Gulf of Aqaba in northern Red Sea.

REMARKS Occurs mostly intertidally, to ~8 m deep. Feeds on crustaceans and polychaetes. Known to hybridise with *Gobius cobitis*.

GENUS *Hazeus* Jordan & Snyder 1901

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–19 rays. LSS 23–27; predorsal area with large scales; sides of head with or without scales. Distinctive pungent spine in 1st and 2nd dorsal fins. Preopercular edge smooth, without spines. Reduced transverse pattern of sensory papillae, with short transverse rows on cheeks arranged between 2 distinctly longitudinal rows, and 2 rows of papillae overlapping directly below eye. Gill opening to under opercle. Found on sandy to muddy substrates around coral reefs. *Hazeus* and its relatives *Oplopomus* and *Opua* are in great need of revision. At least 5 species, in Indo-Pacific, but often misidentified; 3 species in WIO (all of which have been placed in different genera).

KEY TO SPECIES

- 1a First dorsal fin with black blotch posteriorly; sides of head with indistinct dusky blotches; no elongate dorsal-fin spines in males 2



- 1b First dorsal fin with small dark spots on each spine but no large dusky to black blotch on rear of fin; 1 or 2 distinct, oblique dark lines or elongate blotches crossing cheek; 3rd spine of dorsal fin elongate in males *H. diacanthus*
- 2a Cheek and opercle with large cycloid scales; predorsal scales 9; LSS 23–26 *H. elati*
- 2b Cheeks naked, upper part of opercle with a few small scales; predorsal scales 6 or 7; LSS 25–27 *H. maculipinna*

Hazeus diacanthus (Schultz 1943)

Sparsely spotted sandgoby

PLATE 23

Oplopomus diacanthus Schultz 1943: 242, Fig. 21 (lagoon off Canton I., Phoenix Is.); Anderson *et al.* 1998; Kuitert 1998*.

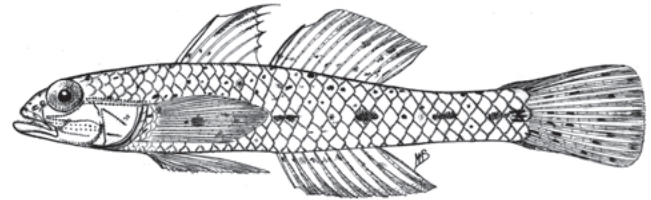
Oplopomops atherinoides: Smith 1959*; Smith & Smith 1963.

?*Oplopomus caninoides*: Kuitert 1998*.

Hazeus diacanthus: Allen & Adrim 2003.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16 or 17 rays. LSS 24–28; TRB 7 or 8; predorsal scales 7–9, reaching to close behind eye; cheek and opercle naked. Slender-bodied, with rather pointed snout.

Head and body translucent, with whitish abdomen; small white spots scattered over dorsum forming short thin bars; a few small brown to orange spots on dorsum, and ~5 short brown lines or thin blotches along midsides of body; 7 or 8 short white bars along lower half of body; short silvery white streaks and spots on sides of head. Attains 34 mm SL.



Hazeus diacanthus, 43 mm TL (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Seychelles and Maldives; elsewhere from scattered localities eastwards to Phoenix Is.

REMARKS Known from sandy lagoonal habitats, in 10–15 m. Sometimes placed in *Oplopomus*.

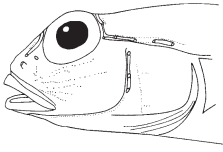
Hazeus elati (Goren 1984)

Eilat sandgoby

Oplopomops elati Goren 1984: 20, Figs. 1–3 (off Eilat, Israel, Gulf of Aqaba, Red Sea); Goren 1986.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–19 rays. LSS 23–26; TRB 7; predorsal scales 6 or 7, ctenoid; cheek and opercle covered with large cycloid scales.

Preserved specimens with yellowish head and body, with brown spots scattered over dorsum and ~5 sets of paired brown spots along midsides of body, posteriormost spot at caudal-fin base darkest; large rounded black blotch on 1st dorsal fin behind 5th spine; black spot on chin. Attains 50 mm SL.



Hazeus elati, head showing papillae and pores (Red Sea). Source: Goren 1984

DISTRIBUTION WIO: northern Red Sea.

REMARKS Poorly known; trawled from 27–80 m over sandy substrate.

Hazeus maculipinna (Randall & Goren 1993)

Black-spot sandgoby

PLATE 24

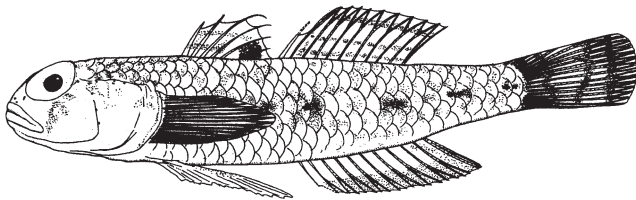
Opua maculipinna Randall & Goren 1993: 15, Fig. 8
(lagoon at Ari Atoll, Maldives).

Hazeus maculipinna: Anderson *et al.* 1998.

Oplopomops maculipinna: Iwata *et al.* 1998.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 10 rays; pectoral fins 17 rays. LSS ~25–27; TRB 9; predorsal scales 7, ctenoid; opercle with a few small scales dorsally; cheeks naked. Snout rounded.

Preserved specimen pale yellowish, with diffuse brown spots on scales on upper half of body; 5 dusky blotches with dark centres along midsides; mottled dusky blotch on cheek below eye; distinct round black blotch on rear of 1st dorsal fin; dusky spot near upper and lower margins of caudal fin. Attains at least 37 mm SL.



Hazeus maculipinna, 37 mm SL, holotype (Maldives). Source: Randall & Goren 1993

DISTRIBUTION Known only from the holotype collected from the Maldives.

REMARKS Found on open white sand at ~20 m.

GENUS *Hetereleotris* Bleeker 1874

First dorsal fin 6 spines, and fin often partly connected to 2nd dorsal fin; 2nd dorsal fin 1 spine, 8–14 rays; anal fin 1 spine, 7–12 rays; pectoral fins 15–19 rays; pelvic fins 1 spine, 4 or

5 rays, and fins nearly always separate, with pelvic frenum present or absent. LSS 0–52; usually only rear part of body scaly. Lateral canals on head, if present, without rear part of oculoscapular canal over opercle; distinguished by sensory papillae in transverse pattern. Distinct single-lobed mental frenum, with 2 parallel rows of sensory papillae behind it. Gill opening restricted to pectoral-fin base; lower limb of 1st gill arch bound to opercle by membrane (except only half of limb bound in a few species). About 25 species (at least 6 of these undescribed), in Indo-Pacific; at least 16 species in WIO, plus several undescribed species in Red Sea which are not included in this account.

KEY TO SPECIES

- 1a Body scaly along sides; LSS 24–52 2
- 1b Body naked or with only a few scales on peduncle; LSS ≤ 11 8
- 2a Scales ctenoid at least posteriorly, from 2nd dorsal-fin origin to peduncle 3
- 2b Scales all cycloid 4
- 3a Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pelvic fins 1 spine, 5 rays; lateral canal pore present between infraorbital pore and terminal oculoscapular canal pore; belly naked *H. zanzibarensis*
- 3b Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pelvic fins usually 1 spine, 4 rays (5th ray sometimes present as rudiment); no lateral canal pore between infraorbital pore and terminal oculoscapular canal pore *H. vinsoni*
- 4a No head pores; head somewhat square to slightly depressed 5
- 4b Head pores present; head distinctly depressed 6
- 5a Second dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 11 rays; pectoral fins 15 rays; black spot dorsally at rear of peduncle; body scales small, LSS 40–52; body slender, its depth at anal-fin origin 14–15% SL *H. bipunctata*
- 5b Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 17 rays; no black spot dorsally on peduncle; body scales large, LSS 28–30; body more robust, its depth at anal-fin origin 16–19% SL *H. margaretae*
- 6a Second dorsal fin usually 1 spine, 10 (rarely 11) rays; anal fin usually 1 spine, 9 rays; enlarged dark brown bar on upper pectoral-fin bases, extending onto pectoral-fin rays *H. poecila*

Continued...

KEY TO SPECIES

- 6b Second dorsal fin 1 spine, 12 or 13 (rarely 11) rays; anal fin 1 spine, 10 or 11 (rarely 9) rays; upper pectoral-fin bases without dark brown bar or else with small anterior spot that does not extend onto pectoral-fin rays 7
- 7a Scales small, LSS 35–48; body with 1 dark vertical band below 1st dorsal fin *H. zonata*
- 7b Scales larger, LSS 32–33; body with 4–6 brown vertical bands *H. kenya*
- 8a No head pores 9
- 8b Head pores present 12
- 9a Body naked; 2nd dorsal fin 1 spine, 12 rays; pelvic fins 1 spine, 5 rays; no spine on opercle 10
- 9b Body with 4 or 5 rows of ctenoid scales on peduncle only; 2nd dorsal fin 1 spine, 10 or 11 rays; pelvic fins 1 spine, usually 4 rays (rarely with rudimentary 5th ray); opercle with 2 spines dorsally *H. apora*
- 10a Body pale, with at least 4 narrow, widely spaced dark bars, anteriormost bar much darker than others; broad oblique dark brown bar from eye to rear edge of preopercle, and narrow dark line from eye to upper jaw *H. diademata*
- 10b Body pale, and any bars present are indistinct; no broad dark brown oblique bar from eye to lower rear edge of preopercle 11
- 11a Second dorsal fin 1 spine, 12 rays; both dorsal fins with blackish submarginal band *H. dorsovittata*
- 11b Second dorsal fin 1 spine, 10 rays; dorsal fins transparent and with scattered white and brownish speckles, but few melanophores near margin *H. psammophila*
- 12a Large tentacle on each eye; posterior nasal tube elongate; anal fin usually 1 spine, 11 rays *H. tentaculata*
- 12b No tentacle on eyes; posterior nasal tube elongate or not; anal fin usually 1 spine, 10 rays 13
- 13a No preopercular pores; peduncle with 7–13 rows of scales 14
- 13b Preopercular pores 2; peduncle naked 15
- 14a Second dorsal fin 1 spine, 10 or 11 (usually 10) rays; anal fin 1 spine, 9 rays; pectoral fins 16–18 (usually 18) rays; dark spot on dorsal portion of pectoral fins *H. georgegilli*
- 14b Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 9 or (usually) 10 rays; pectoral fins 15 or 16 rays; no dark spot on dorsal portion of pectoral fins *H. nebulofasciata*
- 15a Posterior nasal tube elongate, about twice length of anterior nasal tube; 2nd dorsal fin usually 1 spine, 12 rays; pectoral fins usually 17 or 18 rays; rear edge of opercle with dark bar *H. caminata*
- 15b Posterior nasal tube subequal to anterior nasal tube; 2nd dorsal fin usually 1 spine, 11 rays; pectoral fins usually 15 rays; rear edge of opercle pale *H. vulgaris*

Heteroleotris apora (Hoese & Winterbottom 1979)

Poreless goby

PLATE 24

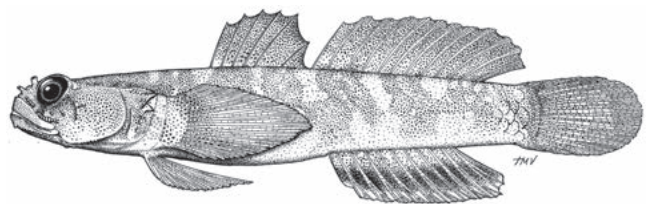
Lioteres aporus Hoese & Winterbottom 1979: 2, Figs. 1–2
(reef off Sodwana Bay, South Africa).

Heteroleotris aporus: Akihito & Meguro 1981; Winterbottom & Emery 1986*; Winterbottom & Anderson 1997.

Heteroleotris apora: Hoese 1986; SSF No. 240.50*; Gill 1998; Fricke 1999.

Second dorsal fin and anal fin each with 1 spine, 10 or 11 rays; pectoral fins 15 or 16 rays; pelvic fins 1 spine, 4 rays. Body naked, except 2 or 3 rows of ctenoid scales at caudal-fin base. Opercle with 2 stout spines dorsally. No lateral canal pores on head.

Body dusky brown, with 8 diffuse dark grey saddles, which may bifurcate ventrally; curved dark bar across caudal-fin base. Attains 24 mm SL.



Heteroleotris apora, ~20 mm SL (South Africa). Source: SSF, composite

DISTRIBUTION WIO: South Africa (Sodwana Bay), Comoros, Réunion, Mauritius, St Brandon Shoals and Chagos.

REMARKS Found in offshore and lagoon reefs, at 5–15 m.

Heteroleotris bipunctata Tortonese 1976

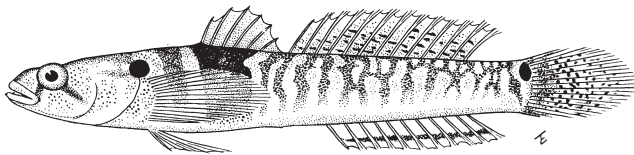
Two-spot goby

Heteroleotris bipunctata Tortonese 1976: 191, Fig. 2

(Somalia, Gulf of Aden); Hoese 1986; Goren & Dor 1994.

Second dorsal fin 1 spine, 13 rays; anal fin 1 spine, 12 rays; pectoral fins 15 rays; pelvic fins 1 spine, 5 rays. LSS 40–52; TRB 12–15; body scaly to behind pectoral-fin bases. No lateral canal pores on head. Lower limb of 1st gill arch connected to opercle by membrane.

Head and body brown, with 2 narrow black to diffuse blackish lines from eyes to lips and across cheeks; broad brown bar across body below 1st dorsal fin; large black spot above pectoral-fin bases, and smaller dark brown oval spot at upper edge of caudal-fin base. Attains 30 mm SL.



Heteroleotris bipunctata, 27 mm SL, holotype (Gulf of Aden).

Source: Tortonese 1976

DISTRIBUTION WIO: Red Sea and Gulf of Aden.

REMARKS Collected from tidepools.

Heteroleotris caminata (Smith 1958)

Mourner

Lioteres (Lioteres) caminatus Smith 1958: 156, Fig. 11 (Shimoni, Kenya).

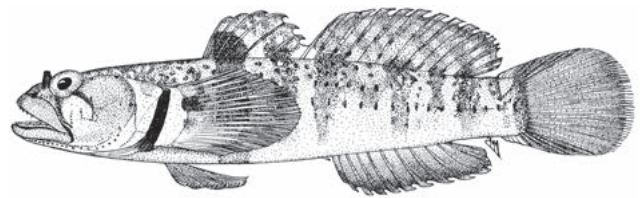
Lioteres caminatus: Hoese & Winterbottom 1979.

Heteroleotris caminatus: Akihito & Meguro 1981*.

Heteroleotris caminata: Hoese 1986; SSF No. 240.51*.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 10 rays; pectoral fins 17–19 rays; pelvic fins 1 spine, 5 rays. No scales. Lateral canal pores on head. Posterior nostrils conspicuous, much longer than anterior nostrils.

Body with 5 or 6 broad irregular bars, more distinct in small specimens; distinctive dark bar along rear edge of opercle; dark spot on 1st dorsal fin confluent with anteriormost bar on body. Attains 34 mm SL.



Heteroleotris caminata, 40 mm TL, holotype (Kenya). Source: Smith 1958

DISTRIBUTION WIO: Kenya (Shimoni) to Mozambique (Bazaruto I.).

REMARKS Collected from shallow coastal reef habitats.

Heteroleotris diademata (Rüppell 1830)

Crowned goby

PLATE 24

Gobius diadematus Rüppell 1830: 137 (Gulf of Suez, Egypt, Red Sea).

Gobiosoma diadematum: Günther 1861.

Gobiosoma (Eleotris) diademata: Kossmann & Räuber 1877.

Lioteres (Pseudolioteres) simulans Smith 1958: 157, Fig. 13

(Gulf of Suez, Egypt, Red Sea).

Heteroleotris diadematus: Smith 1958.

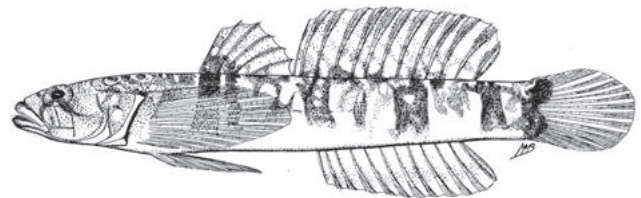
Monishia simulans: Hoese & Winterbottom 1979.

Heteroleotris diademata: Dor 1984; Hoese 1986; Goren & Dor 1994.

Lioteres simulans: Dor 1984.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 15–17 rays; pelvic fins 1 spine, 5 rays. No scales. No lateral canal pores on head.

Body pale, with at least 4 widely spaced narrow dark bars, anteriormost bar darkest; dark spot may be present at upper caudal-fin base, and sometimes another spot below this, forming dark bar across caudal-fin base; dark line from eyes to upper jaw, and second oblique dark line from eyes to rear edge of preopercle. Attains 50 mm SL.



Heteroleotris diademata, 45 mm TL, holotype of *Lioteres simulans* (Gulf of Suez). Source: Smith 1958

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Found in shallow coastal reef habitats.

Hetereleotris dorsovittata

Kovačić & Bogorodsky 2014

Bandfin goby

PLATE 24

Hetereleotris dorsovittata Kovačić & Bogorodsky in Kovačić, Bogorodsky & Mal 2014: 120, Figs. 1–2 (Farasan I., Saudi Arabia, Red Sea).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 rays; pectoral fins 14 rays, none free from membrane; pelvic fins 1 spine, 5 rays. No scales. No lateral canal pores on head.

Preserved specimen with whitish head and body (probably transparent when live), and irregular brown mottling and spots along sides; 2 short, oblique, dark brown lines from lower part of eye, with anterior line reaching towards upper lip and the other reaching partway across preopercle; vertical brown line along caudal-fin base; both dorsal fins transparent, with white speckling and black submarginal band (band more intense on 1st dorsal fin). Attains at least 22 mm SL.

DISTRIBUTION Known only from the holotype collected from the Red Sea.

REMARKS Taken from coral patch in a lagoon, at ~1 m.

Hetereleotris georgegilli Gill 1998

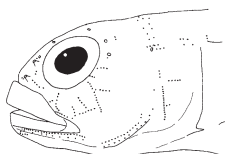
Gill's goby

PLATE 24

Hetereleotris georgegilli Gill 1998: 92, Figs. 2–6 (Flic-en-Flac, Mauritius, Mascarenes); Fricke 1999; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 rays; pectoral fins 16–18 rays; pelvic fins 1 spine, 5 rays. LSS 10–13; body partly scaly, with ctenoid scales extending forward to below second ray of 2nd dorsal fin. Lateral canal pores present on head.

Head and body pale brown, with ~8 indistinct irregular darker brown bars, last bar through caudal-fin base darkest; dark grey spot on upper pectoral-fin bases, extending onto fin rays. Attains 27 mm SL.



Hetereleotris georgegilli (Mauritius).
Source: Gill 1998

DISTRIBUTION WIO: Mascarenes.

REMARKS Found on coral reefs, at entrances to lagoons, and in surge-zones, at 4–10 m. IUCN Red List conservation status Near Threatened.

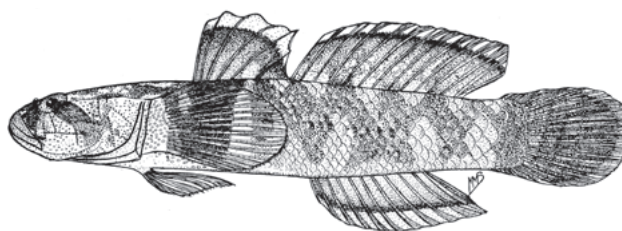
Hetereleotris kenya Smith 1958

Kenya goby

Hetereleotris kenya Smith 1958: 159, Fig. 15 (Vuma, Kenya); Hoese 1986; Fricke 1999; Heemstra *et al.* 2004; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16–18 rays; pelvic fins 1 spine, 5 rays. LSS 32 or 33; body scales cycloid, with narrow naked wedge-shaped area from behind pectoral fins to below middle of 2nd dorsal fin. Head distinctly depressed. Lateral canal pores present on head.

Head and body brownish yellow, with 6 or 7 darker brown oblique bars and mottling, anteriormost body bar darkest, and bars may interconnect, creating zigzag appearance; distinct broad dark oblique bar from eye to rear of preopercle. Attains 34 mm SL.



Hetereleotris kenya, 41 mm TL (Kenya). Source: Smith 1958

DISTRIBUTION WIO: East Africa, Réunion and Rodrigues.

REMARKS Found in intertidal coral-reef habitats.

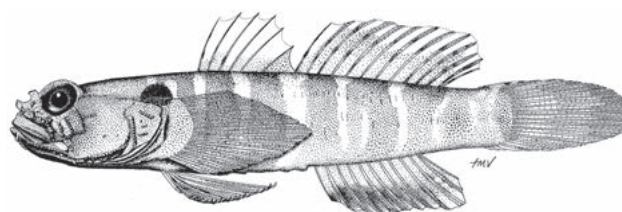
Hetereleotris margaretae Hoese 1986

Smoothscale goby

Hetereleotris margaretae Hoese 1986: 11, Figs. 2–3 (reef off Sodwana Bay, KwaZulu-Natal, South Africa); SSF No. 240.55*; Fricke 1999; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 17 rays; pelvic fins 1 spine, 5 rays. LSS 28–30; scales cycloid; head, breast, pectoral-fin bases and belly midline naked. No lateral canal pores on head.

Head and body pale brown, with ~7 dark grey bars across body; large round black spot above upper rear corner of opercle. Attains 23 mm SL.



Hetereleotris margaretae, 23 mm SL, holotype (South Africa). Source: SSF

DISTRIBUTION WIO: South Africa (Sodwana Bay) and Réunion.

REMARKS Found on coral reefs at depths to 10 m.

Heteroleotris nebulofasciata (Smith 1958)

Cloudybarred goby

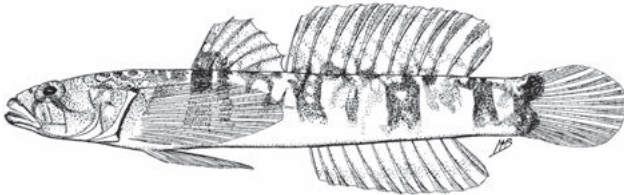
PLATE 24

Chriolepidops nebulofasciatus Smith 1958: 158, Fig. 14
(Pinda, Mozambique).

Heteroleotris nebulofasciata: Hoese 1986.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15 or 16 rays; pelvic fins 1 spine, 5 rays. LSS 5–11; scales ctenoid, present on peduncle only. Lateral canal pores present on head.

Body covered with many small dark spots and 5 or 6 dark diffuse broad bars, most distinct bar below 1st dorsal fin; vertical dusky bar below eyes. Attains 35 mm SL.



Heteroleotris nebulofasciata, 37 mm TL, holotype (N Mozambique).

DISTRIBUTION WIO: Kenya, Mozambique and Comoros.

REMARKS Found over coral rubble in shallow intertidal areas.

Heteroleotris poecila (Fowler 1946)

Mottled goby

Riukiua poecila Fowler 1946: 201, Figs. 62–63

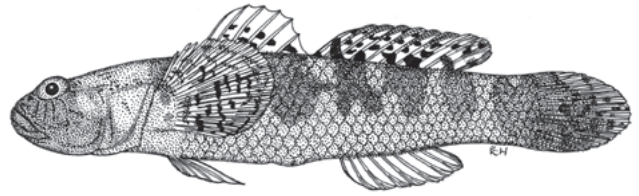
(Aguni Shima, Ryukyu Is., Japan).

Heteroleotris poecila: Akihito & Meguro 1981*; Hoese 1986; Gill 1998.

Heteroleotris zonata: Fricke 1999.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–18 rays, upper 2 rays partly free from membrane; pelvic fins 1 spine, 5 rays. LSS 30–37; scales cycloid. Lateral canal pores present on head.

Head and body brownish, with irregular darker brown mottling; upper and lower edges of pectoral-fin bases with dark irregular blotch, both extending onto fin rays; distinct dark bar across caudal-fin base. Attains 59 mm SL.



Heteroleotris poecila, 28 mm SL, female. Composite based on photographs

DISTRIBUTION Indo-Pacific. WIO: Comoros and Mauritius; elsewhere, southern Japan.

REMARKS Found in shallow reef habitats, at 1–3 m.

Heteroleotris psammophila

Kovačić & Bogorodsky 2014

Sandlover goby

PLATE 24

Heteroleotris psammophila Kovačić & Bogorodsky 2014: 476, Figs. 1–3
(Gulf of Aqaba, Egypt, Red Sea); Kovačić *et al.* 2014.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 14 or 15 rays, upper 2 partly free from membrane; pelvic fins 1 spine, 5 rays. No scales. No lateral canal pores on head.

Head and body transparent, with small widely scattered bluish white, yellow and brownish spots on body, arranged in indistinct vertical rows; predorsal area mottled brown; head with distinct dark brown bar from eye to upper lip, and 3 bluish blotches on cheek; narrow vertical blackish line at caudal-fin base. Attains at least 27 mm SL.

DISTRIBUTION Known only from two type specimens collected from northern Red Sea.

REMARKS Taken from sandy reef habitat, at 18–21 m.

Heteroleotris tentaculata (Smith 1958)

Locusthead goby

PLATE 25

Dactyleleotris tentaculatus Smith 1958: 161, Fig. 17 (Bazaruto I., Mozambique); Hoese & Winterbottom 1979; Randall & Van Egmond 1994*.

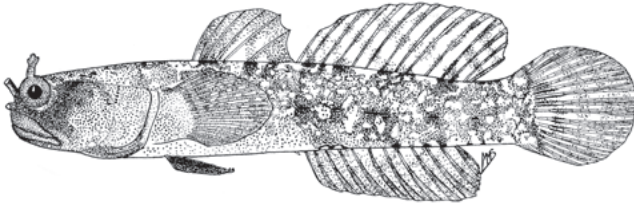
Heteroleotris tentaculatus: Akihito & Meguro 1981*.

Heteroleotris tentaculata: Hoese 1986; SSF No. 240.52*; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 or 12 rays; pectoral fins 15 rays; pelvic fins 1 spine, 5 rays. Body naked or with 1–6 ctenoid scales variably arranged on

peduncle. Nostril tubes long and conspicuous, posterior nostril longest. Elongate fleshy tentacle on dorsal margin of eye. Lateral canal pores present on head.

Head and body brown, head darkest; body with irregular dark and pale mottling, small dark brown blotches along dorsal midline, indistinct blotches along sides, and dark brown bar below 1st dorsal fin. Attains 24 mm SL.



Heteroleotris tentaculata, 25 mm TL, holotype (S Mozambique).
Source: Smith 1958

DISTRIBUTION WIO: Kenya, Mozambique, South Africa (Aliwal Shoal), Seychelles and Rodrigues.

REMARKS Found in coral-reef habitats, to ~25 m deep.

Heteroleotris vinsoni Hoese 1986

Vinson's goby

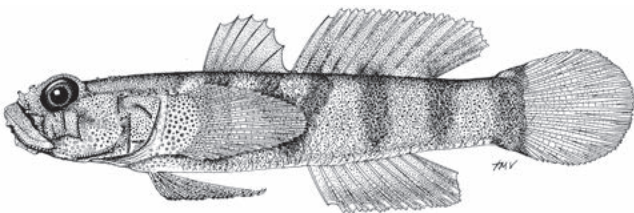
Heteroleotris vinsoni Hoese 1986: 15, Figs. 4–5 (Beauchamp, Jacotet Bay, Mauritius, Mascarenes); Gill 1998; Heemstra *et al.* 2004.

Heteroleotris kenya [in part]: Fricke 1999.

Heteroleotris margaretae [in part]: Fricke 1999.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17 or 18 rays; pelvic fins 1 spine, usually 4 rays (5th ray rudimentary if present). LSS 25–30; body scales cycloid anteriorly, and ctenoid posteriorly from middle of 2nd dorsal fin to caudal-fin base. Lateral canal pores present on head.

Head and body pale brown, with ~6 dark brown bars, 2nd and 3rd bars joined ventrally; narrow brown line from eyes to jaw, and similar line from eye to lower rear of preopercle. Attains 24 mm SL.



Heteroleotris vinsoni, ~19 mm SL (Mauritius). Source: SSF, composite

DISTRIBUTION WIO: Mozambique, Mascarenes and St Brandon Shoals.

REMARKS Occurs in shallow reef habitats, to ~4 m deep.

Heteroleotris vulgaris (Klunzinger 1871)

Ordinary Red Sea goby

PLATE 25

Gobiosoma vulgare Klunzinger 1871: 484 (Al-Qusayr, Egypt, Red Sea).

Heteroleotris vulgaris: Marshall 1952; Randall 1995*.

Lioteres (Lioteres) vulgare: Smith 1958*.

Lioteres vulgare: Magnus 1967.

Lioteres vulgaris: Clark *et al.* 1968.

Lioteres vulgare: Dor 1984.

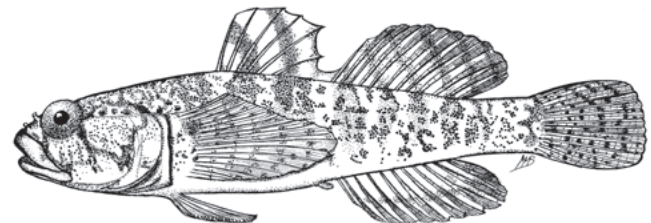
Heteroleotris vulgaris: Hoese 1986; Goren & Dor 1994.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9–11 rays; pectoral fins 15–17 rays; pelvic fins 1 spine, 5 rays. No scales. Lateral canal pores present on head. Jaws in males become larger with growth.

Head and body pale greyish brown, mottled with darker brown, forming 7 or 8 indistinct irregular bars on body and 1 or 2 bars across nape; dark mottling on sides of head, and dark triangular spot at lower rear edge of eye most conspicuous; fins mottled and spotted. Attains 34 mm SL.



Heteroleotris vulgaris (Red Sea). © SV Bogorodsky



Heteroleotris vulgaris, 38 mm TL, holotype of *Lioteres vulgare* (Kenya).
Source: Smith 1958

DISTRIBUTION WIO: Red Sea (and Lessepsian migrant to Mediterranean Sea), Oman, Pakistan and possibly Kenya and Mozambique.

REMARKS Occurs in shallow coastal reef habitats, at 1–24 m.

Hetereleotris zanzibarensis (Smith 1958)

Goggle goby

PLATE 25

Satulinus zanzibarensis Smith 1958: 160, Fig. 16 (Zanzibar, Tanzania).

Monishia oculata Smith 1959: 206, Pl. 9h (Mahé, Seychelles); Smith 1960*;

Smith & Smith 1963*; Hoese & Winterbottom 1979.

Hetereleotris zanzibarensis: Akihito & Meguro 1981*; Hoese 1986*;

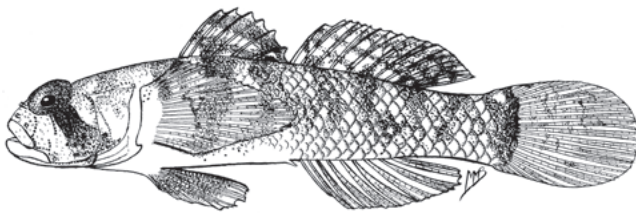
SSF No. 240.53*; Randall & Anderson 1993; Randall & Goren 1993*;

Gill 1998; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8–10 rays; anal fin 7–9 rays; pectoral fins 15–18 rays, upper 2 or 3 rays partly free from membrane; pelvic fins 1 spine, 5 rays, and fins either fused into disc, or partly or completely separate; pelvic frenum rudimentary or absent. LSS 25–30; lateral canal pores present on head.

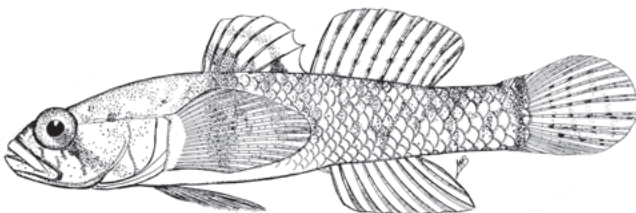
Head and body whitish, with 4 indistinct brown bars across back; broad brown stripe from rear of eyes to lower rear corner of preopercle; 1st dorsal fin translucent, with 2 brown stripes and red and yellow-edged dense black spot at rear of fin.

Attains 24 mm SL.



Hetereleotris zanzibarensis, 25 mm TL, holotype (Tanzania).

Source: Smith 1960



Hetereleotris zanzibarensis, 25 mm TL, holotype of *Monishia oculata* (Seychelles). Source: Smith 1959

DISTRIBUTION WIO: Kenya to Mozambique (Inhaca I.), Tanzania (Zanzibar), Comoros, Seychelles, Mascarenes, St Brandon Shoals and Maldives.

REMARKS Found in shallow water on seaward coral reefs, at 0.5–1.5 m.

Hetereleotris zonata (Fowler 1934)

Blackbar goby

PLATE 25

Leioeleotris zonatus Fowler 1934: 494, Fig. 48 (St Lucia, KwaZulu-Natal, South Africa).

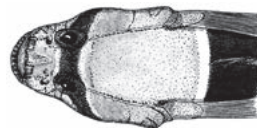
Hetereleotris diadematus: Smith 1949*, 1961.

Hetereleotris zonatus: Smith 1958*; Smith & Smith 1963*; Hoese & Winterbottom 1979; Akihito & Meguro 1981*.

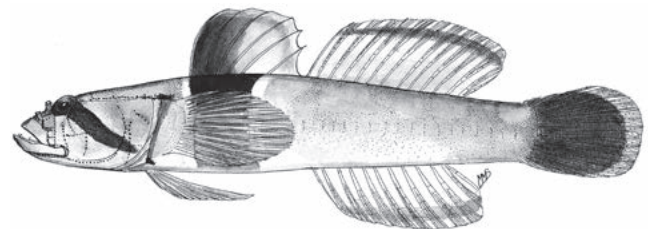
Hetereleotris zonata: Hoese 1986; SSF No. 240.54*; Randall 1995*.

Second dorsal fin 1 spine, 12–14 spines; anal fin 1 spine, 9–11 rays; pectoral fins 16–19 rays; pelvic fins 1 spine, 5 rays, and fins separate. LSS 34–48; body scales cycloid. Lateral canal pores on head.

Head and body white to yellowish, with pale-edged dark brown to blackish broad band on body below 1st dorsal fin, band extending onto 1st dorsal fin anteriorly; broad brown stripe from eye obliquely across preopercle, and sometimes with narrow brown line from eyes to lips; markings most distinct in small specimens. Attains 54 mm SL.



Hetereleotris zonata, 55 mm TL (South Africa). Source: SFSA



DISTRIBUTION WIO: India, Pakistan, Oman, Saudia Arabia, South Africa (St Lucia to Eastern Cape), Mauritius and probably Seychelles.

REMARKS Found in rocky and coral-reef tidepools. Variation between the southern African populations and those from India and Pakistan may represent different species.

GENUS *Istigobius* Whitley 1932

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–13 (usually 10 or 11) rays; anal fin 1 spine, 9–11 (usually 9 or 10) rays; pectoral fins 14–20 (usually 17–19) rays; pelvic fins fused into disc, with distinct pelvic frenum. Scales ctenoid, except predorsal scales 7–17, cycloid; cheek and opercle naked (except upper part of opercle partly scaly in one species); breast and

pectoral-fin bases scaly; LSS 29–38; TRB 7–12. Snout rounded and slightly inflated, overhanging mouth; lower jaw with large recurved canine tooth at each side (except 1 species). Rear portion of oculoscapular lateral canal over opercle detached from anterior portion; sensory papillae in longitudinal pattern. Gill opening restricted to pectoral-fin base. Most species with pale body and several rows of dark spots on sides. Ten species, in Indo-Pacific, 3 in WIO.

KEY TO SPECIES

- 1a Upper pectoral-fin rays not free from membrane; large recurved canine tooth at each side of lower jaw 2
 1b Upper 3 or 4 pectoral-fin rays free from membrane; no canine tooth at sides of lower jaw *I. ornatus*
- 2a Isthmus scaly forward to approximately vertical below eyes, and scales extending onto branchiostegal membrane; no dusky spot on 1st dorsal-fin membrane between spines 1–3; attains <50 mm SL *I. spencei*
 2b Isthmus scaly forward to vertical below rear part of preopercle; dusky spot or short streak on 1st dorsal-fin membrane between spines 1–3; attains >75 mm SL *I. decoratus*

Istigobius decoratus (Herre 1927)

Decorated sandgoby

PLATE 17

Rhinogobius decoratus Herre 1927: 181, Pl. 13, Fig. 3 (Apo I., Philippines).

Acentrogobius ornatus [in part]: Smith 1959.

Acentrogobius spencei: Goren 1979*; Dor 1984.

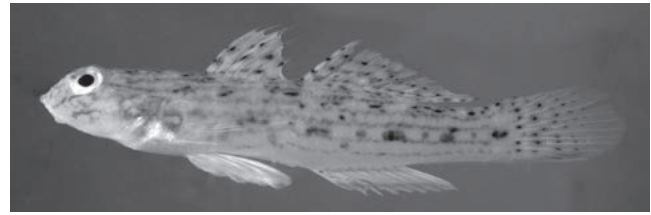
Istigobius sp. (cf. *ornatus*): Hoese & Winterbottom 1979.

Istigobius decoratus: Murdy & Hoese 1985*; SSF No. 240.56*;

Winterbottom & Emery 1986*; Debelius 1993*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Goren & Dor 1994; Randall *et al.* 1994*; Randall & Van Egmond 1994; Randall 1995*; Winterbottom & Anderson 1997; Field & Field 1998*; Kuitert 1998*; Terashima *et al.* 2001*.

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 17–19 rays. LSS 30–33; predorsal scales 8–10.

Head and body translucent whitish, and upper half of body with red-brown to orange-brown fine net-like pattern, with row of large rectangular black spots (or pairs of round spots partly fused together) along sides; several fine red-brown to brown lines on sides of head; distinct small black spots on anterior part of 1st dorsal fin. Attains 98 mm SL.



Istigobius decoratus, 58 mm SL (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, Kenya, Mozambique, South Africa (KwaZulu-Natal), Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere throughout western Pacific to Samoa.

REMARKS Occurs on sandy substrate, around lagoon reefs and in sheltered areas, at 0.5–20 m.

Istigobius ornatus (Rüppell 1830)

Ornate sandgoby

PLATES 17 & 25

Gobius ornatus Rüppell 1830: 135 (Massawa, Eritrea, Red Sea).

Gobius ehrenbergii Valenciennes *in* Cuv. & Val. 1837: 63 (Alexandria, Egypt [probably Red Sea]).

Gobius ventralis Valenciennes (ex Ehrenberg) *in* Cuv. & Val. 1837: 113 (Massawa, Eritrea, Red Sea).

Gobius elegans: Day 1876.

Acentrogobius ornatus: Koumans 1941; Blegvad & Løppenthin 1944;

Roux-Esteve & Fourmanoir 1955; Smith 1959* [in part]; Smith & Smith 1963; Goren 1979*; Dor 1984; Kuroshima & Abe 1986.

Istigobius ornatus: Hoda 1980*; Randall 1983*, 1995*; Murdy & Hoese 1985*;

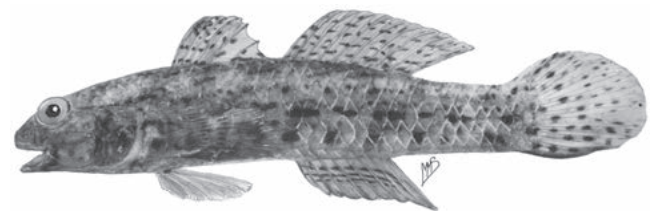
Maugé 1986; Goren & Dor 1994; Field & Field 1998*;

Rahimian & Pehpuri 2006; Ghanbarifardi & Malek 2009.

Istigobius [lapsus] ornatus: SSF No. 240.57*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9–11 rays; pectoral fins 16–20 rays, and 3 or 4 upper rays free from membrane. LSS 29–32; TRB 7½–9; predorsal scales 9–12. No large recurved tooth at each side of lower jaw.

Head and body yellowish to pale brown, with black, yellow, blue and red markings; double row of blackish spots along sides most conspicuous, and lower row shorter; fins finely striped or spotted with red-brown, yellow and blue. Attains 82 mm SL.



Istigobius ornatus, 75 mm TL (N Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: India (Mumbai) to Pakistan, Persian/Arabian Gulf, Gulf of Oman, Red Sea, Kenya to Mozambique (Inhaca I.), Madagascar, Comoros, Seychelles and Mauritius; elsewhere throughout western Pacific to Samoa.

REMARKS Found in shallow coral to rubble or muddy reef areas, also in mangroves and other estuarine habitats.

Istigobius spence (Smith 1947)

Pearl sandgoby

PLATE 25

Gobius spence Smith 1947: 809 (Maputo Bay, Mozambique); SFSA No. 921*; Smith 1959*, 1961*.

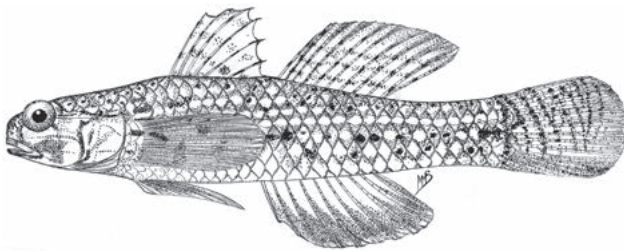
Acentrogobius aestuarius Smith 1959: 202, Fig. 18 (Inhambane, Mozambique).

Acentrogobius spence: Smith 1959*; Smith & Smith 1963*; Goren 1979*.

Istigobius spence: Hoese & Winterbottom 1979; Murdy & Hoese 1985*; Maugé 1986; SSF No. 240.58*.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 8–10 rays; pectoral fins 17–20 rays. LSS 27–32; TRB 7–9; predorsal scales 7–10.

Head and body yellowish to pale brownish, with scales outlined with brown, creating net-like pattern; pairs of round black spots on sides, and relatively conspicuous additional black spots and speckles on body, but no distinct spot anteriorly on 1st dorsal fin. Attains 50 mm SL.



Istigobius spence, 45 mm TL (S Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Kenya to South Africa (Sodwana Bay), Seychelles and Madagascar; elsewhere, Sri Lanka to New Caledonia.

REMARKS Occurs in turbid coastal habitats, at 1–12 m.

GENUS *Kelloggella* Jordan & Seale 1905

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 12–15 rays, mostly all branched; pelvic fins short and cup-like. Body elongate, compressed; head compressed, especially in interorbital region; few sensory papillae on head. Teeth in both jaws tricuspid; teeth of outer rows enlarged. No scales. Gill opening restricted to pectoral-fin base. Gut elongate. Six species, 1 in WIO.

Kelloggella quindecimfasciata (Fowler 1946)

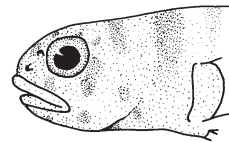
Splashpool goby

Agunia quindecimfasciata Fowler 1946: 207, Fig. 69 (Aguni Shima, Ryukyu Is., Japan).

Kelloggella quindecimfasciata: Winterbottom & Emery 1986*; Randall & Van Egmond 1994; Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 5–8 rays; pectoral fins 12–14 rays.

Head and body pale brown, with 11–13 orange to dark brown or black vertical bars, and bar colours extending onto dorsal fins; head with dark spots and fine mottling on cheek; 1st dorsal fin with round black spot. Attains 22 mm SL.



Kelloggella quindecimfasciata, 16 mm SL (Chagos). Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Seychelles and Chagos; elsewhere to southern Japan, Marshall Is. and Cook Is.

REMARKS Known from pools on shallow reef flats, at 0–0.5 m. Probably feeds on algae of tiny exposed pools, flat boulders and reef benches.

GENUS *Larsonella* Randall & Senou 2001

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 16–19 rays; pelvic fins fused, and no pelvic frenum. Body with row of ctenoid scales (partly embedded) along midsides from below 2nd dorsal fin, and short row of papillae on each midlateral scale; several

scales or rows of scales around caudal-fin base. Reduced transverse pattern of sensory papillae. Gill opening reaching to just behind preopercle margin. One species known, closely related to *Lubricogobius* Tanaka 1915, and work is needed to clarify their relationship.

Larsonella pumilus (Larson & Hoese 1980)

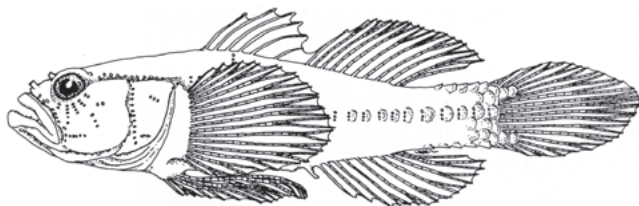
Dwarf slippergoby

Lubricogobius pumilus Larson & Hoese 1980: 41, Fig. 536 (off Somalia); Randall & Van Egmond 1994.

Larsonella pumila: Randall & Senou 2001*.

Diagnosis as for genus. Tiny and short-bodied; head compressed, and jaws strongly oblique. Ctenoid scales around caudal-fin base and in 1–6 rows on sides, posteriorly from below 2nd dorsal-fin origin.

Head and body uniformly orange; top of head crossed by ~6 thin bluish lines extending obliquely over cheeks and snout; fins yellowish orange. Attains 14.5 mm SL.



Larsonella pumilus, 15 mm SL (off Somalia). Source: Larson & Hoese 1980, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: Somalia and Seychelles (SW of La Digue); elsewhere, northwestern Australia.

REMARKS Found in relatively deep water, offshore around coral reefs, and lives among corals and sponges; known from 30–68 m.

GENUS *Lobulogobius* Koumans 1944

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 9 rays; pectoral fins 19–21 rays, all branched; pelvic fins form rounded cup, with fleshy lobes around pelvic-fin spines, and pelvic frenum folded into anteriorly facing pocket. LSS 25–30; TRB 9–12; predorsal scales present or absent. Eyes small, with bony ridge above; interorbital space wide; no median anterior interorbital pore, but median posterior interorbital pore present; bony flange on rear of preopercle in 1 species. Gill opening wide, forming free fold across isthmus.

Two species, both in WIO. However, *L. morrigan* Larson 1983 (seapen goby) (not described herein) is known in WIO only from a photograph from Sodwana Bay, South Africa (Plate 25).

Lobulogobius omanensis Koumans 1944

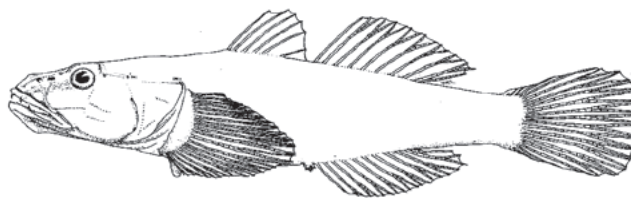
Giant lobegoby

Lobulogobius omanensis Koumans in Blegvad & Løppenthin 1944: 169, Pl. 10, Fig. 3 (Gulf of Oman); Larson & Hoese 1980*; Randall 1995*.

Labulogobius [lapsus] omanensis: Kuronuma & Abe 1986.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 9 rays; pectoral fins 20 or 21 rays, all branched; pelvic-fin spines each with flat fleshy lobe. LSS 29–30; TRB 10–12; predorsal scales 13. Body robust; eyes small, with bony ridge in interorbital space above each eye. Gill openings unrestricted, membranes attached to each other below eyes and forming free fold across isthmus. Tongue cup-like, tip bilobed.

Preserved specimens pale, with dusky line from eyes to snout tip; iris silvery. Attains 51 mm SL.



Lobulogobius omanensis, 36 mm SL, female (Gulf of Aden). Source: Larson & Hoese 1980, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: Gulf of Aden, Gulf of Oman and Persian/Arabian Gulf; elsewhere, Vietnam and northwestern Australia.

REMARKS Commensal on giant soft coral *Umbellulifera*; known from 35–45 m.

GENUS *Lotilia* Klausewitz 1960

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 rays; pectoral fins 14–17 rays, fins large and rounded; pelvic fins fused, and pelvic frenum present; caudal fin rounded. LSS 46–53; TRB 14–19; body scales small, cycloid anteriorly, and ctenoid posteriorly from below 1st dorsal fin; predorsal area naked. Head and body somewhat compressed; head large. Mouth oblique, extending to under mideyes; teeth in 1–3 rows, with 1 or 2 canine teeth at each side of lower jaw. No oculoscapular canal over opercle; sensory papillae

in transverse pattern. Gill opening extends just forward of pectoral-fin base. Unique colour pattern. At least 2 species, 1 in WIO.

Lotilia graciliosa Klausewitz 1960

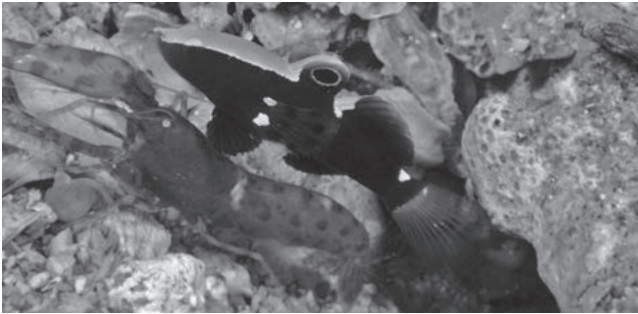
Whitecap shrimpgoby

PLATE 26

Lotilia graciliosa Klausewitz 1960: 158, Figs. 8–10 (Farasan Is., Saudi Arabia, Red Sea); Klausewitz 1970; Goren 1979*; Dor 1984; Debelius 1993*, 1998*; Eichler & Lieske 1994*; Goren & Dor 1994; Field & Field 1998*.

Fin counts as for genus. LSS 46–53; TRB 16–19.

Body distinctively velvety dark brown to black, with broad white zone on dorsal midline, from snout tip to 1st dorsal fin, and 3 small white spots also along dorsal midline (1 spot on pectoral-fin base); 1st dorsal fin with white-edged black ocellus; dorsal fins, pelvic fins and anal fin dark brown to black; pectoral fins and caudal fin transparent. Attains 33 mm SL.



Lotilia graciliosa (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Red Sea, including Gulf of Aqaba.

REMARKS Found over sand in sheltered (lagoonal) coral-reef habitats, to ~20 m deep. Commensal with an alpheid shrimp (probably *Alpheus djiboutensis*); very shy, hovers and waves its fan-like pectoral fins, and quickly retreats into its burrow.

GENUS *Luposicya* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 7–9 (usually 8) rays; pectoral fins 13–15 rays, and lower 3–6 rays unbranched, small and slender; pelvic fins fused into cup, fleshy lobes around pelvic-fin spines, and pelvic frenum with weak forward-folding pocket. Snout long, with fleshy upper lip anteriormost, and edge of lower lip fused to sides of jaw; lower jaw with row of long comb-like teeth

running diagonally across outer face of jaw towards underside of chin. Gill opening restricted to below opercle. Tongue tip narrow and pointed. One species.

Luposicya lupus Smith 1959

Cup-sponge goby

PLATES 9 & 26

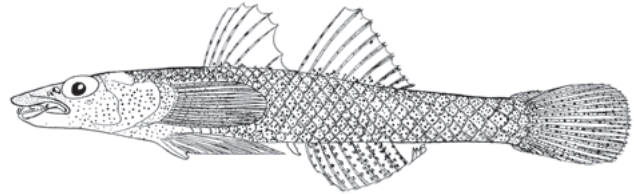
Luposicya lupus Smith 1959: 217, Fig. 36 (Pinda, Mozambique); Winterbottom & Emery 1986; Larson 1990*; Goren & Dor 1994; Winterbottom & Anderson 1997.

Luposicya luipus [*lapsus*]: Goren 1986.

Pleurosicya elongata: Anderson *et al.* 1998*; Kuitert 1998*.

Diagnosis as for genus. Interorbital space narrow; nape naked in specimens <15 mm SL.

Body transparent to greenish, with fine brown speckling; 2 brown lines from eyes to jaws, 2 brown lines across cheek and opercle, and series of short brown lines along vertebral column. Attains 29 mm SL.



Luposicya lupus, 28 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea and Mozambique; elsewhere, Indonesia to Tonga.

REMARKS Commensal on the cup sponge *Phyllospongia foliascens* and occasionally on the foliaceous sponge *P. papyracea*, at 1–20 m.

GENUS *Macrodontogobius* Herre 1936

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 15–17 rays. Scales large and ctenoid, except cycloid scales on isthmus; opercle entirely scaly, and cheek with 3 rows of scales; predorsal scales 6 or 7; LSS 27–31; TRB 6 or 7; predorsal scales 6 or 7. Head and anterior part of body cylindrical, body compressed posteriorly. Eyes large. Snout slightly overhanging tips of jaws; mouth subterminal, reaching to under front of eyes. Teeth small and conical, tightly packed in 4 or 5 rows in each jaw; teeth of outermost row largest, and most specimens with 1 large recurved canine tooth at bend of lower jaw. Sensory

papillae on head in transverse pattern. Gill opening restricted to below opercle; isthmus broad. One species.

Macrodontogobius wilburi Herre 1936

Largetooth sandgoby

PLATE 26

Macrodontogobius wilburi Herre 1936: 279, Pl. 1, Fig. 2 (Gorror Reef, Palau); Randall & Anderson 1993; Randall & Goren 1993; Bogorodsky *et al.* 2011*.

Diagnosis as for genus.

Head and body whitish to yellow-brown, with 5 dark brown rounded to elongate blotches along midsides of body, posteriormost blotch darkest (may be black); many fine pale brown to yellowish brown spots and speckles, mostly on dorsal half of body; nebulous blackish blotch on cheek below eye (most distinct markings on head); pelvic fins whitish, and sometimes with blackish barring. Attains 55 mm SL.



Macrodontogobius wilburi, 55 cm SL (New Caledonia).

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Seychelles and Maldives; elsewhere widespread in western Pacific to Line Is.

REMARKS Occurs in shallow sandy coral-reef (lagoonal) habitats, to ~20 m deep.

GENUS *Mahidolia* Smith 1932

First dorsal fin 6 spines, and fin elongate in males (first 3 spines longest), triangular to rounded in females; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16 or 17 rays. Body scales ctenoid, reaching forward to gap between dorsal fins; predorsal area and sides of head naked; LSS 33–39; TRB 13 or 14. Head and body compressed; mouth greatly enlarged, jaws reaching to lower rear corner of preopercle in adult males. Eyes large, dorsolateral. No anterior interorbital pore; sensory papillae on head in transverse pattern. One species currently recognised; occurs in Indo-Pacific, but with several forms in need of review.

Mahidolia mystacina (Valenciennes 1837)

Smiling goby

PLATE 26

Gobius mystacinus Valenciennes *in* Cuv. & Val. 1837: 124 (Java, Indonesia).

Mahidolia duque Smith 1947: 812 (Inhaca I., Maputo Bay, Mozambique);

SFSA No. 907*; Smith 1961*; Hoese & Winterbottom 1979.

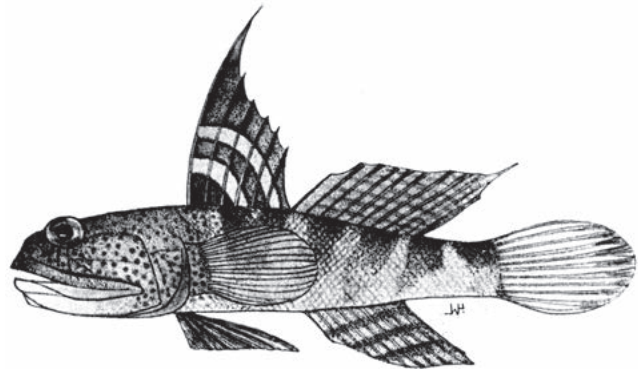
Waitea duque: Smith 1960.

Waitea mystacina: Smith 1959; Maugé 1986.

Mahidolia mystacina: Hoese 1986*.

Diagnosis as for genus.

Several colour forms known (brown, blue and yellow); head and body usually pearly grey to brown, with 8–10 anteriorly oriented oblique broad brown bands and scattered fine blackish spots; head and nape spotted and marbled with orange, yellow or blue; 1st dorsal fin with ocellate black spotting (in males) or with broad alternating pale and dark bands (in females). Attains at least 50 mm SL.



Mahidolia mystacina, 77 mm TL, holotype of *Waitea duque* (S Mozambique). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: East Africa to Mozambique and Madagascar; elsewhere in western Pacific to Fiji.

REMARKS Occurs over silty sand to muddy substrates, often associated with mangrove habitats; found in burrows, often commensally with an alpheid shrimp, at 3–22 m.

GENUS *Obliquogobius* Koumans 1941

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 21–23 rays; caudal fin elongate and pointed (asymmetrically oblique in 1 species). Body scales ctenoid; predorsal scales 5–7, but nape with narrow naked midline, and 2 rows of elongate fleshy papillae before 1st dorsal

fin; cheek with large cycloid scales on lower portion; opercle naked or with few large cycloid scales; LSS 22–25. Head and body compressed. Eyes large, dorsolateral. Jaws wide, oblique, reaching to under mideyes; tip of lower jaw anteriormost. Rear portion of oculoscapular canal over opercle absent; sensory papillae on head in longitudinal pattern; papillae on cheek elongate and fleshy, barbel-like. Gill opening moderate, extending to below opercle or rear edge of preopercle. Found in deep offshore waters of tropical Indo-Pacific. At least 6 poorly known species, and several others undescribed; at least 2 species in WIO at depths of <200 m. In addition, a single specimen trawled from ~133 m off Madagascar has been tentatively identified as *O. yamadai* Shibukawa & Aonuma 2007 (Plate 27), a species otherwise known only from the northwestern Pacific.

KEY TO SPECIES

- 1a Preopercle and pectoral-fin bases with cycloid scales; caudal fin asymmetrical, upper rays much longer than lower rays; caudal fin and 2nd dorsal fin strongly banded *O. cometes*
- 1b Preopercle naked; pectoral-fin bases naked or with 1 large cycloid scale; caudal fin symmetrical, pointed; caudal fin and 2nd dorsal fin may have indistinct dark spotting *O. turkayi*

Obliquogobius cometes (Alcock 1890)

Oblique goby

PLATE 27

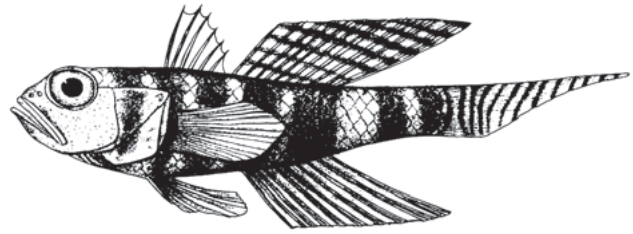
Gobius cometes Alcock 1890: 208, Pl. 8, Fig. 2 (off Chennai, India); Regan 1905.

Obliquogobius cometes: Koumans 1941; Smith 1959*.

Orissagobius cometes: Herre 1945.

Second dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 22–24 rays; caudal fin pointed, asymmetrical, with upper rays much longer than lower rays. LSS 22–24; TRB 6 or 7; preopercle, opercle and pectoral-fin bases with cycloid scales; 6 or 7 scales on sides of nape; predorsal midline naked.

Original description reports live colour as “transparent grey, with 7 broad bright yellow crossbands...2nd dorsal and caudal fins beautifully pencilled in alternate, narrow, transverse stripes of black and white; anal fin with broad dark border.” Attains 90 mm SL.



Obliquogobius cometes, ~110 mm TL (Bay of Bengal). Source: Alcock 1892

DISTRIBUTION Indo-Pacific. WIO: Gulf of Aden, Gulf of Oman and India; elsewhere, east coast of India, Indonesia and Philippines.

REMARKS Trawled from hard-sand substrate, at 178–1 112 m.

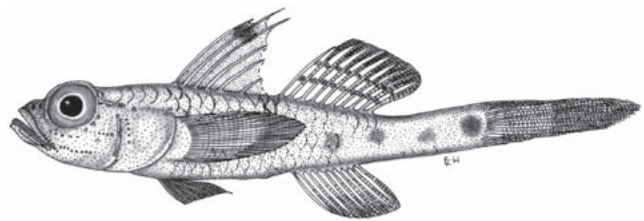
Obliquogobius turkayi Goren 1992

Turkey's oblique goby

Obliquogobius turkayi Goren 1992: 267, Figs. 1–3 (southern Sudan, Red Sea); Goren & Dor 1994.

Second dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 21–23 rays; caudal fin pointed, symmetrical. LSS 24 or 25; TRB 6 or 7; predorsal midline and preopercle naked; opercle with 1 or 2 large (deciduous) cycloid scales; 5 or 6 scales on sides of nape; pectoral-fin bases naked or with 1 large cycloid scale.

Preserved specimens pale, with dusky scale margins; 5 or 6 dusky blotches along sides of body, darkest blotch at caudal-fin base; 2 rows of dark spots on 2nd dorsal fin; upper and lower caudal-fin rays dusky. Attains 54 mm SL.



Obliquogobius turkayi, 53 mm SL (Red Sea). Composite

DISTRIBUTION WIO: Red Sea and India; probably also western Pacific.

REMARKS Known from few specimens trawled from deep water, at 179–496 m.

GENUS *Oplopomus* Valenciennes 1837

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 10 rays; pectoral fins 18 or 19 rays. Distinctive pungent spines in 1st and 2nd dorsal fins. LSS 22–30; predorsal area variably scaly, midline may be naked; sides of head scaly or naked. Sensory papillae in longitudinal pattern, forming many rows on lower cheek; 1 or 2 flat opercular spines. Gill opening extends to rear edge of preopercle. Found over sand, usually in open areas. At least 2 species, both in WIO. The genus has never been revised, and *O. oplopomus*, as currently understood, may represent 2 or more species.

KEY TO SPECIES

- 1a Cheek and opercle with cycloid scales; predorsal area fully scaly, scales ctenoid; 1st dorsal fin low and rounded *O. caninoides*
- 1b Cheek and opercle naked; predorsal scales cycloid, but area often partly naked; 1st dorsal fin pointed *O. oplopomus*

Oplopomus caninoides (Bleeker 1852)

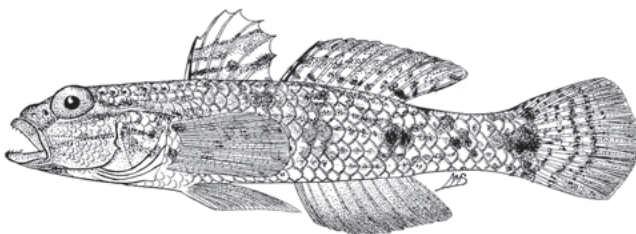
Shy lagoongoby

PLATE 38

Gobius caninoides Bleeker 1852: 274 (Ambon I., Moluccas, Indonesia).*Hoplopomus caninoides*: Regan 1908.*Oplopomus caninoides*: Smith 1959*; Randall & Goren 1993; Debelius 1998*.

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 18 rays. LSS 22–26; TRB 8–10; predorsal scales 10–13, extending to behind eyes; cheek and opercle covered with cycloid scales; rear edge of preopercle with 2–4 flat spines.

Head and body sandy white to greyish, paler ventrally; 5 brown to blackish rounded blotches on sides of body; many small orange to orange-brown spots on sides of body and nape; sides of head with brownish mottling; dorsal fins with dark brown horizontal lines and rows of blue or orange spots; caudal fin banded with oblique brown and blue lines or with rows of spots mostly on lower half of fin. Attains 68 mm SL.

*Oplopomus caninoides*, 50 mm TL (central Mozambique).

Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Mozambique, Madagascar and Maldives; elsewhere, Indonesia to Solomon Is.

REMARKS Found over silty to muddy sand, at 5–65 m.

Oplopomus oplopomus (Valenciennes 1837)

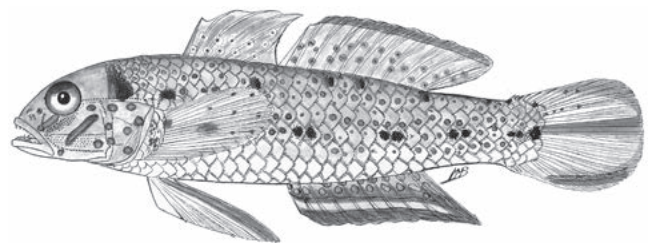
Pretty lagoongoby

PLATES 27 & 38

Gobius oplopomus Valenciennes (ex Ehrenberg) in Cuv. & Val. 1837: 66 (Massawa, Eritrea, Red Sea).*Gobius bitelatus* Valenciennes in Cuv. & Val. 1837: 89 (Red Sea).*Hoplopomus acanthistius* Regan 1908: 242, Pl. 29, Fig. 3 (Mulaku, Maldives).*Oplopomus oplopomus*: Smith 1959*; Smith & Smith 1963*; Goren 1979; Hoese & Winterbottom 1979; SSF No. 240.67*; Randall & Goren 1993; Eichler & Lieske 1994*; Randall 1995*; Kuitert 1998*; Heemstra *et al.* 2004.*Oplopomus hoplopomus*: Kuronuma & Abe 1986.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 10 rays; pectoral fins 18 or 19 rays. LSS 24–30; TRB 9 or 10; predorsal scales 2–13, reaching forward to above rear edges of preopercle; nape midline naked or partly scaly; cheek and opercle naked; rear edge of preopercle with 1 or 2 flattened spines.

Head and body pearly grey to bluish white, with several silvery white to pale blue spots and short streaks on sides of head; small blue spots scattered over body; 5 paired dark brown to golden brown oblong blotches along midsides of body; diffuse dark spot on opercle, and usually another just behind top of pectoral-fin bases; unpaired fins highly ornamented with blue, red and yellow (most pronounced in males); caudal fin with central yellow to red stripe. Attains 63 mm SL.

*Oplopomus oplopomus*, 60 mm TL (S Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Oman to Mozambique, Madagascar, Comoros, Seychelles, Rodrigues, Chagos, India and Maldives; elsewhere, Indonesia to Society Is.

REMARKS Generally found over open sandy to silty areas associated with coral reefs, often near large hummocks and holes, at 4–25 m.

GENUS *Palutrus* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 14–16 rays. Distinct mental frenum, with 2 papillae immediately behind it; sensory papillae on head in reduced longitudinal pattern. TRB 8 or 9; predorsal area naked or with 7–11 scales; pectoral-fin bases and pre-pelvic area scaly or naked. Gill opening restricted to pectoral-fin base. Small-sized, benthic; very similar in appearance to members of *Bathygobius* but tips of pectoral-fin rays not free from membrane. About 3 species in Indo-Pacific and all in need of study; at least 1 species in WIO.

Palutrus scapulopunctatus (De Beaufort 1912)

Shoulderspot goby

PLATE 27

Gobius (Rhinogobius) scapulopunctatus De Beaufort 1912: 137 (reef at Saonek, Waigeo I., Indonesia).

Acentrogobius meteori Klausewitz & Zander 1967: 85, Fig. 1 (Sarso Khebir I., Farasan Is., Saudi Arabia, Red Sea); Goren 1979*.

Palutrus pusillus Tortonese 1976: 188, Fig. 1 (Gulf of Aden).

Palutrus reticularis Smith 1959: 208, Fig. 27 (Pinda, Mozambique); Smith & Smith 1963*; Randall & Goren 1993*.

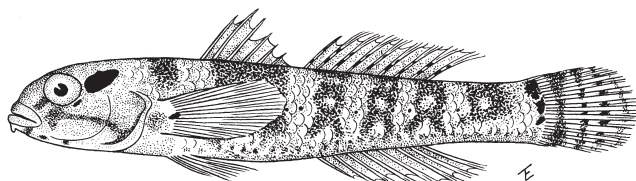
Bathygobius meteori: Goren & Dor 1994.

Palutrus meteori: Randall 1995*.

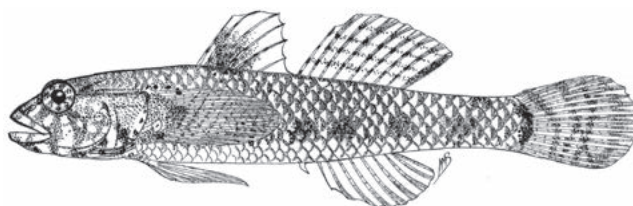
Palutrus scapulopunctatus: Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 rays; pectoral fins 14–16 rays. LSS 23–25; TRB 8 or 9; predorsal scales 7–11; pre-pelvic area scaly; pectoral-fin bases partly scaly.

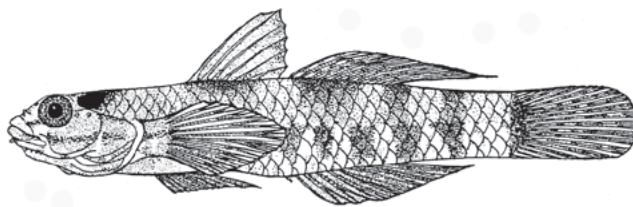
Body brownish to fawn, with dark bars and mottling; large black spot behind eyes (may be diffuse in females); 3 or 4 small dark spots above pectoral-fin bases; dark vertical bar at caudal-fin base, may be most distinct above midline. Attains 21 mm SL.



Palutrus scapulopunctatus, 19 mm SL, holotype of *P. pusillus* (Gulf of Aden). Source: Tortonese 1976



Palutrus scapulopunctatus, 22 mm TL, holotype of *P. reticularis* (N Mozambique). Source: Smith 1959



Palutrus scapulopunctatus, 21 mm SL, type of *Acentrogobius meteori* (Red Sea). Source: Klausewitz & Zander 1967, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman, Mozambique, Madagascar, Seychelles, Rodrigues and Maldives; elsewhere, Vietnam to Solomon Is.

REMARKS Found over sand and rubble on coastal rocky or coral reefs, to ~10 m deep.

GENUS *Parachaeturichthys* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 20–23 rays. Body scales ctenoid; head fully covered with cycloid scales, including 1 row along edge of branchiostegal membranes; predorsal scales 10–15, also cycloid, reaching interorbital space up to rear portion of snout; LSS 26–29; TRB 8½–10. No anterior interorbital pore; large oval postorbital pore; 3 preopercular pores. Sensory papillae on cheek in longitudinal pattern of short, flat, thin ridges; slender barbels may or may not be present on underside of head and chin. Mental frenum bilobed (may not be prominent), and may have 2 rows of barbels. Gill opening extends to pectoral-fin base. Resembles members of *Aulopareia* and is in need of review. One species currently recognised.

Parachaeturichthys polynema (Bleeker 1853)

Taileyed goby

PLATE 27

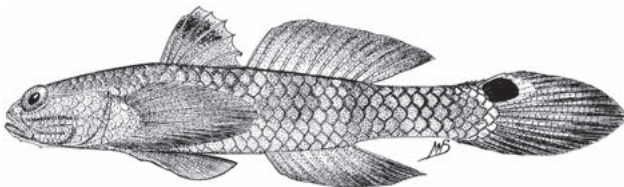
Chaeturichthys polynema Bleeker 1853: 44, Pl., Fig. 4 (Nagasaki, Japan).*Gobius polynema*: SFSA No. 920*; Smith 1961*.*Parachaeturichthys polynema*: Smith 1959*, 1960;

Smith & Smith 1963*; Hoese & Winterbottom 1979; Hoda 1980*;

SSF No. 240.73*; Randall 1995*.

Diagnosis as for genus, except WIO specimens do not have barbels, but a few short fleshy knobs may be present.

Fresh and preserved specimens pale whitish to yellowish, with dusky mottling over back and sides; 1st dorsal fin dusky to blackish, fin tip always darkest or with dense black blotch; distinctive large oval black spot with white or yellow ring on upper caudal-fin base. Attains 120 mm SL.



Parachaeturichthys polynema, 75 mm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: India (Mumbai), Pakistan, Persian/Arabian Gulf and Kuwait Bay, Gulf of Oman, Mozambique, South Africa (KwaZulu-Natal), Seychelles and Madagascar; elsewhere, east coast of India to eastern Australia and Japan.

REMARKS Usually caught by trawling over muddy or sand-mud bottoms, at 8–70 m. The WIO population may represent a separate species.

GENUS *Paragobiodon* Bleeker 1872

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8–10 rays; pectoral fins 19–23 rays; pelvic fins form rounded disc, with fleshy pelvic frenum. Body short and stocky with rounded head; lower surface of head with small fleshy bumps and flaps, which may be present on top of head also. LSS 22–26; TRB 7–10; predorsal area and sides of head naked. Sensory papillae in reduced longitudinal pattern. Gill opening restricted to pectoral-fin base. Commensal with stony corals *Pocillopora*, *Seriatopora* and *Stylophora*, among which

they can be difficult to see. Similar in appearance to members of *Gobiodon*, which also inhabit corals but have no scales. Six species, in tropical Indo-Pacific, 4 in WIO.

KEY TO SPECIES

- 1a Head with large elongate flaps, numerous and elongate dorsally; upper lip with few (if any) flaps, and no flaps directly under eyes; no enlarged bumps behind upper jaw 2
- 1b Head with small rugose flaps, sparse and very short dorsally; upper lip usually densely covered with rugose bumps in adults; several small flaps directly under eyes, and numerous flaps between eyes and upper lip; 2 or 3 enlarged bumps immediately behind middle of upper jaw 3
- 2a Body and fins black; head paler than body, red or reddish orange in life *P. echinocephalus*
- 2b Head and body pale brown in preserved specimens, and yellowish to bright green in life; caudal fin and usually 2nd dorsal fin and anal fin with black margin *P. xanthosoma*
- 3a Body pale orange to yellowish brown; all fins except pectoral fins and pelvic-fin disc dark brown to jet-black; gill opening extends down to lower 3rd–5th pectoral-fin ray, membrane attaching on side of pectoral-fin base *P. lacunicolus*
- 3b Body black, head paler and reddish to orange in life; gill opening extends down to lowest pectoral-fin ray *P. modestus*

Paragobiodon echinocephalus (Rüppell 1830)

Redhead coralgoby

PLATE 28

Gobius echinocephalus Rüppell 1830: 34, Pl. 34, Fig. 3
(Massawa, Eritrea, Red Sea).

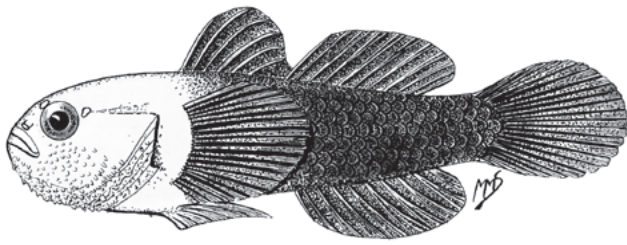
Gobius amiciensis: Sauvage 1891.

Gobiopterus modestus Regan 1908: 242, Pl. 29, Fig. 1
(Egmont I. and Salomon I., Chagos) [in part].

Paragobiodon echinocephalus: Smith 1959* [in part]; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.74*; Winterbottom & Emery 1986*; Stiassny & Raminosa 1994; Winterbottom & Anderson 1997; Field & Field 1998*; Herler & Hilgers 2005*.

Second dorsal fin and anal fin each with 1 spine, 9 or 10 rays; pectoral fins 19–22 rays. LSS 22–27; TRB 8–10.

Body and fins black to brownish black; head red to reddish orange, may be finely spotted or marbled with bluish vermiculate lines; iris orange-red. Attains 30 mm SL.



Paragobiodon echinocephalus, 25 mm SL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea, Tanzania (Zanzibar), Mozambique (Maputo Bay), Madagascar, Comoros, Aldabra, Seychelles, Mauritius, Réunion and Chagos; elsewhere to Tuamotu Is.

REMARKS Occupies *Stylophora pistillata* coral, at 1–43 m.

Paragobiodon lacunicolus

(Kendall & Goldsborough 1911)

Blackfin coralgoby

PLATE 28

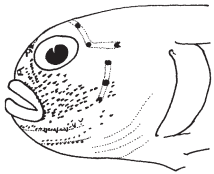
Ruppellia lacunicola Kendall & Goldsborough 1911: 318, Pl. 6, Fig. 1 (lagoon at Fakarava, Tuamotu Is.).

Paragobiodon echinocephalus: Smith 1959 [in part].

Paragobiodon lacunicolus: SSF No. 240.75*; Winterbottom & Emery 1986*; Randall & Goren 1993*; Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 8 or 9 rays; pectoral fins 21 or 22 rays. LSS 20–24; TRB 7–9.

Head orange to pale orange-brown, body pale orange to yellowish; all fins except pelvic-fin disc brownish black to jet-black. Attains 18 mm SL.



Paragobiodon lacunicolus, 12 mm SL (Chagos).

Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific. WIO: Chagos and Maldives; elsewhere widespread to Ryukyu Is., Australia and Tuamotu Is.

REMARKS Found in fine-branched *Pocillopora* stony corals (particularly *P. damicornis*), at 5–20 m.

Paragobiodon modestus (Regan 1908)

Palehead coralgoby

PLATE 28

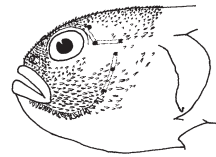
Gobiopodus modestus Regan 1908: 242, Pl. 29, Fig. 1 (Egmont I. and Salomon I., Chagos).

Paragobiodon echinocephalus: Smith 1949*, 1959* [in part].

Paragobiodon modestus: Hoese 1986*; Winterbottom & Emery 1986*; Randall & Goren 1993*; Randall & Van Egmond 1994; Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 19–24 rays. LSS 22–25; TRB 8 or 9.

Head bright orange to reddish or brownish orange, shading into black body past pectoral-fin bases; iris red to orange; all fins black. Attains 25 mm SL.



Paragobiodon modestus, 25 mm SL (Chagos). Source: Winterbottom & Emery 1986

DISTRIBUTION Indo-Pacific (widespread). WIO: Mozambique (Inhaca I.), Seychelles, Mascarenes, Chagos and Maldives; elsewhere in western Pacific to Society Is.

REMARKS Found among branches of *Pocillopora* corals, to ~15 m deep.

Paragobiodon xanthosoma (Bleeker 1853)

Emerald coralgoby

PLATE 28

Gobius xanthosoma Bleeker 1853: 703 (Wahai, Seram I., Moluccas, Indonesia).

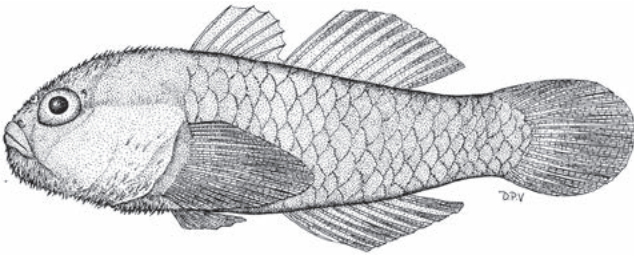
Paragobiodon echinocephalus: Smith 1959 [in part].

Paragobiodon xanthosoma: Goren & Voldarsky 1980*; Goren 1984.

Paragobiodon xanthosomus: SSF No. 240.77*; Winterbottom & Emery 1986*; Randall & Van Egmond 1994; Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 18–21 rays. LSS 21–26; TRB 8–10.

Head, body and fins bright green to greenish or lemon yellow; head may be covered with tiny blue spots; iris golden to orange; caudal fin may have narrow dark margin. Attains 32 mm SL.



Paragobiodon xanthosoma, 20 mm SL (Kenya). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea (Eilat, Port Sudan), Kenya, Seychelles and Chagos; elsewhere throughout western Pacific to Samoa.

REMARKS Found among fine-branching *Seriatopora hystrix* coral, to ~23 m deep.

GENUS *Phyllogobius* Larson 1986

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 7 or 8 rays; pectoral fins 16–20 (usually 19) rays, lower 6–9 rays unbranched and slightly thickened toward tips; pelvic fins fused into cup, fleshy lobes around pelvic-fin spines, distinct forward-folding pocket in pelvic frenum, and skin of lobes and frenum may be papillose or fimbriate; caudal fin rounded. Distinguished by greatly flattened head. Interorbital space broad, with 2 pairs of interorbital pores, and thin bony ridge on sides of each interorbital canal. LSS 28–37; TRB 9–13; predorsal scales 10–13. Tongue tip rounded to blunt. Gill opening unrestricted, with broad free fold over isthmus; at least half of 1st gill arch bound by membrane to inner face of opercle. One species.

Phyllogobius platycephalops (Smith 1964)

Flathead sponge goby

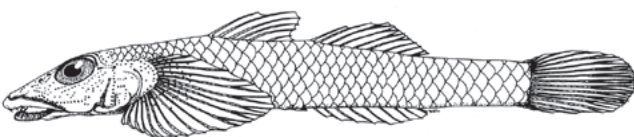
PLATE 28

Cottogobius platycephalops Smith 1964: 174, Pl. 4 (Pinda, Mozambique).

Phyllogobius platycephalops: Larson 1986*.

Diagnosis as for genus.

Body transparent pinkish orange; red line from upper lip to eyes, and indistinct reddish dashes in row along back and lateral line; eyes silvery. Attains 24 mm SL.



Phyllogobius platycephalops, 20 mm SL. Source: Larson 1986

DISTRIBUTION Indo-Pacific. WIO: Mozambique; elsewhere in western Pacific to Solomon Is.

REMARKS Commensal on purplish brown upright foliaceous sponge *Phyllospongia papyracea*, to ~15 m deep.

GENUS *Pleurosicya* Weber 1913

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6–9 rays; anal fin 1 spine, 7–9 rays; pectoral fins 14–20 rays, lower 2–7 rays unbranched; pelvic fins cup-like, fleshy lobes around pelvic-fin spines, distinct forward-facing pocket in pelvic frenum, and skin of lobes and frenum may be papillose or fimbriate. Nape scaly or naked. Interorbital space narrow, with single anterior interorbital pore. Teeth fine and pointed in both jaws; teeth of outer row in lower jaw usually horizontal and movable; at least one pair of large curved teeth behind tooth rows near tip of lower jaw. Lip fused at tip of chin, and free at sides of jaw. Small-sized; commensal with various invertebrates and seagrasses. Seventeen species, 11 in WIO.

KEY TO SPECIES

[Some specimens, especially small juveniles, may be difficult to differentiate using the key alone.]

- | | | |
|----|---|--------------------|
| 1a | Nape naked | 2 |
| 1b | Nape scaly only to behind eyes, or at least sides of nape scaly | 8 |
| 2a | Gill opening extends forward to below preopercle or nearly to eye | 3 |
| 2b | Gill opening restricted to pectoral-fin base | 4 |
| 3a | Tongue trilobed (rarely blunt); lobes of pelvic-fin spines usually long and folded; colour pale, without brown bars; no black blotch at rear of 2nd dorsal fin in males [associated with corals] | <i>P. plicata</i> |
| 3b | Tongue bilobed (occasionally blunt, rarely trilobed); lobes of pelvic-fin spines usually not greatly expanded or folded; live fish green, with ~12 narrow brown bars; males with black blotch at rear of 2nd dorsal fin [commensal on seagrasses] | <i>P. bilobata</i> |
| 4a | Tongue very small, usually narrow and pointed (but sometimes blunt or rounded); tip of upper lip elongate and fleshy, giving bird-like profile; no small canine tooth at each side of lower jaw | 5 |
| 4b | Tongue moderately broad and pointed, and slightly trilobed or round; upper lip may be fleshy, but tip never elongate and pointed; small canine tooth may be present at each side of lower jaw | 6 |

Continued ...

KEY TO SPECIES

- 5a Tip of upper jaw narrow, with cartilaginous tooth-bearing projection, covered by elongated pointed upper lip; scales on body often reach only to below gap between dorsal fins; no black spot on anal fin *P. prognatha*
- 5b Tip of upper jaw without cartilaginous projection, upper lip may be elongated and fleshy; scales on body always reach to behind pectoral-fin bases; males with black spot on anal fin anteriorly *P. fringilla*
- 6a Mouth terminal, snout convex; eyes relatively small (~25% HL); at least 5 reddish lines on head radiating from eyes in live fish (not always visible in preserved specimens); lower 1–7 (usually 2) pectoral-fin rays unbranched [commensal on soft corals] *P. muscarum*
- 6b Mouth subterminal, with upper lip overhanging lower jaw; eyes moderate (~29% HL); probably only 1 thin reddish or brown line from eyes to snout in live fish; lower 4–7 (usually 6) pectoral-fin rays unbranched 7
- 7a Dense elongate black spot on centre of nape; head width moderate; upper lip not particularly fleshy but overhanging lower jaw *P. occidentalis*
- 7b Diffuse spot on centre of nape (occasionally absent); head relatively broad; upper lip fleshy [commensal on blue coral *Heliopora coerulea*] *P. coerulea*
- 8a Second dorsal fin 1 spine, 7 rays; anal fin 1 spine, 8 rays; no melanophores visible on body, head or fins of preserved specimens; body plain white in life, with thin red or pink stripes on head [commensal on deepwater soft corals] *P. boldinghi*
- 8b Second dorsal fin and anal fin each usually with 1 spine, 8 (rarely 7) rays; body and fins variously pigmented: lateral stripe on body, or blotch on pectoral-fin bases or 1st dorsal fin, and at least part of body dusky 9
- 9a Distinct black blotch or streak (but occasionally absent) on lower part of 1st dorsal fin; gill opening always wide (usually extends to rear margin of eye) 10
- 9b Usually no black blotch or spotting on 1st dorsal fin; gill opening extends forward to at least rear edge of eye; body slender; 1st dorsal-fin base sometimes with scattered dusky markings, and lower half of body and caudal fin with brown streak; head triangular and eyes dorsolateral [commensal on hard corals] *P. micheli*
- 10a Pectoral fins 17–19 (average 18) rays; body depth at anus 15–19% SL (average 17%); nape midline usually naked [coral-reef habitats, at 1–24 m, commensal on a range of organisms, such as soft corals and sponges] *P. mossambica*
- 10b Pectoral fins 19 or 20 (average 19) rays; body depth at anus 15–22% SL (average 18%); nape midline always fully scaly [offshore habitats, at 14–70 m] *P. annandalei*

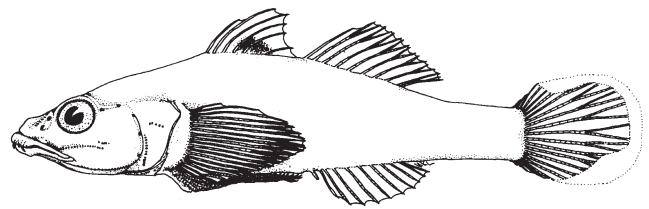
Pleurosicya annandalei Hornell & Fowler 1922

Scalynape goby

Pleurosicya annandalei Hornell & Fowler 1922: 924 (Thoothukudi, India); Larson & Hoese 1980*; SSF No. 240.80*; Larson 1990*.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–20 rays, lower 3–5 rays unbranched and thickened toward tips. LSS 20–25; TRB 6–9; predorsal scales 7–14, and midline always fully scaly. Gill opening wide, reaching to below rear edge of eye. Tongue tip blunt to slightly concave.

Body translucent pink; 1st dorsal fin with blackish streak or dusky blotch near base. Attains 28 mm SL.



Pleurosicya annandalei, 23 mm SL, male (off Somalia).

Source: Larson & Hoese 1980, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay), Somalia and southern India; elsewhere to east coast of India, Indonesia, Philippines, New Guinea and Australia.

REMARKS Commensal on the gorgonian *Solenocaulon tortuosum*, offshore, at 14–70 m.

Pleurosicya bilobata (Koumans 1941)

Seagrass goby

PLATE 9

Cottogobius bilobatus Koumans 1941: 253 (Muthivaratu Paar, India).

Pleurosicya taisnei Plessis & Fourmanoir 1966: 765,

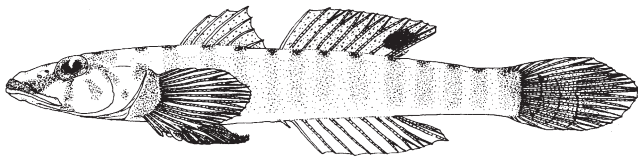
Fig. (Île des Pins, New Caledonia).

Pleurosicya bilobatus: Larson & Hoese 1980*.

Pleurosicya bilobata: Larson 1990*.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–19 rays, lower 3–7 rays unbranched and thickened toward tips. LSS 23–29; TRB 5–7; nape naked. Slender-bodied with relatively long snout. Gill opening wide, reaches at least rear edge of eye. Tongue tip usually bilobed.

Body translucent greenish to yellowish green, with ~12 brown or golden bars, bars forming spots at dorsal midline; 3 or 4 oblique brownish stripes across head, radiating from eyes; males with distinct black spot at rear of 2nd dorsal fin. Attains 23 mm SL.



Pleurosicya bilobata, 22 mm SL, male (Guam). Source: Larson 1990

DISTRIBUTION Indo-Pacific. WIO: St Brandon Shoals, Comoros and Mascarenes; elsewhere, Sri Lanka to New Caledonia.

REMARKS Commensal on seagrasses, such as *Enhalus* and *Halophila*, and apparently the ascidian *Polycarpa aurata*, at 2–30 m. Feeds on small crustaceans taken from seagrass or nearby water.

Pleurosicya boldinghi Weber 1913

Giant softcoral goby

PLATE 9

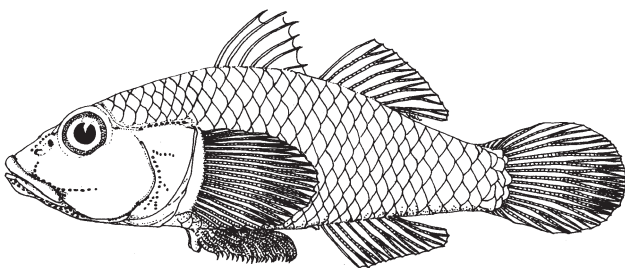
Pleurosicya boldinghi Weber 1913: 456 (New Guinea);

Larson & Hoese 1980*; Larson 1990*; Randall & Van Egmond 1994.

Bryaninops amplus: Debelius 1993*.

Second dorsal fin 1 spine, 7 rays; anal fin 1 spine, 6–8 rays; pectoral fins 18–21 rays, lower 2–6 rays unbranched and thickened toward tips. LSS 22–25; TRB 7–10; predorsal scales 5–18. Robust-bodied, with small eyes set high on head. Gill opening wide, reaching at least halfway between eye and rear edge of preopercle, and sometimes to rear edge of eye. Tongue tip usually blunt.

Body translucent white, may be pinkish ventrally; eyes silver to pale golden; thin red line from each eye to tip of upper lip (lines do not meet). Attains 28 mm SL.



Pleurosicya boldinghi, 27 mm SL, female (off Somalia).

Source: Larson & Hoese 1980, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay and Aliwal Shoal), East Africa and Seychelles; elsewhere, Philippines to New Guinea.

REMARKS Commensal on large spiky soft corals *Dendronephthya* and occasionally sea pens, at 24–127 m.

Pleurosicya coerulea Larson 1990

Heliopora goby

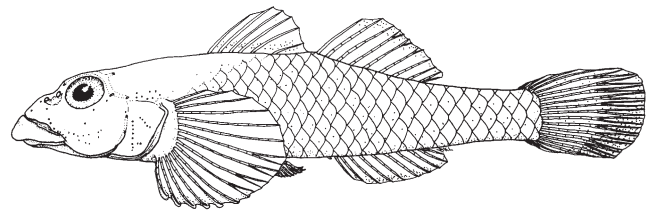
PLATE 9

Pleurosicya coerulea Larson 1990: 20, Fig. 16 (Japton I., Marshall Is.); Winterbottom & Anderson 1997.

Pleurosicya HKL sp. 5: Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 15–18 rays, lower 4–7 rays unbranched and thickened toward tips. LSS 22–25; TRB 5–7; nape naked. Gill opening usually restricted to pectoral-fin base, but may reach to under opercle; gill membranes often folded over isthmus, and also joined to isthmus. Upper lip large, usually concealing mouth when jaws closed. Tongue tip rounded to somewhat pointed.

Body translucent bluish to blue-green; eyes silvery, may be purple dorsally; thin reddish line from eyes to snout. Attains 20 mm SL.



Pleurosicya coerulea, 16 mm SL, male (Enewetak Atoll). Source: Larson 1990

DISTRIBUTION Indo-Pacific. WIO: Amirante Is. (Seychelles) and Chagos; elsewhere, Indonesia to Marquesas Is.

REMARKS Commensal on blue coral *Heliopora coerulea*, at 1–27 m; feeds on the cuticle of the coral and any associated epibiota.

Pleurosicya fringilla Larson 1990

Staghorn coralgoby

PLATE 9

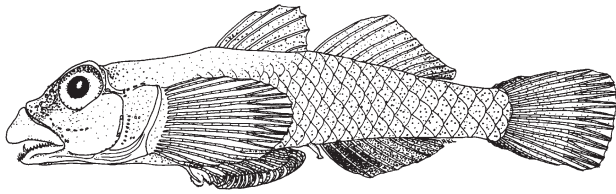
Pleurosicya fringilla Larson 1990: 25, Fig. 18 (Yanutha Islet, Lau Group, Fiji); Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Pleurosicya HKL sp. 1: Winterbottom & Emery 1986*.

Pleurosicya sp. 1: SSF No. 240.83.

Second dorsal fin and anal fin each with 1 spine, 7–9 rays; pectoral fins 14–16 rays, lower 4–6 rays unbranched and sometimes thickened. LSS 23–31; TRB 7–10; nape naked. Gill opening restricted to pectoral-fin base. Upper lip large, fleshy, rather pointed. Tongue small and pointed.

Body transparent, with brown and silver peritoneum and brown and yellow internal stripes; brown stripe from each eye onto snout tip (meeting at tip); anterior part of anal fin with dense black blotch in males. Attains 19 mm SL.



Pleurosicya fringilla, 15 mm SL, male (Fiji). Source: Larson 1990

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay), Seychelles, Mauritius, Rodrigues and Chagos; elsewhere, Indonesia to Tuamotu Is.

REMARKS Commensal with large staghorn corals, particularly *Acropora formosa* and *A. grandis*, among which they cling to the undersides of the branches, at 3–30 m.

Pleurosicya micheli Fourmanoir 1971

Hardcoral goby

PLATE 9

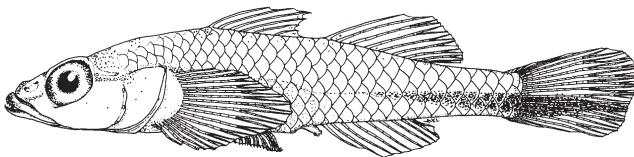
Pleurosicya micheli Fourmanoir 1971: 499, Fig. 8 (Caban I., off Luzon, Philippines); Larson 1990*; Randall & Anderson 1993*; Randall & Goren 1993*; Randall 1995*; Winterbottom & Anderson 1997; Kuitert 1998*; Herler & Hilgers 2005*.

?*Pleurosicya* HKL sp. 15: Winterbottom & Emery 1986.

?*Pleurosicya mossambica*: Debelius 1998*.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–19 rays, lower 2–5 rays unbranched, with thickened tips. LSS 22–28; TRB 6–9; predorsal midline naked, but scale rows on sides of nape 8–12. Gill opening wide, reaching forward to at least rear edge of eye. Tongue tip blunt to weakly trilobed.

Body transparent, with red to red-brown internal stripe along vertebral column, the stripe banded with white or silver; lower half of body with dusky streak, intensifying to black stripe on peduncle and lower half of caudal fin. Attains 20 mm SL.



Pleurosicya micheli, 18 mm SL, female (Philippines). Source: Larson 1990

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Red Sea, Seychelles, Réunion, Chagos and Maldives; elsewhere, Malaysia to French Polynesia.

REMARKS Commensal only on hard corals, such as *Turbinaria*, *Pachyseris* and *Porites*, sitting exposed on top of the coral, at 10–53 m.

Pleurosicya mossambica Smith 1959

Many-host goby

PLATE 28

Pleurosicya mossambica Smith 1959: 218, Fig. 37 (Pinda, Mozambique);

Hoesle & Winterbottom 1979; Goren 1984*; SSF No. 240.81*;

Larson 1990*; Debelius 1993*; Goren & Dor 1994; Winterbottom & Anderson 1997; Anderson *et al.* 1998; Kuitert 1998*.

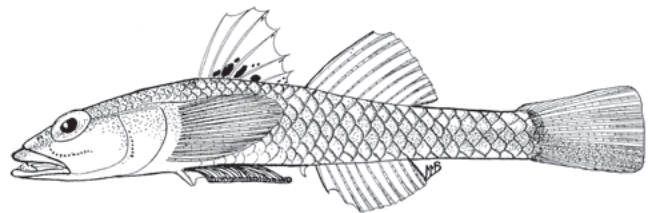
Pleurosicya sinaia Goren 1984: 74, Fig. 2 (Marsa Barecha, Sinai, Egypt, Red Sea); Larson 1990; Goren & Dor 1994.

Pleurosicya HKL sp. 2: Winterbottom & Emery 1986*.

?*Pleurosicya micheli*: Debelius 1998*; Field & Field 1998*.

Second dorsal fin 1 spine, 6–8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–20 rays, lower 3–8 rays unbranched and thickened. LSS 20–27; TRB 6–8; predorsal scales 6–13, nape midline may be naked or partly scaly. Body stocky; usually snout approximately rectangular when viewed dorsally. Gill opening wide, reaching to below rear edge of eye or mideye. Tongue tip usually blunt.

Colour variable, partly depending on host colour: body usually translucent pink, grey-green or dull yellow, and sometimes whole body dusky-speckled; black stripe along lower part of 1st dorsal fin; brownish to red or pink narrow stripe from eyes to snout tip; some specimens with dusky streak along peduncle. Attains 25 mm SL.



Pleurosicya mossambica, 25 mm TL, male holotype (N Mozambique).

Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; elsewhere, Indonesia to Marquesas Is.

REMARKS Commensal on a range of marine organisms, such as stony corals, gorgonians, soft corals, sponges, tunicates, leafy green algae and the giant clam *Tridacna gigas*, at 1–28 m.

Pleurosicya muscarum (Jordan & Seale 1906)

Softcoral goby

PLATE 29

Rhinogobius muscarum Jordan & Seale 1906: 401, Fig. 90
(Pago Pago, Tutuila I., American Samoa).

Pleurosicyops timidus Smith 1959: 217, Fig. 35 (Pinda, Mozambique).

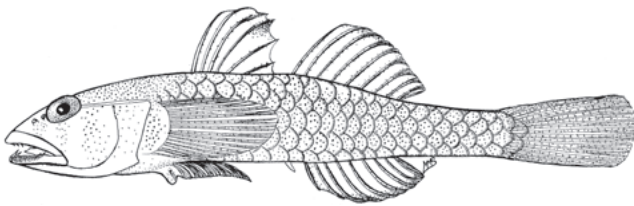
Pleurosicya timidus: Hoese & Winterbottom 1979.

Pleurosicya muscarum: SSF No. 240.82*; Larson 1990*;
Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Pleurosicya HKL sp. 8: Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–19 rays, lower 1–7 rays unbranched and thickened towards tips. LSS 21–25; TRB 5–7; head and nape naked. Snout profile distinctively convex; eyes relatively small and set high on head. Gill opening restricted to pectoral-fin base. Tongue tip blunt to rounded, rarely weakly trilobed.

Body transparent reddish to bluish or greenish grey, with at least 5 narrow pink to reddish lines on head, radiating from eyes across head and snout; iris silvery or pale golden; no distinct fin markings. Attains 22 mm SL.



Pleurosicya muscarum, 20 mm TL, holotype of *Pleurosicyops timidus* (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Seychelles, Rodrigues and Chagos; elsewhere, Indonesia to West Samoa.

REMARKS Commensal in small groups on soft corals only, mainly *Lobophytum* and *Sinularia*, at 1–25 m.

Pleurosicya occidentalis Larson 1990

Western cling-goby

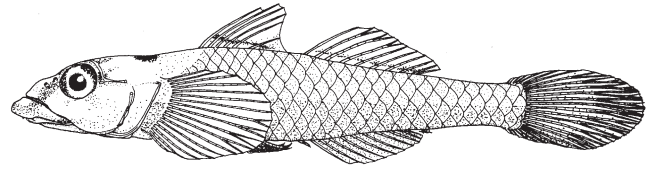
Pleurosicya occidentalis Larson 1990: 40, Fig. 24 (St Brandon Shoals);
Winterbottom & Anderson 1997.

Pleurosicya HKL sp. 3: Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 6–9 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–18 rays, lower 4–7 rays unbranched and sometimes thickened; lobes of pelvic-fin spines usually rounded. LSS 21–27; TRB 5–7; nape naked. Slender-bodied.

Gill opening restricted to pectoral-fin base. Tongue tip rounded, with pointed centre.

Preserved specimens pale, with elongate dense black blotch on centre of nape. Attains 20 mm SL.



Pleurosicya occidentalis, 18 mm SL, male holotype (St Brandon Shoals). Source: Larson 1990

DISTRIBUTION WIO: Seychelles, St Brandon Shoals and Chagos.

REMARKS Found in marine habitats, to ~25 m deep.

Pleurosicya plicata Larson 1990

Folded-lobe goby

PLATE 29

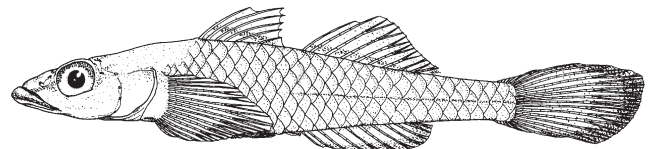
?*Acentrogobius mbudyae* Nalbant & Mayer 1975: 238, Pl. 2, Fig. 6
(Mbudya I., Tanzania).

Pleurosicya plicata Larson 1990: 41, Figs. 25–26 (Isle Boddam,
Salomon Atoll, Chagos Archipelago); Randall & Van Egmond 1994;
Winterbottom & Anderson 1997; Bogorodsky *et al.* 2011.

Pleurosicya HKL sp. 12: Winterbottom & Emery 1986*.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 15–18 rays, lower 2–4 rays unbranched, tips sometimes thickened; pelvic fins long and flat; lobes of pelvic-fin spines usually long and folded inward. LSS 22–26; TRB 6–8; nape naked. Relatively slender-bodied. Gill opening at least to rear edge of preopercle. Tongue tip trilobed (sometimes weakly).

Body pale pink or reddish orange, and head reddish and darker than body; scale margins with faintly dusky outline. Attains 23 mm SL.



Pleurosicya plicata, 19 mm SL, holotype (Chagos). Source: Larson 1990

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Seychelles, Mauritius to Chagos; elsewhere to Philippines, Caroline Is. (Pohnpei), Australia and Tonga.

REMARKS Red Sea individuals observed living on hard corals *Favia* and *Goniastrea*, at 10–33 m.

Pleurosicya prognatha Goren 1984

Beaky Acropora goby

PLATE 29

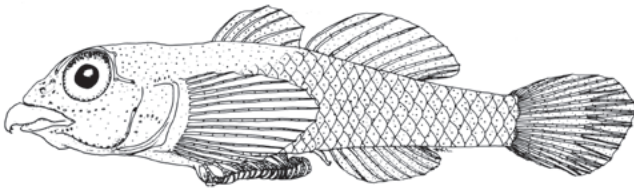
Pleurosicya prognatha Goren 1984: 76, Fig. 3 (Marsa Barecha, Sinai, Egypt, Red Sea); Larson 1990*; Goren & Dor 1994; Herler & Hilgers 2005*.

Pleurogicya [lapsus] prognatha: Goren & Spanier 1985.

Pleurosicya prognata [lapsus]: Goren & Dor 1994.

Second dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 14–16 rays, lower 5–8 (or all) rays unbranched, tips may be thickened. LSS 15–27; TRB 1–10; scales on body usually reach forward only to below gap between dorsal fins; nape naked. Gill opening restricted to pectoral-fin base. Very small species. Tongue small, tip pointed to rounded; tip of upper jaw and lip elongated by cartilaginous tooth-bearing projection, giving beak-like appearance.

Body transparent to dusky, with yellow around abdomen; iris silvery to pink. Attains 15 mm SL.



Pleurosicya prognatha, 14 mm SL, male (W Australia).

Source: Larson 1990, composite

DISTRIBUTION WIO: Red Sea.

REMARKS Commensal on large staghorn corals, such as *Acropora formosa* and *A. grandis*, and less often in *Acropora* tablecorals, at 1–20 m.

GENUS *Pomatoschistus* Gill 1863

First dorsal fin 5–7 spines; 2nd dorsal fin 1 spine and anal fin each with 1 spine, 6–12 rays; pectoral fins 13–21 rays. Body scales ctenoid; head naked, and predorsal area usually naked; LSS 36–75. Slender, small-sized, with pointed snouts

and dorsolateral eyes. Anterior nostrils without flap or lappet; sensory papillae in transverse pattern. Pelvic frenum sometimes with fine villi along posterior edge. Gill opening extends to pectoral-fin base. Total vertebrae 30–33. Benthic; occur in Atlantic Ocean and Mediterranean Sea. At least 16 species, with one having colonised part of the Red Sea in WIO region. This genus has recently been placed in the Gobionellinae.

Pomatoschistus marmoratus (Risso 1810)

Marbled goby

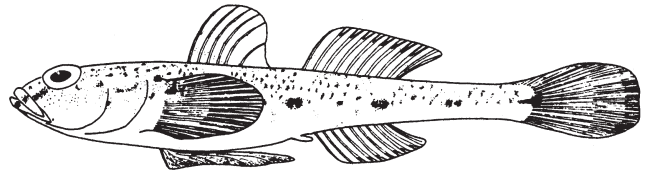
PLATE 29

Atherina marmorata Risso 1810: 339 (Nice, France, Mediterranean Sea).

Pomatoschistus marmoratus: Fouda 1995.

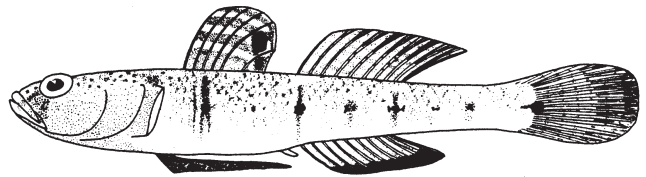
Diagnosis as for genus. First dorsal fin 5–7 spines; 2nd dorsal fin and anal fin each with 1 spine, 8–10 rays; pectoral fins 17–21 rays. LSS 37–48; TRB 10 or 11; predorsal area naked, but some scales in front of pelvic fins.

Body pale sandy, with 6–8 dark spots in row along midline, darkest spot at caudal-fin bases; males with 4–6 narrow vertical dusky bars on sides, and black spot at rear of 1st dorsal fin. Attains 65 mm SL.



Pomatoschistus marmoratus, female (Mediterranean Sea).

Source: Miller 1986; © UNESCO



Pomatoschistus marmoratus, male with pectoral fin removed to show colour pattern (Mediterranean Sea). Source: Miller 1986; © UNESCO

DISTRIBUTION Eastern Atlantic Ocean (Spain and Portugal), Black Sea and Sea of Azov, Mediterranean Sea, and anti-Lessepsian migrant to the Suez Canal (northern Red Sea) in WIO.



REMARKS Occurs in shallow coastal habitats, to ~20 m deep; also abundant in hypersaline Bitter Lakes region of Suez Canal, such as Lake Timsah, Egypt.

GENUS *Priolepis* Valenciennes 1837

Richard Winterbottom and Mary Burrige

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8–11 rays; anal fin 1 spine, 6–9 rays; pectoral fins 16–21 rays. LSS 23–32; scales large, ctenoid. Distinguished by the following combination of characters: lack of cephalic sensory canals and associated pores; gill opening extending anteroventrally to below vertical limb of preopercle or just anterior to this; head and body with vertical bars (at least primitively) with darkened borders; and, denticles on gill rakers of outer medial surface of 1st gill arch. The genus forms three groups of species, namely those with: 1) well-developed transverse pattern of sensory papillae on cheeks, and scales on predorsal midline; 2) reduced pattern of sensory papillae on cheeks, and scales on predorsal midline; and 3) reduced pattern of sensory papillae on cheeks, and predorsal midline naked. Small-sized (<50 mm SL), cryptic, and usually associated with reefs. About 35 species, mainly in Indo-Pacific, 10 in WIO.

KEY TO SPECIES

- | | | |
|----|--|---|
| 1a | Cheeks with transverse rows of sensory papillae..... | 2 |
| 1b | Cheeks without transverse rows of papillae | 4 |
- 

- | | | |
|----|--|-----------------------|
| 2a | Predorsal scales absent | <i>P. melanops</i> |
| 2b | Predorsal scales present | 3 |
| 3a | No pale bars on body | <i>P. anthioides</i> |
| 3b | Pale bars present on body | <i>P. randalli</i> |
| 4a | Predorsal scales absent | 5 |
| 4b | Predorsal scales present | 8 |
| 5a | Head and body with 4 black bars, the middle 2 extending into dorsal fins | <i>P. nocturna</i> |
| 5b | Colour pattern not as above | 6 |
| 6a | Head with 3 vertical bars joined behind eye by a horizontal bar | <i>P. compita</i> |
| 6b | Head with 2 vertical bars joined behind eye | 7 |
| 7a | Postocular and opercular bars on head joined behind eye | <i>P. kappa</i> |
| 7b | Opercular and pectoral bars on head joined behind eye | <i>P. semidoliata</i> |

Continued...

KEY TO SPECIES

- | | | |
|----|--|------------------|
| 8a | Scale edges on body darkly outlined with melanophores, no bars on body | <i>P. inhaca</i> |
| 8b | Scale edges on body not darkly outlined, barred pattern well-developed | 9 |
| 9a | Body pale with 6 black bars, 1st and last vertical, 2nd to 5th oblique | <i>P. zebra</i> |
| 9b | Body brown with 7 vertical dark-edged light bands | <i>P. cincta</i> |

Priolepis anthioides (Smith 1959)

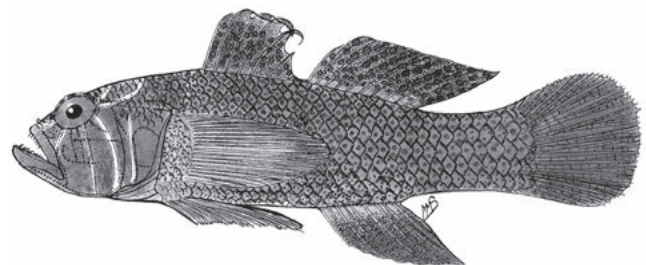
Orange goby

PLATE 30

Quisquilius anthioides Smith 1959: 210, Pl. 10f (Zanzibar, Tanzania).*Priolepis anthioides*: Winterbottom & Burrige 1992*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 18 rays. GR 3/12. LSS 26; TRB 10½; 19 scales in predorsal midline; cheek naked; 5 rows of scales on opercle; cycloid scales on pectoral-fin bases, and all other scales ctenoid. Sensory papillae on cheek in 6 well-developed transverse rows extending from eye; 3 papillae in anterior transverse interorbital row, and 6 papillae in posterior transverse interorbital row.

Head and body orange; no banding pattern on body, but head with 2 narrow white bars on snout, 2 bars across cheek, 1 bar on opercle, and 2 bars running from posterodorsal region of eye to nape; body scales each with small central red spot; dorsal fins with numerous small red spots. Attains at least 30 mm SL.

*Priolepis anthioides*, 38 mm TL, holotype (Tanzania). Source: Smith 1959

DISTRIBUTION Known only from the holotype collected from Tanzania (Zanzibar).

REMARKS Found in an orange sponge, at ~15 m.

Priolepis cincta (Regan 1908)

Banded reef goby

PLATES 29 & 30

Gobiomorphus cinctus Regan 1908: 240 (Salomon Atoll, Chagos Archipelago).

Heteroleotris eugenius: Smith 1949.

Quisquilius eugenius: Smith 1959*; Smith & Smith 1963*.

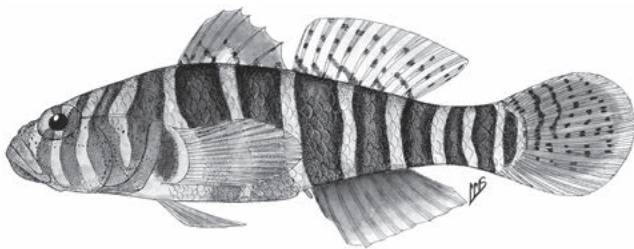
Quisquilius cinctus: Goren 1979*; Hoese & Winterbottom 1979.

Priolepis cincta: SSF No. 240.84*; Winterbottom & Emery 1986*; Randall 1995*; Debelius 1998*; Kuitert 1998*.

Priolepis cinctus: Allen & Steene 1987*; Randall & Goren 1993*; Winterbottom & Burridge 1993*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–19 rays. GR 3 or 4/12–14. LSS 27–31; TRB 11 or 11½; scales in predorsal midline 16–19 (number increasing with size); cheek naked; 2 or 3 rows of scales on opercle; cycloid scales on pectoral-fin bases and pre-pelvic area, and all other scales ctenoid. No transverse rows of cheek papillae.

Head and body whitish and crossed by 12 yellow-brown to dark brown (straw-coloured) dark-edged vertical bars, those on head usually paler and often with darker edges; pelvic fins translucent, other fins sprinkled with dark and pale spots; dark spots at base of 1st dorsal-fin membrane between spines 1–4 (especially prominent in juveniles). Attains 45 mm SL.



Priolepis cincta, 50 mm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Persian/Arabian Gulf, Gulf of Oman, Red Sea, East Africa to South Africa (Transkei region), Comoros, Seychelles, Mascarenes, Chagos, Maldives and Sri Lanka; elsewhere to Japan, Australia and Tonga.

REMARKS Common; usually to ~50 m deep.

Priolepis compita Winterbottom 1985

Crossroad goby

PLATES 29 & 30

Priolepis compita Winterbottom 1985: 748, Figs. 1–2, 4

(Salomon Atoll, Chagos Archipelago); Winterbottom & Emery 1986*;

Heemstra *et al.* 2004.

Priolepis sp.: SSF No. 240.86.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 6–8 rays; pectoral fins 17 or 18 rays. GR 1–3/10–12. LSS 23–26; TRB 7 or 8; body scales extend forward to between dorsal side of pectoral-fin bases and 1st dorsal-fin origin; body scales cycloid anteriorly, ctenoid posteriorly. Reduced pattern of cheek papillae.

Head and anterior body pale orange background, grading to off-white posteriorly, with 7 vertical black-edged pale bars: 2 bars below front half of eye, 2 bars across cheek, 1 bar across pectoral-fin base, and 2 bars crossing the dorsum at 1st dorsal-fin base; 3 bars between eyes and pectoral fins continue dorsally over nape, joined by horizontal line level with eyes. Attains 14 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea (photograph only), South Africa (Sodwana Bay), Comoros, Seychelles, Rodrigues and Chagos; elsewhere to Indonesia, Australia and Marquesas Is.

REMARKS Occurs on coral-reef tops, drop-offs and lagoons, to ~36 m deep.

Priolepis inhaca (Smith 1949)

Network goby

PLATES 29 & 30

Gobius inhaca Smith 1949: 103 (Inhaca I., Maputo Bay, Mozambique); SFSA No. 923a*.

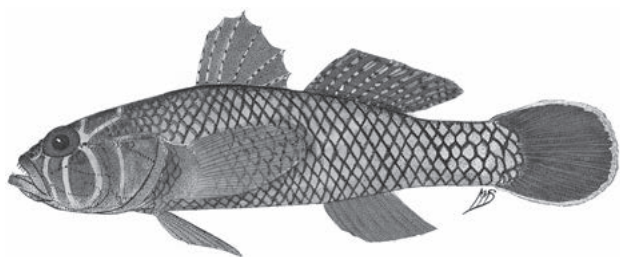
Quisquilius inhaca: Smith 1959*; Hoese & Winterbottom 1979.

Priolepis inhaca: SSF No. 240.85*; Winterbottom & Emery 1986*;

Winterbottom & Burridge 1993*; Anderson *et al.* 1998; Kuitert 1998*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 rays; pectoral fins 15–17 rays. GR 2–4/10–13. LSS 26–28; TRB 10–12; scales in predorsal midline 12–17 (number increasing with size of fish, developing at ~17 mm SL); cheek naked; few cycloid scales along upper margin of opercle (specimens at least 17 mm SL); cycloid scales on pectoral-fin bases, breast and midline of belly, and all other scales ctenoid. Reduced transverse pattern of cheek papillae. Posterior nasal opening fused with front edge of eye.

Head ochre, speckled with black spots, and with 3 thin vertical white lines below eyes (their width ~¼ pupil diameter); body pale, each scale pocket strongly outlined with dark pigment; 1st and 2nd dorsal fins with many small dark spots; 2nd dorsal fin tinged with orange, and with 2 rows of orange-brown spots on rays. Attains 34 mm SL.



Priolepis inhaca, 50 mm TL, holotype (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to Mozambique (Inhaca I.), Madagascar, Comoros, Chagos and Maldives; elsewhere to Cocos (Keeling) Is., southern Japan, Australia, Gilbert Is. (Kiribati) and Society Is.

REMARKS Often found in shallow pools, to usually <10 m deep.

Priolepis kappa Winterbottom & Burrigge 1993

Kappa goby

PLATE 30

Priolepis kappa Winterbottom & Burrigge 1993: 501, Figs. 9–10
(Anjouan I., Comoros).

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 17–19 rays. GR 2 or 3/11 or 12. LSS 24–26; TRB 7 or 8; predorsal midline, nape, opercle and cheek naked; cycloid scales on belly, and a few scales on pre-pelvic region in larger specimens, and all other scales ctenoid. Reduced transverse pattern of papillae on cheek.

Body pale, with scale pockets strongly outlined with melanophores; head darker, straw-coloured, with chromatophores and 5 or more vertical bars, 2 at anterior and posterior margins of eye and 3rd and 4th joined behind eye (occasionally 6th pale bar at 1st dorsal-fin base); cheek and opercle with faint pink tinge; dorsal fins with 3 rows of brown blotches (width of blotch $\sim\frac{1}{2}$ pupil diameter); anal fin and paired fins with pale flecks; blotches on upper half of caudal fin. Attains 25 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Comoros; elsewhere to Indonesia, Philippines, Taiwan, Australia and Fiji (Rotuma).

REMARKS Found on shallow reef tops, to \sim 10 m deep.

Priolepis melanops Bogorodsky, Suzuki & Mal 2016

Black-faced reefgoby

PLATE 30

Priolepis melanopus: Bogorodsky, Suzuki & Mal 2016: 171,
Figs. 1–2 (Al Lith, Saudi Arabia, Red Sea).

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 rays; pectoral fins 14–15 rays; LSS 25; TRB 7; GR 5/15; no predorsal scales in midline; no cheek or opercular scales; cycloid scales on pectoral-fin and pelvic-fin bases, all other scales ctenoid. Cheek with 6 transverse rows of papillae extending from eye; 4 papillae in anterior transverse interorbital row; 4 papillae in posterior transverse interorbital row.

Head and most of body brownish orange, darker on peduncle, with dense covering of tiny melanophores; snout, lips, chin and chest black; dorsal and anal fins clear with narrow black stripe along base. Attains 24 mm SL.

DISTRIBUTION Known only from holotype, central Red Sea.

REMARKS The only known specimen was collected at a depth of 27–29 m.

Priolepis nocturna (Smith 1957)

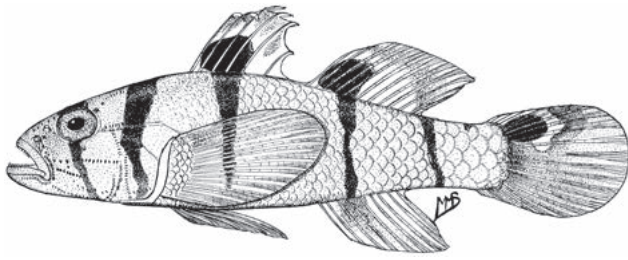
Night goby

PLATE 30

Ctenogobius nocturnus Smith 1957: 723, Fig. 2 (Aldabra, Seychelles);
Smith 1959*; Smith & Smith 1963*.
Priolepis nocturna: Randall & Goren 1993*; Winterbottom &
Burrigge 1993*; Kuitert 1998*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 rays; pectoral fins 20 or 21 rays. GR 4 or 5/12–16. LSS 28–31; TRB 11 or 12; predorsal midline naked; scales on sides of nape extend to just behind eyes; pectoral-fin bases, head and belly with cycloid scales, all other scales ctenoid. Reduced transverse pattern of cheek papillae.

Head and body uniformly milky white, with 4 or 5 wide black bars, 2 of which continue into dorsal fins; black spots on anterior margins of both dorsal fins and anterodorsal margin of caudal fin. Attains 40 mm SL.



Priolepis nocturna, 50 mm TL, male (Aldabra). Source: Smith 1957

DISTRIBUTION Indo-Pacific (widespread). WIO: southern Mozambique to South Africa (Sodwana Bay), Comoros, Assumption I., Aldabra, Seychelles, Mauritius and Maldives; elsewhere to Indonesia and Marquesas Is.

REMARKS Found on rocky drop-offs to ~35 m deep, and in lagoon habitats to ~10 m deep. Rare in collections; appears to be most abundant in areas where species diversity is lowest.

Priolepis randalli Winterbottom & Burrige 1992

Randall's goby PLATES 30 & 31

Priolepis randalli Winterbottom & Burrige 1992: 1942, Fig. 8
(Jana I., Saudi Arabia, Persian/Arabian Gulf); Randall 1995*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 17–19 rays. GR 3–5/15–17. LSS 25–28; TRB 9 or 10; scales in predorsal midline 14–16, extending anteriorly to eyes; cheek and pectoral-fin bases with cycloid scales, other head and body scales ctenoid; well-developed transverse pattern of cheek papillae.

Head reddish brown with 4 white bars, body brown with 7 white bars; 1st dorsal fin with ocellated black spot or smudge covering bases of first 5 spines. Attains 40 mm SL.



Priolepis randalli, 19 mm SL (Gulf of Aqaba). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf to Gulf of Oman, Oman and Red Sea (including Gulf of Aqaba).

REMARKS Found on coral-reef drop-offs, to ~18 m deep.

Priolepis semidoliata (Valenciennes 1837)

Barrel goby

PLATE 30

Gobius semidoliatus Valenciennes in Cuv. & Val. 1837: 67
(Vanikoro I., Santa Cruz Is., Solomon Is.).

?*Priolepis mica* Ehrenberg in Valenciennes 1837: 57 (Red Sea).

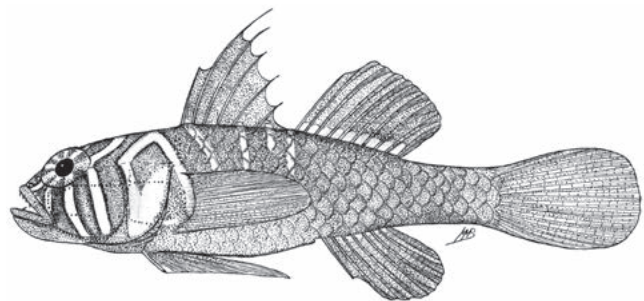
Zonogobius semidoliatus: Koumans 1953; Steinitz & Ben-Tuvia 1955; Smith 1959*.

Priolepis vexilla: Fricke 1999.

Priolepis semidoliata: Hoese & Winterbottom 1979 [as *semidoliatus*]; Randall & Goren 1993*; Winterbottom & Burrige 1993*; Herler & Hilgers 2005*; Fricke *et al.* 2009; Hoese *et al.* 2015.

Second dorsal fin 1 spine, 9 rays; second spine of 1st dorsal fin often elongate; anal fin 1 spine, 7 rays; pectoral fins 17 or 18 rays. GR 4/10–15. LSS 25–28; TRB 9–12; predorsal midline, nape, opercle, cheek and upper side of pectoral-fin bases naked; cycloid scales under pectoral-fin bases, on belly, and sometimes on breast, and all other scales ctenoid. Reduced transverse pattern of cheek papillae.

Head brown, fading to yellow on body; 2 vertical bars over opercle and pectoral-fin bases joined behind eyes; 7 dark-edged pale bars on head (width of bars and interspaces ~½ pupil diameter) and 4 or 5 dark-edged pale bars on body, extending midlaterally from membrane of dorsal fins; bar interspaces on body and head with diffuse melanophores and small brown chromatophores (mature specimens have scale pockets lightly outlined, and interspaces on head heavily pigmented); fins pale orange with diffuse melanophores, particularly on dorsal fins. Attains 25 mm SL.



Priolepis semidoliata, 20 mm TL, male (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique, Comoros, Seychelles, Réunion, Mauritius, Maldives and Sri Lanka; elsewhere to Cocos (Keeling) Is., Christmas I., southern Japan, Solomon Is., Australia and Pitcairn Is.

REMARKS Relatively common in shallow water.

Priolepis zebra (Randall 1994)

Bighead goby

PLATES 30 & 31

Ego zebra Randall 1994: 336, Pls. 15–16 (cave in reef, Rahah Bay, Oman); Randall 1995*.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 18 or 19 rays. GR 4/17. LSS 49 or 50; TRB 16; scales in predorsal midline 21, extending to midline of eyes; cycloid scales on nape, breast and pectoral-fin bases, and all other scales ctenoid. Reduced pattern of cheek papillae.

Head and body translucent pale pink, with pale yellow belly; black blotch behind upper end of gill opening, followed by 6 dark bars on body: first and last bars vertical, and bars 2–5 progressively oblique. Attains 35 mm SL.

DISTRIBUTION WIO: Arabian Sea (Oman).

REMARKS Collected from a drop-off with small caves and ledges, at ~21 m deep. Observed in aggregations of ~10–20 or more, hovering above the reef and apparently feeding on plankton. Randall (1994) placed *P. zebra* in the new genus *Ego* primarily because the head is more narrow than deep, and the nasal apparatus is contained in a shallow depression; neither character was polarised, however, and both (especially the latter) are likely autapomorphies of the species. All other characters of this species correspond to genus *Priolepis* (Winterbottom & Burrige 1992); a more detailed examination could help to better establish its position within gobiids.

GENUS *Psammogobius* Smith 1935

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8–11 rays; pectoral fins 17–19 rays. LSS 27–31; opercle naked or with patch of ctenoid scales. Sensory papillae in longitudinal pattern. Gill opening wide, free of isthmus to below rear edge of eye. Tongue deeply bilobed. Slender-bodied; somewhat cryptic. Three species, two in WIO. Previously considered a monotypic genus, but *P. biocellatus* (formerly placed in *Glossogobius*) is placed here according to DF Hoese (pers. comm.), who is revising the genus *Glossogobius*, which differs in its gill opening and pattern of sensory papillae.

KEY TO SPECIES

- 1a Eyes with small lappet over iris; body with longitudinal rows of blackish spots which may form lines *P. biocellatus*
 1b Eyes without lappet over iris; body with scattered small brown spots and 1 row of dark blotches along midsides, and sometimes 5 or 6 vertical silvery white lines on lower portion of sides *P. knysnaensis*

Psammogobius biocellatus (Valenciennes 1837)

Crocodile goby

PLATE 31

Gobius biocellatus Valenciennes in Cuv. & Val. 1837: 73 (Puducherry, India).

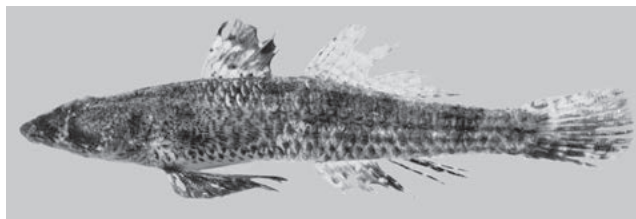
Glossogobius biocellatus: Day 1876; Hoese & Winterbottom 1979;

Hoda 1980*; Maugé 1986; SSF No. 240.42*; Stiassny & Raminosoa 1994.

Psammogobius biocellatus: Hoese & Larson 2006*.

Second dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 17–19 rays. LSS 28–32; TRB 8 or 9; predorsal scales 14–17, reaching to eyes. Small lappet over each eye. Snout pointed; lower jaw protruding.

Head and body brown, with dark to indistinct bands or saddles across back and darker blotches along sides, and entire dorsum usually paler than lower half of body; head often heavily pigmented, with pale stripe from eyes to upper jaw; 1st dorsal fin with 1 or 2 black spots, posteriormost spot may be ocellated; pelvic fins and lower part of caudal fin with dark oblique bands. Attains 80 mm SL.



Psammogobius biocellatus, 70 mm SL (Mozambique).

PC Heemstra © NRF-SAIAB

DSITRIBUTION Indo-Pacific (widespread). WIO: Pakistan to India, East Africa to South Africa (Eastern Cape) and Madagascar; elsewhere to east coast of India and French Polynesia.

REMARKS Found in shallow coastal reefs or estuarine areas. Previously placed in genus *Glossogobius*.

Psammogobius knysnaensis Smith 1935

Knysna sandgoby

PLATE 31

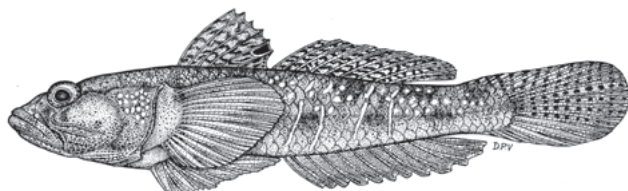
Psammogobius knysnaensis Smith 1935: 215 (Knysna, South Africa);

SFSA No. 906*; Smith 1960*, 1961*; Smith & Smith 1966*; Hoese &

Winterbottom 1979; Maugé 1986; SSF No. 240.87*; Branch *et al.* 1994*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9–11 rays; pectoral fins 17 or 18 rays. LSS 27–30; TRB 9½–10; predorsal scales 11 or 12; cheek and opercle naked. Snout rounded to slightly pointed.

Body pale brown to greyish, with brown and blackish speckling and spots, which may form indistinct saddles across back, and row of blackish spots along midsides; often with 5 or 6 vertical silvery white lines on lower sides; males may have black spot at rear of 1st dorsal fin. Attains 60 mm SL.



Psammogobius knysnaensis, 46 mm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION Endemic to South Africa, from Port Nolloth (Northern Cape) in southeastern Atlantic, to St Lucia (KwaZulu-Natal) in WIO.

REMARKS Inhabits estuaries; tolerates a range of salinities.

GENUS *Psilogobius* Baldwin 1972

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 14–19 rays. LSS 32–78, scales ctenoid; TRB 12–18; predorsal area naked; sides of head usually naked (small patch of scales on opercle in 1 species); pectoral-fin bases and breast scaly or naked. Mouth large, oblique, reaching back to behind eyes. Oculoscaphular canals on head complete or else rear portion over opercle absent; preopercle pores 0–2; sensory papillae on head include transverse rows; row immediately below eye with oblique transverse rows. Gill opening reaches to in front of preopercle margin. Unlike many gobiids, females have a pronounced colour pattern: characteristically, 6 or 7 silvery white vertical lines or narrow bars across abdomen. Three species; 1 poorly known species in WIO.

Psilogobius randalli (Goren & Karplus 1983)

White-bar shrimpgoby

PLATE 31

?*Gobius albopunctatus* [in part] Valenciennes in Cuv. & Val. 1837: 57 (Mauritius, Mascarenes).

Tomiyamichthys randalli Goren & Karplus 1983: 27, Figs. 1–4 (Sinai, Egypt, Gulf of Aqaba, Red Sea).

Psilogobius randalli: Goren & Dor 1994.

?*Flabelligobius fourmanoiri* [in part]: Fricke 1999.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16 rays. LSS 40–65; TRB 12–18; head, predorsal area, pectoral-fin bases and belly naked. Oculoscaphular canal complete, extending over opercle; no preopercular pores. Gill opening to under opercle or close to rear edge of preopercle. First dorsal fin pointed, spines 1–3 filamentous and elongate (spine 3 longest).

Head and body yellowish, with brown spotting and irregular saddles across back; ~5 or 6 irregular brown blotches along midsides of body; 6 or 7 thin vertical whitish lines on sides of abdomen, more distinct in females. Attains 29 mm SL.

DISTRIBUTION WIO: Red Sea, and possibly Mauritius.

REMARKS Found in shallow coral-reef habitats, over fine sediment, at 1–2 m. Commensal in burrows with an alpheid snapping shrimp.

GENUS *Silhouettea* Smith 1959

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 11–13 rays (always 1 or 2 more rays than in 2nd dorsal fin), and fin base always longer than 2nd dorsal-fin base; pectoral fins 14–16 rays; pelvic fins long, and pelvic frenum with fimbriate or crenulate margin. Body scales ctenoid; head, predorsal area and pectoral-fin bases naked; breast naked or with cycloid scales; LSS 23–28. Gill opening extends forward to behind rear edge of preopercle. Snout rather pointed, tip of lower jaw anteriormost. Eyes dorsolateral, placed close to snout tip; interorbital space narrow. Opercle margin slightly scalloped or irregular. Cryptically coloured, usually pale yellowish to whitish, with fine brown spots, bars and speckling, plus characteristic black spot or short line in front of 1st dorsal fin. Small-sized and slender; bury themselves shallowly in sand or muddy sand, leaving only eyes visible. At least 10 species in Indo-Pacific, plus several undescribed; 3 species in WIO.

KEY TO SPECIES

- 1a Spines 2–4 of 1st dorsal fin not elongate, or when depressed the spines reach at most to first few elements of 2nd dorsal fin; body with more or less distinct dusky elongate blotches along midsides [estuarine or marine habitats] 2
- 1b Spines 2–4 of 1st dorsal fin very long, reaching beyond middle of 2nd dorsal fin when depressed; body with 4 narrow vertical dark bars, midsides may show vertically oriented X-shaped dusky blotches [freshwater only] *S. sibayi*

Continued...

KEY TO SPECIES

- 2a Sides of body with 8–10 short vertical dark lines; 1st dorsal fin speckled, and may have 2 dark spots (anteriorly and posteriorly); in males, first spine of 1st dorsal fin longest *S. aegyptia*
- 2b Sides of body with at least 4 or 5 oblong to triangular blotches; 1st dorsal fin with black spot anteriorly and scattered dusky speckles posteriorly (but no distinct spot posteriorly); in males, first spine of 1st dorsal fin shorter than second spine *S. insinuans*

Silhouettea aegyptia (Chabanaud 1933)

Egyptian sandgoby

PLATE 31

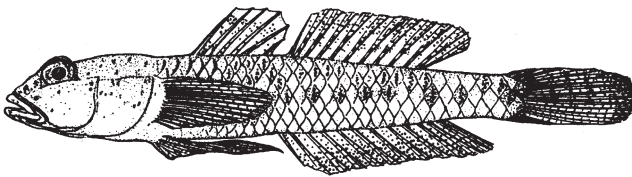
Gobius lesueuri aegyptius Chabanaud 1933: 11, Fig. 7 (Lake Timsah, Suez Canal region, Egypt).

Minictenogobius sinaii Goren 1978: 192, Fig. 1 (Ras Muhammad, Sinai, Egypt, Red Sea); Goren 1979*; Dor 1984.

Silhouettea aegyptia: Miller & Fouda 1986; Miller 1988*.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 11 or 12 rays; pectoral fins 13–15 rays. LSS 24–26; TRB 7 or 8; breast naked or with a few scales near pelvic-fin bases. First dorsal fin low, and triangular to rounded.

Body white to yellowish, scale margins on upper half of body thinly outlined with brown, sometimes with short narrow brown crescents on scale margins of those above and below midlateral row of dark lines; midsides with 8–10 short narrow vertical dark lines, each may be surrounded by brownish blotch. Attains 36 mm SL.



Silhouettea aegyptia, 32 mm SL, holotype of *Minictenogobius sinaii* (Red Sea). Source: Goren 1978

DISTRIBUTION WIO: Red Sea, Gulf of Suez and Bitter Lakes region of Suez Canal, including Lake Timsah (Egypt).

REMARKS Found in shallow sandy habitats.

Silhouettea insinuans Smith 1959

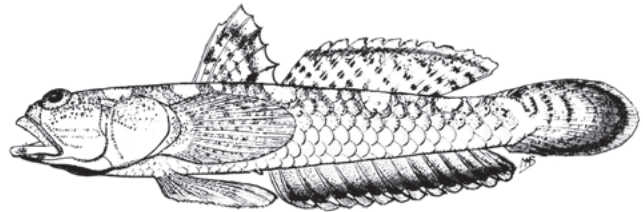
Phantom sandgoby

PLATE 31

Silhouettea insinuans Smith 1959: 214, Fig. 33, Pl. 11e (Silhouette, Seychelles); Smith & Smith 1963*; Goren 1979*; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.94*; Winterbottom & Emery 1986*; Miller 1988*; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 13 or 14 rays; pectoral fins 14–16 rays. LSS 23–26; TRB 7–10; breast with cycloid scales. First spine of 1st dorsal fin shorter than 2nd spine in males.

Head and body whitish to yellowish, with several pale saddles across back, and at least 3 brownish blotches along midsides of body; 1st dorsal fin with black spot anteriorly, may be some dark speckling posteriorly. Attains 35 mm SL.



Silhouettea insinuans, 44 mm TL, holotype (Seychelles). Source: Smith 1959

DISTRIBUTION WIO: Red Sea, East Africa to Mozambique (Bazaruto I.), Aldabra, Seychelles, Rodrigues and Chagos.

REMARKS Found in shallow sandy habitats, at 15–34 m.

Silhouettea sibayi Farquharson 1970

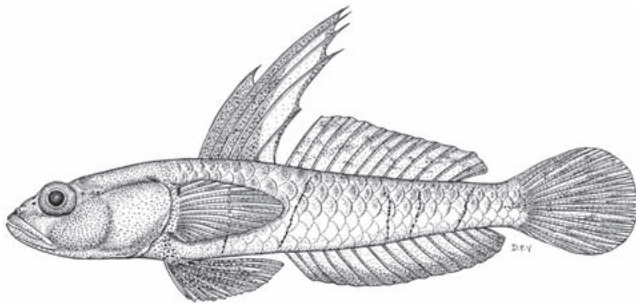
Barebreast sandgoby

PLATES 31 & 32

Silhouettea sibayi Farquharson 1970: 85, Fig. 1 (Lake Sibhayi, KwaZulu-Natal, South Africa); Hoese & Winterbottom 1979 [as *sibaya*]; Maugé 1986; SSF No. 240.95*; Miller 1988*; Skelton 1993*.

Second dorsal fin 1 spine, 11–13 rays; anal fin 1 spine, 13 rays; pectoral fins 13–16 rays. LSS 26–27; TRB 8. Spines of 1st dorsal fin greatly elongate, spines 2–4 reaching to rear of 2nd dorsal fin when depressed.

Body whitish, with 4 narrow vertical dark lines and incomplete dark line at caudal-fin bases; dorsal half of body with reddish and brown speckles; 1st dorsal fin with 2 dusky blotches; pelvic fins dark brown. Attains 40 mm SL.



Silhouettea sibayi, 25 mm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: Mozambique (Lake Piti) and South Africa (KwaZulu-Natal: Thukela River, Lake Sibayi, Kosi River system, Kosi Bay and Lake St Lucia).

REMARKS Appears to be rare; found in freshwater coastal lakes and estuaries, over open sandy areas as well as among aquatic vegetation, to ~20 m deep. IUCN Red List conservation status Endangered.

GENUS *Stonogobiops* Polunin & Lubbock 1977

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 9–11 rays; pectoral fins 16–18 rays; pelvic fins fused, with well-developed pelvic frenum. Body scales cycloid, somewhat embedded; head naked or with scales on nape only; LSS 72–115. Sensory papillae on head in reduced transverse pattern. Mouth large and oblique, extending to rear edge of eyes; lower jaw protruding, with bulbous chin; vomer with large ridge-like ventral projection on each side bearing 1–4 stout recurved canine teeth; palatines with narrow sharp ridge with tooth-like processes, and small teeth sometimes present. Gill membranes united, forming free fold across isthmus; gill opening broad, extending forward to between eye and preopercle margin. Tongue tip rounded to slightly pointed. Spectacularly coloured. Commensal with alpheid shrimps. Seven species, in Indo-Pacific, 2 in WIO.

KEY TO SPECIES

- 1a Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; 1st dorsal fin rounded (no filamentous rays); dark bars on body slightly oblique, the white interspaces bisected by red line in life (faint in some individuals) *S. dracula*
- 1b Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 rays; spines 1–2 of 1st dorsal fin extremely elongate in both sexes; filament of 1st dorsal fin black, the rest of fin clear; 3 oblique black bars on body and 1 vertical black bar on peduncle *S. nematodes*

Stonogobiops dracula Polunin & Lubbock 1977

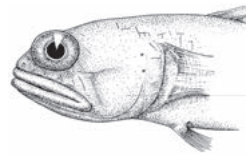
Dracula shrimpgoby

PLATES 17 & 32

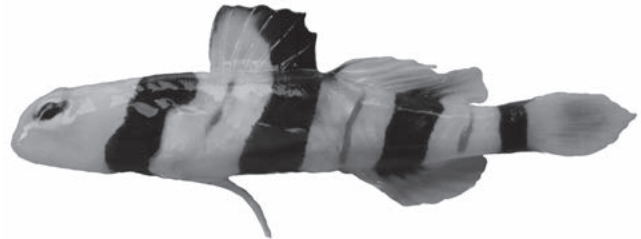
Stonogobiops dracula Polunin & Lubbock 1977: 74, Figs. 6–7 (Baie Ternay, Mahé, Seychelles); Hoese & Randall 1982*; Debelius 1993*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Kuitert 1998*; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16–18 rays. LSS 84–94; TRB 26–32. First dorsal-fin margin rounded.

Head and body white, with 4 black to dark red-brown slightly oblique bars, interspaces with narrow reddish brown line, and second bar extending onto 1st dorsal fin; eyes and top of snout yellow. Attains 42 mm SL.



Stonogobiops dracula, head of holotype (Seychelles). Source: Polunin & Lubbock 1977



Stonogobiops dracula (South Africa). AD Connell © NRF-SAIAB

DISTRIBUTION WIO: South Africa (photograph only), Seychelles, Réunion (photographs only) and Maldives.

REMARKS Commensal with snapping shrimp *Alpheus randalli*, in pairs, at 15–34 m.

Stonogobiops nematodes Hoese & Randall 1982

Blackrayed shrimpgoby

PLATES 17 & 32

Stonogobiops nematodes Hoese & Randall 1982: 13, Pl. 3, Figs. 1, 4 (off Dumaguete City, Philippines); Randall & Van Egmond 1994.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 rays; pectoral fins 16 rays. LSS 84; TRB 21. Spines 1–2 of 1st dorsal fin greatly elongate.

Body translucent white, with 3 oblique and 1 vertical black bar across head and body; anteriormost bar extends onto 1st dorsal fin, thus spines 1–2 are black; snout, interorbital space and eyes yellow. Attains 37 mm SL.

DISTRIBUTION Indo-Pacific. WIO: South Africa (photograph only) and Seychelles (few specimens); elsewhere, Philippines and Indonesia (Bali).

REMARKS Occurs in pairs over dark or calcareous fine sand; commensal with red and white alpheid shrimp *Alpheus randalli*, at 20–40 m.

GENUS *Sueviota* Winterbottom & Hoese 1988

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 7–9 rays; pectoral fins 16–19 rays, most rays unbranched; 5th ray of pelvic fins branched and joined by membrane (fragile and easily damaged), and pelvic frenum present or absent. Body scales ctenoid; head, nape, pectoral-fin bases and breast naked; LSS 21–27; TRB 6–9. Head pores reduced; preopercular pores 0–2; rear portion of oculoscapular canal absent; sensory papillae in reduced transverse pattern. Anterior nostrils long and thin; posterior nostrils with raised rim, set close to eyes. Gill opening restricted, reaching to preopercle margin. One to 3 enlarged, curved, canine teeth in inner row near symphysis of lower jaw. Tongue tip pointed. Small-sized; inhabit coral reefs. Resemble species of *Eviota*, which have pelvic-fin rays at least partly forming disc. Seven species in Indo-Pacific, 2 in WIO.

KEY TO SPECIES

- 1a Preopercular pores 2; 2nd dorsal fin 1 spine, 8 or 9 rays; in males, spines 2–3 of 1st dorsal fin may be longest but not filamentous, reaching at most to space between dorsal fins *S. lachneri*
- 1b No preopercular pores; 2nd dorsal fin 1 spine, 10 rays; in males, spines 1–2 of 1st dorsal fin are filamentous and may reach to rear of 2nd dorsal fin *S. aprica*

Sueviota aprica Winterbottom & Hoese 1988

Apricot sueviota

PLATE 32

New genus, new species A: Winterbottom & Emery 1986*.

Sueviota aprica Winterbottom & Hoese 1988: 4, Figs. 3–4 (Peros Banhos Atoll, Chagos Archipelago); Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 17–19 rays; 5th rays of pelvic fins partly joined by membrane for at least one-third of their length (membrane easily damaged), no pelvic frenum. LSS 26 or 27; TRB 6 or 7. No preopercular pores. Spines 1–2 of 1st dorsal fin filamentous in males, and may reach to rear of 2nd dorsal fin.

Head and body pale yellow; 3 dark yellow to orange-red bars across nape, and bright red round spot on head behind eyes; body with 7 darker yellow to orange-brown bars across back; 6 dark internal bars along ventral midline. Attains 16 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Madagascar and Chagos; elsewhere, western New Guinea and Fiji.

REMARKS Occupies coral crevices in drop-offs and coral caves, at 10–48 m.

Sueviota lachneri Winterbottom & Hoese 1988

Lachner's sueviota

PLATE 32

New genus, new species B: Winterbottom & Emery 1986*.

Sueviota lachneri Winterbottom & Hoese 1988: 9, Figs. 6–7 (Isle Poule, Salomon Atoll, Chagos Archipelago); Randall & Anderson 1993; Randall & Goren 1993; Winterbottom & Anderson 1997; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8 rays; pectoral fins 16–18 rays; 5th ray of pelvic fins joined by membrane for their length (may be easily damaged), no pelvic frenum. LSS 25 or 26; TRB 6 or 7. Preopercle pores 2. Spines 2–3 of 1st dorsal fin may be longest in males but not filamentous, reaching to space between dorsal fins.

Head and body translucent yellow or green, with round black and brown to orange-red blotches on head and nape; eye red; anterior nostrils red with black rim; scale margins outlined blackish; internal reddish bars or blotches variably present. Attains 21 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Comoros, Seychelles, Mauritius, Rodrigues, Chagos and Maldives; elsewhere to Ogasawara Is., Great Barrier Reef and Fiji.

REMARKS Occurs in lagoons and especially over coral drop-offs, at 8–10 m.

GENUS *Tomiyamichthys* Smith 1956

First dorsal fin 6 spines, and at least spines 1 and 2 filamentous, and fin either tall, triangular and pointed, or very tall, narrow-based (pennant-like) and rounded; 2nd dorsal fin 1 spine, 9–12 rays; anal fin 1 spine, 8–12 rays; pectoral fins 16–18 rays; pelvic fins fused, and pelvic frenum present. Body scales usually cycloid anteriorly and ctenoid posteriorly, or all scales may be cycloid; head naked; LSS ~48–138, scales may be non-imbricate anteriorly; TRB 17–30. Mouth oblique,

large, extending back to below opercle or below rear edge of eye; lower lip continuous, with only shallow fold at chin. Preopercular and often postorbital areas inflated, giving fat-cheeked appearance. Sensory papillae mostly in longitudinal pattern, with some short transverse rows on lower part of head (except ~20 vertical rows of papillae on sides of head in at least 1 species). No lateral canal pores; rear portion of oculoscapular canal over opercle absent or else with short lateral canal tube and 2 pores over opercle. Gill opening from under opercle to just below preopercle margin. Commensal with alpheid shrimps. The generic definition is in need of review. Fifteen species currently recognised, plus several undescribed; 3 species in WIO.

KEY TO SPECIES

- 1a Anterior nostrils with flattened elongate flap; ~20 vertical rows of papillae on sides of body; first spine of 1st dorsal fin longest *T. fourmanoiri*
- 1b Anterior nostrils without flap; no rows of papillae on sides of body; spine 2 or 3 of 1st dorsal fin longest 2
- 2a Dorsal-fin spines 1–3 elongate in males, and spines 2–3 filamentous and free; in females, 1st dorsal fin tall and triangular, without elongate spines *T. latruncularius*
- 2b Dorsal fin spines 1–4 greatly elongated in males, and fin tip rounded, forming very tall pennant-like fin; in females, spines of 1st dorsal fin shorter, forming broader, rounded, fan-like fin *T. praealtus*

Tomiyamichthys fourmanoiri (Smith 1956)

Leafnose shrimpgoby

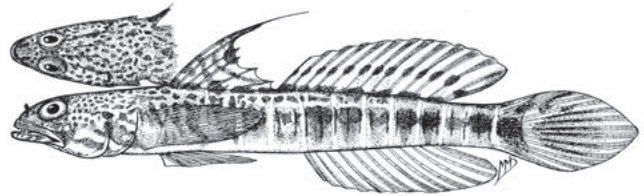
Flabelligobius fourmanoiri Smith 1956: 553, Fig. 1 (Nosy Be, Madagascar); Smith 1959*.

?*Tomiyamichthys dorsostigma* Bogorodsky, Kovačić & Randall 2011: 214, Figs. 1–2 (Egypt, Gulf of Aqaba, Red Sea).

Tomiyamichthys fourmanoiri: Bogorodsky, Kovačić & Randall 2011*.

Second dorsal fin and anal fin each with 1 spine, 12 rays; pectoral fins 16–18 rays. LSS ~90–138; TRB 17–30; predorsal area naked or with ~3 small scattered scales; head, breast and pectoral-fin bases naked; belly with cycloid scales, non-imbricate behind pectoral fins. Anterior nostrils with conspicuous leaf-like flap; ~20 vertical rows of papillae on sides of body. First spine of 1st dorsal fin elongate and filamentous, second spine slightly less so, and fin tall, triangular and pointed.

Head and dorsal part of body with small dark spots and irregular markings; ~12 or 13 vertical dark bars along sides with narrow interspaces; 1st dorsal fin with 3 dark stripes and an irregular black marking along tips of spines 1–3. Attains 74 mm SL.



Tomiyamichthys fourmanoiri, 92 mm TL, male holotype (NW Madagascar).

Source: Smith 1956

DISTRIBUTION WIO: Gulf of Aqaba (northern Red Sea), Madagascar and Mauritius.

REMARKS Known from few specimens, trawled from muddy substrate, at 16–18 m; probably commensal with an alpheid shrimp. *Tomiyamichthys dorsostigma* (Plate 32) is likely a valid species, but additional research is required.

Tomiyamichthys latruncularius (Klausewitz 1974)

Fan shrimpgoby

PLATE 32

Eilatia latruncularia Klausewitz 1974: 206, Figs. 1–4

(Gulf of Aqaba, Red Sea); Goren 1979*; Karplus *et al.* 1981;

Dor 1984; Goren & Dor 1994.

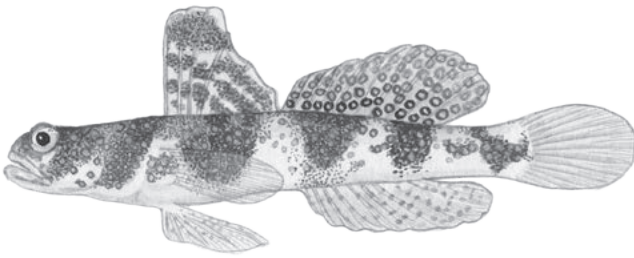
Flabelligobius latruncularius: Randall & Anderson 1993;

Randall & Goren 1993*; Randall *et al.* 1994*; Randall 1995*;

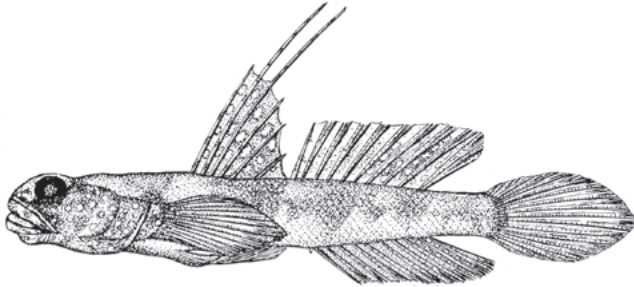
Kuiter 1998*; Debelius 1999*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–18 rays. LSS 48–54; TRB 17 or 18; predorsal area naked or with few embedded cycloid scales before 1st dorsal fin; ctenoid scales at least on peduncle, may extend forward to below 2nd dorsal fin; few embedded scales on breast. No vertical rows of papillae on body. In males, spines 1–3 of 1st dorsal fin elongate, and spines 2–3 longest, filamentous and free; in females, 1st dorsal fin tall and triangular but without elongate spines.

Head and body whitish, with many small irregular brown to yellowish spots and mottling; 4 diffuse to dark brown or blackish spots along midsides of body; dark brown blotch at corners of jaws. Attains 43 mm SL.



Tomiyamichthys latruncularius, 42 mm SL, female (Oman).



Tomiyamichthys latruncularius, 43 mm SL, holotype (Red Sea).

Source: Klauswitz 1974

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to Red Sea, and Maldives; elsewhere, Australia.

REMARKS Commensal in burrows with snapping shrimps *Alpheus bellulus* or *A. randalli*, at 1.5–40 m, in open sand and rubble areas.

Tomiyamichthys praealtus

(Lachner & McKinney 1981)

Bannerfin shrimpgoby

PLATE 33

Vanderhorstia praealta Lachner & McKinney 1981: 965, Figs. 1–2 (off D'Arros I., Amirante Is., Seychelles); Randall & Anderson 1993; Randall & Goren 1993*; Kuitert 1998*; Debelius 1999*.

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 18 rays. LSS 56–65; TRB 18–24; predorsal area and breast naked; body scales cycloid and embedded anteriorly; belly partly scaly. Gill opening to under opercle. In males, spines 1–4 of 1st dorsal fin greatly elongated, fin short-based, very tall (banner-like) with rounded tip; in females, spines of 1st dorsal fin shorter, forming broad, rounded, fan-like fin.

Body very dark brown, head paler brown with many fine whitish spots in males; 1st dorsal fin grey with red-brown spots, becoming blue-edged towards rear of fin; 2nd dorsal fin

yellow with blue submarginal stripe and rows of blue spots. Attains 36 mm SL.



Tomiyamichthys praealtus, 32 mm SL (Maldives).

© JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (disjunct). WIO: southern Mozambique (Ponta Mamoli), South Africa (Sodwana Bay), Amirante Is. (Seychelles) and Maldives; elsewhere, Indonesia.

REMARKS Commensal in burrows with alpheid shrimps *Alpheus ochrostriatus* and *A. randalli*, on fine sand and rubble in lagoon habitats, at 19–40 m. The status of the disjunct populations needs investigation.

GENUS *Trimma* Jordan & Seale 1906

Richard Winterbottom and Margaret Zur

Tiny (<30 mm SL) and generally referred to as pygmy gobies. Distinguished by lack of head pores; greatly reduced pattern of sensory papillae on head; wide gill opening (extending anteroventrally to a point below vertical limb of preopercle, or anterior to this); lack of spicules on outer gill rakers of 1st gill arch; 2nd dorsal fin and anal fin each with <12 rays; and, 5th ray of pelvic fins $\geq 40\%$ length of 4th ray. Some members are schooling planktivores on Indo-Pacific coral reefs, although most appear to be either solitary benthic forms or males interacting with a harem of females. Currently 107 valid species, plus numerous additional species in the western Pacific which have yet to be described; at least 30 species in WIO.

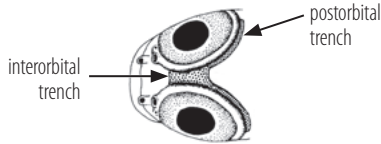
KEY TO SPECIES

- 1a Predorsal midline with some scales 2
- 1b No scales in predorsal midline 17

- 2a Pelvic frenum present 3
- 2b No pelvic frenum 4

- 3a Both dorsal fins with distal black margin; sides of interorbital trench with scales *T. unisquamae*
- 3b First dorsal fin without black margin; no interorbital scales *T. fraena*

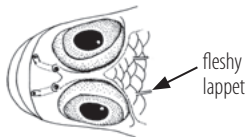
- 4a Interorbital trench present and vertically sided; postorbital trench may also be present 5



- 4b No interorbital trench, or present as moderate trough with sloping sides 8

- 5a Interorbital and postorbital trenches both well-developed ... 6
- 5b Only interorbital trench developed; head with spots or bars; spines 2–3 of 1st dorsal fin elongate, and 2nd spine reaching to rear half of 2nd dorsal fin or beyond 7

- 6a Small fleshy lappets present on nape behind orbital trenches; cheeks with dark bars; no gill rakers on epibranchial *T. mendelssohni*



- 6b No fleshy lappets on nape; pectoral-fin bases with vertical black bar; gill rakers present on epibranchial *T. naudei*

- 7a Few pale, pupil-sized spots on head only *T. barralli*
- 7b Small pale spots (<1/2 pupil size) scattered over head and anterior portion of body, often some spots darker at centre and with a pale halo *T. halonevum*

- 8a Interorbital width >1/2 pupil diameter; no interorbital trench, or if present then shallow and may be divided by central ridge 9
- 8b Interorbital width <1/2 pupil diameter; interorbital trench moderately deep 14

- 9a Predorsal scales extending only midway from 1st dorsal fin towards eyes; caudal fin forked *T. hoesei*
- 9b Predorsal scales extending completely from 1st dorsal fin to above rear margin of eye; caudal fin not forked 10

- 10a Fifth pelvic-fin ray branched 11
- 10b Fifth pelvic-fin ray unbranched 13

- 11a Some pectoral-fin rays branched 12
- 11b All pectoral-fin rays unbranched; lower portion of caudal-fin base with dark pigment; second spine of 1st dorsal fin elongate *T. griffithsi*

- 12a Second dorsal fin usually 10 rays, and anal fin usually 9 rays; pelvic-fin rays 1–4 sequentially branched 3 or 4 times, and 5th ray dichotomously branched twice; cheek and opercle naked *T. taylora*
- 12b Second dorsal fin and anal fin each with 8 rays; 5th ray of pelvic fins branched once; cycloid scales on cheek, opercle and pectoral-fin bases *T. winchi*

- 13a Large black patch on rear of peduncle *T. caudomaculatum*
- 13b Body colour pattern plain, but usually with 3 or 4 faint dark saddles across dorsum *T. fishelsoni*

- 14a Fifth pelvic-fin ray branched dichotomously twice; 3 dark bars below eye *T. quadrimaculatum*
- 14b Fifth pelvic-fin ray branched dichotomously once; no dark bars below eye 15

- 15a Cheek and opercle with red spots in life, pale spots in preserved specimens; peduncle often paler than rest of body *T. flavicaudatum*
- 15b Cheek and opercle uniformly coloured, without pale spots; peduncle never paler than rest of body 16

- 16a Scale pockets outlined, but body otherwise plain and without pale spots; 5th ray of pelvic fins subequal to 4th ray *T. emeryi*

- 16b Body and posterodorsal surface of head with pale spots and blotches; 5th ray of pelvic fins ~30–60% length of 4th ray *T. fucatum*

- 17a Head and nape with wide pale and dark longitudinal stripes *T. striatum*
- 17b No stripes on head or body, or stripes not longitudinal if present 18

Continued ...

KEY TO SPECIES

- | | | | | | |
|-----|--|-------------------------|-----|---|------------------------|
| 18a | Interorbital and postorbital trenches both well-developed | 19 | 25a | Head with 4 pale vertical bars, and peduncle with 2 white saddles on dorsal and ventral surfaces | <i>T. bisella</i> |
| 18b | Postorbital trench absent or weak | 24 | 25b | No pale vertical bars on head | 26 |
| 19a | Body with rows of many distinct spots | 20 | 26a | Pectoral-fin rays unbranched; 4 small dark saddles over dorsal midline | <i>T. anaima</i> |
| 19b | Colouration on body patchy, with pale bands across dorsum, but no rows of distinct spots | 22 | 26b | At least some pectoral-fin rays branched; distinct dark ovalish spot near posterodorsal corner of opercle | <i>T. stobbsi</i> |
| 20a | Each body scale with central spot, creating distinct and even rows of tiny regularly spaced spots | 21 | 27a | Head and body covered with irregular and unequal orange-red spots, with 2 distinct spots at pectoral-fin bases | <i>T. flammeum</i> |
| 20b | Spots larger and not centred on scales, more randomly placed on body, but none on cheeks | <i>T. volcana</i> | 27b | Body somewhat plain, with few or no spots, but saddles may be present over dorsal midline | 28 |
| 21a | Upper half of head with large irregular spots and blotches; second spine of 1st dorsal fin filamentous (thread-like) and reaching to peduncle or beyond | <i>T. filamentosum</i> | 28a | Dorsal midline with ~14 white to grey saddles; head with 3 red vertical bars | <i>T. haima</i> |
| 21b | Dorsal midline with 4 dark saddles, and spots on head and body of similar shape and size; second spine of 1st dorsal fin not reaching past anterior rays of 2nd dorsal fin | <i>T. avidori</i> | 28b | No pale to grey saddles on dorsal midline; no vertical red bars on head, but bars yellow if present | 29 |
| 22a | No oblong to triangular black spot above opercle; pectoral-fin bases scaly | 23 | 29a | Body pale yellow, semi-translucent, with oval spot or 2 small dark blotches above gill opening, and 7 or 8 dark internal blotches along vertebral column | <i>T. sheppardi</i> |
| 22b | Bold, oblong to triangular black spot above opercle, and dark bands sometimes present on nape; breast and pectoral-fin bases scaly | <i>T. winterbottomi</i> | 29b | Colour on snout of live fish broken by 2 pale yellow horizontal stripes from dorsal and ventral margins of pupil (ventral stripe may continue onto chin), preserved specimens with dark stripe from upper lip to anterior region of interorbital space; no dark spot above gill opening | <i>T. dalerocheila</i> |
| 23a | Dark patch on gular region | <i>T. corallinum</i> | | | |
| 23b | No dark patch on gular region | <i>T. omanense</i> | | | |
| 24a | Fifth pelvic-fin ray unbranched | 25 | | | |
| 24b | Fifth pelvic-fin ray branched dichotomously once or twice | 27 | | | |

Trimma anaima Winterbottom 2000

Pallid pygmy goby

PLATES 33 & 34

Trimma anaima Winterbottom 2000: 58, Fig. 1 (Anjouan I., Comoros).*Trimma* sp. 5: Kuiter 1998*.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15 or 16 rays; 5th ray of pelvic fins unbranched. GR 2 or 3/11 or 12. LSS 23; TRB 7; no predorsal scales. Interorbital space bony, its width $\sim\frac{2}{3}$ eye diameter; no interorbital or postorbital trenches.

Body translucent above midlateral septum and reddish orange below; 4 small dark saddles over dorsal midline; small dark spot just behind eyes. Preserved specimens become straw-yellow but retain postorbital spot and pattern of saddles. Attains 15 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Comoros and Maldives; elsewhere to Indonesia, Philippines, Japan, Caroline Is., New Guinea, Solomon Is., Australia and Fiji.

REMARKS Collected over reefs and drop-offs, at 3–35 m.

Trimma avidori (Goren 1978)

Avidor's pygmy goby

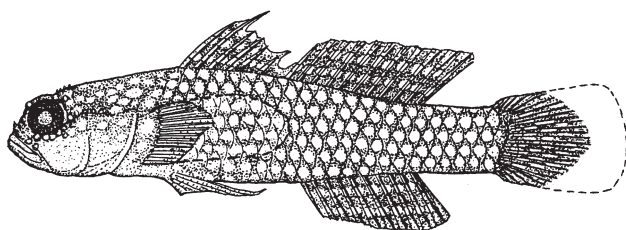
PLATES 33 & 34

Zonogobius avidori Goren 1978: 198, Fig. 5 (Taba, Sinai, Egypt, Red Sea); Goren 1979*; Dor 1984.

Trimma avidori: Field & Field 1998*; Herler & Hilgers 2005*.

Second dorsal fin 1 spine, 9–11 (usually 10) rays; anal fin 1 spine, 9–11 (usually 9) rays; pectoral fins 16–19 rays; 5th ray of pelvic fins branches dichotomously twice. GR 2–4/11–14. LSS 22–25; TRB 7 or 8; no scales in predorsal midline. Anterior spines of 1st dorsal fin not elongate.

Head and body reddish brown, with small orange-red spots in centre of each scale and similarly sized spots on head; 4 distinctive small dark saddles across dorsum; both dorsal fins, anal fin, and caudal fin with 3 rows of red spots. Preserved specimens with more opaque body but same pattern of spots. Attains 21 mm SL.



Trimma avidori, 20 mm SL, holotype (Red Sea). Source: Goren 1978

DISTRIBUTION WIO: Gulf of Aqaba (northern Red Sea) to Gulf of Tadjoura (Gulf of Aden).

Trimma barralli Winterbottom 1995

Barrall's pygmy goby

PLATES 33 & 34

Trimma barralli Winterbottom 1995: 93, Figs. 1–2 (Ras Abu Galum, Egypt, Red Sea); Debelius 1998*.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 7–9 rays; pectoral fins 17–19 rays, some branched; 5th ray of pelvic fins branched once. GR 3–5/14–16. LSS 25 or 26; TRB 7 or 8; predorsal scales 6–9; cheek naked. Interorbital space bony and narrow, its width $\frac{1}{3}$ – $\frac{1}{2}$ eye diameter. Spines 2–3 of 1st dorsal fin elongate.

Body suffused with red over golden-brown background, grading to red anteriorly; scale-sized pale spots on head; top of eyes mottled with alternating red and white bands; single row of yellow spots along 1st dorsal-fin base, and 2–4 such rows along 2nd dorsal-fin base. Attains 28 mm SL.

DISTRIBUTION Red Sea (Gulf of Aqaba to Port Sudan).

REMARKS Presumably a deep-reef species, usually found at >24 m.

Trimma bisella Winterbottom 2000

Two-saddle pygmy goby

PLATE 34

Trimma bisella Winterbottom 2000: 60, Fig. 2 (west coast of Mauritius, Mascarenes).

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–19 rays; 5th ray of pelvic fins unbranched. GR 3–5/14 or 15. LSS 24–26; TRB 7 or 8; no predorsal scales. Interorbital trench well-developed. Spine 2 of 1st dorsal fin elongate.

Body pale orangish pink; head with 4 vertical orange bars; row of orange spots along dorsal-fin bases; peduncle orange with 2 distinct white saddles (one each on dorsal and ventral surfaces). Attains 24 mm SL.

DISTRIBUTION WIO: Mauritius.

REMARKS Known from 24–33 m.

Trimma caudomaculatum Yoshino & Araga 1975

Blotch-tailed pygmy goby

Trimma caudomaculata Yoshino & Araga in Masuda, Araga & Yoshino 1975: 272, Pl. 89m (fringing reef off Nerome, Okinawa I., Japan).

Trimma caudomaculatum: Winterbottom & Hoese 2015.

Second dorsal fin and anal fin each with 1 spine, 7–9 rays; pectoral fins 13–17 rays; 5th ray of pelvic fins unbranched. GR 3 or 4/12–16. LSS 26–30; TRB 7–9; predorsal scales 9 or 10. Interorbital space broad. Second spine of 1st dorsal fin filamentous.

Body golden brown, white ventrally (including head); adults with bluish or purple stripe along midline to upper edge of eye; large black blotch at caudal-fin base. Attains 28 mm SL.

DISTRIBUTION Indo-Pacific (true range uncertain: possibly a species-complex). WIO: Maldives; elsewhere widespread from Indonesia to Japan and Tonga.

REMARKS Known from 3–50 m; may form loose schools; hovers with head up, orienting its body vertically in the water column.

Trimma corallinum (Smith 1959)

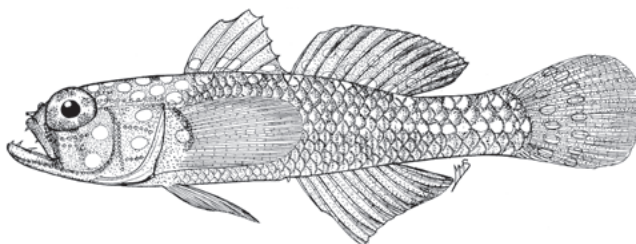
Polkadot pygmy goby

PLATE 34

Zonogobius corallinus Smith 1959: 209, Fig. 29 (Pinda, Mozambique).*Trimma* sp. 1: Kuitert 1998.*Trimma corallinus*: Hoese & Winterbottom 1979.*Trimma corallina*: SSF No. 240.100*.

Second dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 9 rays; pectoral fins 18–21 rays; 5th ray of pelvic fins branches dichotomously twice, its length $\sim\frac{4}{5}$ of 4th ray. GR 2–4/12–15. LSS 23–26; TRB 7 or 8; no predorsal scales; pectoral-fin bases scaly. Interorbital and postorbital trenches both well-developed.

Body orangish red, with pattern of irregular and unequal orange blotches on pale nape, and pale narrow bands across dorsum; distinctive dark patch on gular region; both dorsal fins, anal fin, and caudal fin with rows of orange spots fading distally; dark crescent shape on rear edge of pectoral-fin bases. Preserved specimens lose colour but retain original pattern. Attains 24 mm SL.

*Trimma corallinum*, 25 mm TL, male holotype (N Mozambique).

Source: Smith 1959

DISTRIBUTION WIO: Tanzania (Zanzibar), Mozambique, South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Socotra, Oman and Maldives.

REMARKS Collected at 0.5–24 m.

Trimma dalerocheila Winterbottom 1984

Hotlips pygmy goby

PLATE 34

Trimma dalerocheila Winterbottom 1984: 697, Figs. 1, 11

(Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin and anal fin each with 1 spine, 9–11 rays; pectoral fins 18–20 rays. GR 2 or 3/12 or 13. LSS 23 or 24; TRB 10; no predorsal scales.

Body brick-red, usually with 2 paler bars: 1st bar crosses pectoral-fin base, and 2nd bar between dorsal fins; snout and chin fiery red, broken by 2 pale yellow horizontal stripes

from dorsal and ventral margins of pupil (ventral stripe may continue onto chin). Preserved specimens with prominent dark median stripe between nostrils, from upper lip to anterior region of interorbital space. Attains 20 mm SL.

DISTRIBUTION WIO: Seychelles, Mauritius and Chagos.

REMARKS Found in lagoons and at drop-offs, at 3–48 m. The large number of specimens collected, coupled with their known habitat, suggests that this species forms schools.

Trimma emeryi Winterbottom 1985

Emery's pygmy goby

PLATE 34

Trimma emeryi Winterbottom 1985: 752, Fig. 5 (Salomon Atoll,

Chagos Archipelago); Winterbottom & Emery 1986;

Randall & Goren 1993; Kuitert 1998*; Heemstra *et al.* 2004.*Trimma mendelsohni* (*non* Goren 1978): Winterbottom 1984.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 16–18 rays, all unbranched; 5th ray of pelvic fins branched once, its length subequal to 4th ray. GR 2 or 3/11–13. LSS 24 or 25; TRB 6 or 7; predorsal scales 7 or 8. Interorbital trench moderate; no postorbital trench.

Body colour very plain, but scale pockets outlined with melanophores, centre of most scales with diffuse yellow spot; head and body sprinkled with melanophores on translucent background, and head may have yellow mottling; iris red. In preserved specimens, red, yellow and translucent areas all become straw-yellow but with melanophores still evident. Attains 19 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Comoros, Rodrigues, Chagos and Maldives; range elsewhere is uncertain.

REMARKS Collected from lagoons and on drop-offs, at 3–43 m.

Trimma filamentosum Winterbottom 1995

Long-spine pygmy goby

PLATE 34

Trimma filamentosum Winterbottom 1995: 94, Figs. 3–4

(Marsa el Muqabila, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 17 or 18 rays. LSS 27 or 28; TRB 8–10; no predorsal scales. Distinguished by having relatively numerous dorsal- and anal-fin rays. Second spine of 1st dorsal fin filamentous and reaching back to peduncle or beyond in adults.

Each body scale with orange spot on brownish background; dorsal portion of head with larger orange spots, blotches, or oval and/or elongate and sometimes curved balloon-like marks; usually with pale stripe below eyes, but cheek otherwise uniform in colour. In preserved specimens, patterns remain but orange areas become straw-yellow. Attains 28 mm SL.

DISTRIBUTION WIO: northern Red Sea.

REMARKS Collected to ~24 m deep from outer reef slopes and vertical walls with small caves.

Trimma fishelsoni Goren 1985

Fishelson's pygmy goby

PLATES 33 & 34

Trimma fishelsoni Goren 1985: 64, Figs. 1–3 (Sinai, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 15 rays; 5th ray of pelvic fins unbranched. GR 3 or 4/14–16. LSS 26–28; TRB 7 or 8; predorsal scales 11 or 12; cheek and opercle scaly. Interorbital space broad, its width subequal to pupil diameter. Second spine of 1st dorsal fin elongate.

Body colour plain, but usually with 3 or 4 faint dark saddles across dorsum (more apparent in preserved specimens than in life). Attains 28 mm SL.



Trimma fishelsoni, 27 mm SL (Gulf of Aqaba). © JE Randall, Bishop Museum

DISTRIBUTION WIO: northern Red Sea.

REMARKS Collected to ~15 m deep.

Trimma flammeum (Smith 1959)

Flame pygmy goby

PLATE 34

Zonogobius flammeus Smith 1959: 209, Pl. 10g (Pinda, Mozambique); Smith 1960; Smith & Smith 1963*.

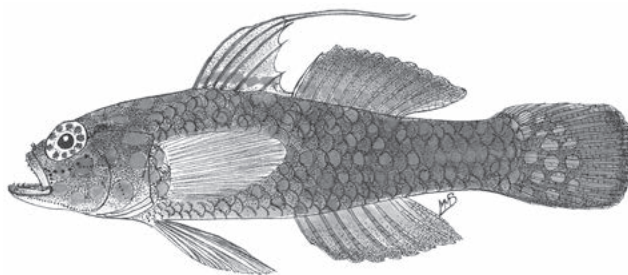
Trimma flammeus: Hoese & Winterbottom 1979; Randall & Goren 1993*.

Trimma macrophthalma: SSF No. 240.101*; Winterbottom & Emery 1986.

Trimma sp. 2: Randall & Goren 1993.

Second dorsal fin 1 spine, 9 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–19 rays; 5th ray of pelvic fins branching twice dichotomously, its length 60–80% that of 4th ray. GR 2 or 3/11–13. LSS 25–27; TRB 7–10; predorsal area, head, opercle and cheek naked.

Body semi-translucent; males red and fading to orange distally, females dark orange and fading to pale orange or deep yellow distally; both sexes with same pattern of blotchy, irregular and unequal yellow-orange or orange-red spots over entire body, including on cheeks, head and breast, but males with darker spots than females. Preserved specimens opaque but retain original pattern of spots. Attains 22 mm SL.



Trimma flammeum, 25 mm TL, holotype (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Chagos and Maldives; elsewhere to Thailand, Cocos (Keeling) Is. and Strait of Malacca (Malaysia).

REMARKS Collected at 6–30 m.

Trimma flavicaudatum (Goren 1982)

Yellow-tailed pygmy goby

PLATE 34

Quisquilius flavicaudatus Goren 1982: 139, Fig. 1 (Sinai, Egypt, Red Sea); Dor 1984.

Trimma flavicaudata [*lapsus*]: Goren 1986.

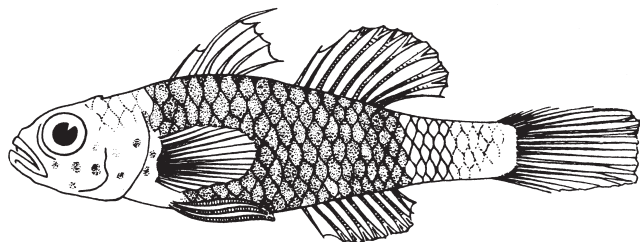
Trimma flavicaudatum: Debelius 1998*.

Trimma flavicaudatus: Field & Field 1998*.

Second dorsal fin and anal fin each with 1 spine, 7 or 8 rays; pectoral fins 16 or 17 rays, unbranched; 5th ray of pelvic fins branched once. GR 2–4/10–12. LSS 23–27; TRB 6–8; predorsal area scaly. Distinguished by relatively low number of dorsal and anal-fin rays. No trough with slanted sides posterodorsal to eye. Spines of 1st dorsal fin not elongate.

Body pale reddish, with irregular pupil-sized orange-red spots on head (pale in preserved specimens), especially prominent on cheeks; peduncle and caudal fin usually bright

yellow, with tiny blue spots (sometimes dull reddish grey spots). Preserved specimens lose colour but faintly retain pattern. Attains 25 mm SL.



Trimma flavicaudatum, 20 mm SL, holotype (Red Sea).

Source: Goren 1982 (by Z Sheffer); CC BY-NC 3.0

DISTRIBUTION WIO: Gulf of Aqaba (northern Red Sea) to Gulf of Tadjoura (Gulf of Aden).

REMARKS Collected at 5–20 m.

Trimma fraena Winterbottom 1984

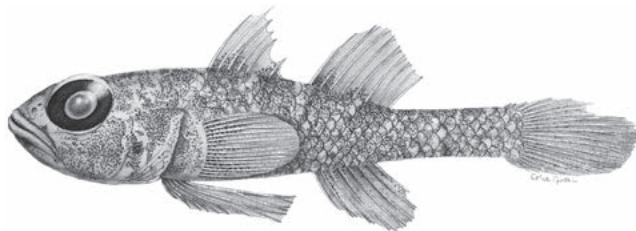
Bridled pygmy goby

Trimma fraena Winterbottom 1984: 699, Figs. 14–15

(Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 rays; pectoral fins 16 or 17 rays; pelvic fins completely joined at base, and pelvic frenum present. GR 2 or 3/12 or 13. LSS 25 or 26; TRB 9 or 10; predorsal scales 10.

Preserved specimens with 8 distinctive pale saddles over dorsal midline on dark background. Attains at least 17 mm SL.



Trimma fraena, 17 mm SL, female holotype (Chagos).

Source: Winterbottom 1984 (by CM Godkin)

DISTRIBUTION WIO: Comoros and Chagos.

REMARKS Collected on silty coral-reef habitats, at 9–15 m.

Trimma fucatum Winterbottom & Southcott 2007

Harlot pygmy goby

PLATE 33

?*Trimma* sp. 3: Randall & Goren 1993.

Trimma fucatum Winterbottom & Southcott, 2007: 70, Figs. 1, 2A–B, 3A (Phuket, Thailand).

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 17–19 rays; 5th ray of pelvic fins branched dichotomously once, and ~30–60% length of 4th ray. Spines 2–3 of 1st dorsal fin not elongate. GR 3–4/10–14. LSS 21–25; TRB 6–7; predorsal scales 4–5, and predorsal midline scaly. Interorbital trench moderate; postorbital trench poorly developed or absent.

When alive, *T. fucatum* has 3 or 4 rows of yellow to orange blotches along the body and a narrow red bar on the vertical limb of the preopercle. Preserved specimens plain yellowish, with large pale spots and saddles on head and anterodorsal body. Attains 22 mm SL.

DISTRIBUTION WIO: Maldives, India; elsewhere, west coast of Thailand and Indonesia.

REMARKS Collected on coral reefs, at 1–21 m.

Trimma griffithsi Winterbottom 1984

Griffith's pygmy goby

PLATE 34

Trimma griffithsi Winterbottom 1984: 701, Figs. 2, 16, 27a (lagoon on Peros Banhos, Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 8 rays; pectoral fins 14 or 15 rays; 5th ray of pelvic fins branched. Distinguished by sexual dimorphism in length of last rays of 2nd dorsal fin and anal fin: these rays exceeding half distance to first caudal-fin rays in females, but shorter in males. GR 2/12 or 13. LSS 23 or 24; TRB 6; predorsal scales 4 or 5 (relatively few). Second spine of 1st dorsal fin longest.

Body translucent pinkish, with most of abdomen and head pale orange-pink; area of deep red at middle of caudal-fin base (becomes dark in preserved specimens). Attains at least 18 mm SL.

DISTRIBUTION WIO: Chagos.

REMARKS Type specimens collected from a lagoon, at 25–32 m.

Trimma haima Winterbottom 1984

Cut-face pygmy goby

PLATE 34

Trimma haima Winterbottom 1984: 702, Figs. 3, 17 (Chagos Archipelago); Winterbottom & Emery 1986; Randall & Van Egmond 1994; Debelius 1999*; Heemstra *et al.* 2004.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9 rays; pectoral fins 16–19 rays; 5th ray of pelvic fin branches dichotomously once. GR 2 or 3/11 or 12. LSS 24 or 25; TRB 7; no predorsal scales. Interorbital trench deep.

Body reddish orange and 14 orange-red saddles over dorsal midline; head with 3 red vertical bars; preserved specimens retain this pattern, but areas of red and orange become colourless. Attains 19 mm SL.

DISTRIBUTION WIO: Comoros, Amirante Is. (Seychelles), Mauritius, Rodrigues and Chagos.

REMARKS Collected to ~36 m deep, from lagoons, reef tops and drops-offs.

Trimma halonevum Winterbottom 2000

Pimple pygmy goby

PLATE 34

Trimma halonevum Winterbottom 2000: 62, Fig. 3 (Normanby I., Papua New Guinea).
Trimma sp. 2: Kuiter 1998*.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 8 rays; pectoral fins 17–20 rays; 5th ray of pelvic fin with single dichotomous branch. GR 3–5/12–15. LSS 23–25; TRB 7 or 8; predorsal scales 6–10. Interorbital trench moderate and steep-sided. Spines 2–3 of 1st dorsal fin elongate.

Head and body scattered with yellow spots, often some spots darker and with pale halos. In preserved specimens, spots appear as pale areas with chromatophores in centre. Attains 27 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Maldives; elsewhere to Christmas I., Indonesia, Philippines, New Guinea, Solomon Is., Vanuatu and possibly Society Is.

REMARKS Often found in silty habitats, among sheltered rubble and sandy reef slopes; collected from 1–45 m.

Trimma hoesei Winterbottom 1984

Hoese's pygmy goby

PLATES 33 & 34

Trimma hoesei Winterbottom 1984: 704, Figs. 7, 18–19 (Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 9–11 rays; pectoral fins 15 or 16 rays; 5th ray of pelvic fins branched; caudal fin forked. GR 4/15. LSS 25 or 26; TRB 7; predorsal scales 2–5, extending midway from 1st dorsal-fin origin towards eyes.

Body translucent dorsally, with scale pockets edged in yellow, and pinkish or yellowish ventrally; head yellow-orange above and pale below eyes; eyes with some gold; dorsal fins and anal fin with yellow line near base of elements; anal fin yellowish distally; caudal fin with 4 longitudinal pale yellow stripes with reddish inbetween, and bases of reddish rays orange. Preserved specimens without distinctive colour except continuous line of melanophores in midventral septum, between last anal fin-ray and ventral procurrent rays. Attains 24 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Chagos and Maldives; elsewhere to Indonesia, Palau, New Guinea (Bismarck Archipelago), Solomon Is., Great Barrier Reef and Fiji.

REMARKS Collected from drop-off caves, at 20–48 m.

Trimma mendelsohni (Goren 1978)

Mendelsohn's pygmy goby

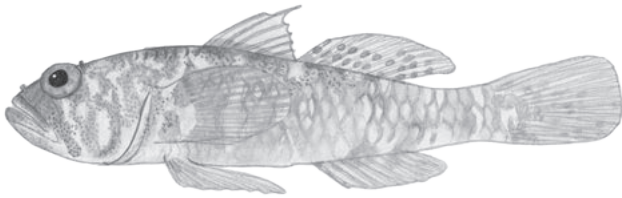
PLATE 33

Quisquilius mendelsohni Goren 1978: 195, Fig. 3 (Nuweiba, Sinai, Egypt, Red Sea); Dor 1984.

Trimma mendelsohni: Anderson *et al.* 1998*; Heemstra *et al.* 2004; Herler & Hilgers 2005*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 17–19 rays; 5th ray of pelvic fins branched dichotomously multiple times, no pelvic frenum. GR 0 [none on epibranchials]/12–14. LSS 24–27; TRB 7–9; predorsal scales 7 or 8, and midline scaly. Interorbital and postorbital trenches well-developed; distinguished by pair of small fleshy lappets on nape, just behind trenches.

Body red-brown, with characteristic mottling and ~8 yellow or white diffuse saddles or vertical bars (~1½ eye-widths apart). Attains 24 mm SL.



Trimma mendelssohni, 22 mm SL (Rodrigues).

DISTRIBUTION WIO: northern Red Sea to Madagascar (Toliara), Rodrigues, St Brandon Shoals and Maldives.

Trimma naudei Smith 1957

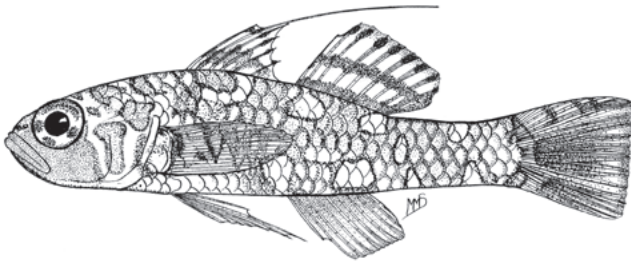
Naude's pygmy goby

PLATE 35

Trimma naudei Smith 1957: 828, Fig. 5 (Mahé, Seychelles); Smith 1958*; Smith & Smith 1963*; Winterbottom & Emery 1986; Randall & Goren 1993*; Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 16–18 rays, no pelvic frenum. GR 3/14 or 15. LSS 24; TRB 7; predorsal scales 6–8. Interorbital and postorbital trenches deep. First spine of 1st dorsal fin elongate and may reach peduncle.

Body orange-red, with ~7 irregular dorsolateral white spots which may coalesce into a zigzag line anteriorly, and 4 irregular ventrolateral spots. Attains 26 mm SL.



Trimma naudei, 27 mm TL, holotype (Seychelles). Source: Smith 1957

DISTRIBUTION Indo-Pacific. WIO: Comoros, Aldabra, Seychelles, Mauritius, Rodrigues, St Brandon Shoals, Chagos and Maldives; elsewhere to Indonesia, Pratas Reef (South China Sea), Philippines, Ryukyu Is. and Western Australia.

REMARKS Found in lagoons, usually at 10–30 m; may form loose schools.

Trimma omanense Winterbottom 2000

Crescent-winged pygmy goby

PLATE 35

Trimma omanense Winterbottom 2000: 65, Fig. 4 (Gulf of Oman).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 rays; pectoral fins 19–21 rays; 5th ray of pelvic fin branches dichotomously twice. LSS 26–30; TRB 8–12; no scales on predorsal midline; head naked; pectoral-fin bases scaly. Interorbital and postorbital trenches well-developed.

Body brick-red background, with irregular and unequal reddish blotches on nape, and pale narrow bands across dorsum; dorsal fins and caudal fin with rows of red spots, fading distally; dark crescent on rear edge of pectoral-fin bases. Preserved specimens lose colour but retain patterns. Attains 22 mm SL.

DISTRIBUTION WIO: Gulf of Oman.

REMARKS Collected to ~20 m deep.

Trimma quadrimaculatum

Hoese, Bogorodsky & Mal 2015

Four-spotted pygmy goby

PLATE 35

Trimma quadrimaculatum Hoese, Bogorodsky & Mal 2015: 540, Figs. 1–2 (Jeddah, Saudi Arabia, Red Sea).

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 rays; pectoral fins 15–17 rays. LSS 23–25; TRB 6 or 7; predorsal scales 6–8; cheek and opercle naked. Distinguished by 2 small fleshy lappets on nape.

Body with characteristic mottling; 3 dark brown bars below eye; 2 dark spots on pectoral-fin base; ovoid dark bar over hypurals and bases of caudal-fin rays. Attains at least 17 mm SL.

DISTRIBUTION WIO: Red Sea.

REMARKS Types collected from cave of steep slope, at ~14 m.

Trimma sheppardi Winterbottom 1984

Sheppard's pygmy goby

PLATE 35

Trimma sheppardi Winterbottom 1984: 709, Figs. 6, 24, 27b

(Chagos Archipelago); Winterbottom & Emery 1986;

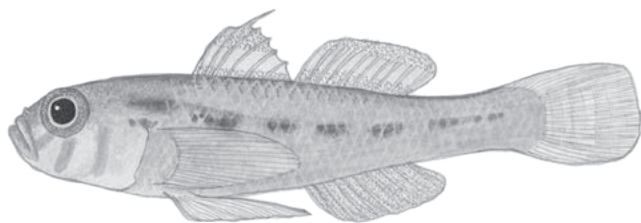
Randall & Van Egmond 1994; Debelius 1998*.

?*Trimma* sp. 3 [yellow-spotted pygmy goby]: Kuitert 1998*.

?*Trimma* sp. 4 [filamentous pygmy goby]: Kuitert 1998*.

Second dorsal fin and anal fin each with 1 spine, 8 or 9 rays; pectoral fins 17–19 rays. GR 2 or 3/13–15. LSS 24; TRB 8 or 9; no predorsal scales. No interorbital and postorbital trenches.

Body pale yellow, semi-transparent, with dark oval or 2 small dark spots above gill opening, and series of 7 or 8 internal dark blotches along vertebral column. Attains ~18 mm SL.



Trimma sheppardi, ~15 mm SL (Red Sea).

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Seychelles and Chagos; elsewhere, Japan.

REMARKS Collected from 5–45 m; relatively large numbers of specimens in some collections indicates this species may form small schools in some localities.

Trimma stobbsi Winterbottom 2001

Stobbs's pygmy goby

PLATE 35

Trimma stobbsi Winterbottom 2001: 20, Figs. 1–2

(Port de Goro, New Caledonia).

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–19 rays; 5th ray of pelvic fins unbranched. GR 2–4/11–15. LSS 22–24; TRB 7 or 8; no predorsal scales; sides of nape scaly, but narrow scaleless gap in midline. Interorbital trench weak; no postorbital trench; dark spot above opercle preceded by shallow groove along dorsal margin of operculum.

Body grey-brown, and head yellow with distinct dark ovalish spot above opercle. Attains 20 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Maldives; elsewhere to Indonesia, Philippines, New Guinea, Solomon Is., Australia and New Caledonia.

REMARKS Collected from caves, reefs and drop-offs, at 1–40 m.

Trimma striatum (Herre 1945)

Red-striped pygmy goby

PLATE 35

Coronogobius striatus Herre 1945: 81 (Busuanga I., Philippines).

Trimma striata: Randall & Goren 1993*; Kuitert 1998*.

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 8 or 9 rays; pectoral fins 16–20 rays; 5th ray of pelvic fin branched dichotomously twice, its length 65–95% that of 4th ray, with complete basal membrane. GR 3 or 4/13–16. LSS 23–27; TRB 8 or 9; no predorsal scales; cycloid scales on breast and pectoral-fin bases; head, opercle and cheek naked. Interorbital trench moderate; postorbital trench weak.

Head and body dark brown with diffuse dark red spots in scale centres on body; head with 5 red stripes, fading at level of 1st dorsal fin; median fins with red spots and/or stripes; pectoral fins red. Attains 35 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Maldives; elsewhere to Thailand, Indonesia, Philippines, Palau, New Guinea and offshore islands of northwestern Australia.

REMARKS Found over sandy bottom in lagoons, small caves and overhangs, to ~21 m deep.

Trimma taylori Lobel 1979

Taylor's pygmy goby

PLATES 35 & 36

Trimma taylori Lobel 1979: 3, Fig. 1 (Oahu I., Hawaii);

Winterbottom & Emery 1986; Randall & Goren 1993*; Kuitert 1998*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 13–15 rays; pelvic-fin rays 1–4 branched sequentially 3 or 4 times, and 5th ray branched dichotomously twice; caudal fin asymmetrical, with upper rays slightly longer than lower rays. Distinguished by numerous dorsal- and anal-fin rays GR 2–4/13–15. LSS 23 or 24; TRB 7; predorsal scales 6–8; cheek and opercle naked. Interorbital space broad, subequal to pupil diameter. In males last 2nd dorsal- and anal-fin rays reach to bases of the unbranched caudal-fin rays; in females they do not reach past midpoint of peduncle.

Head and body plain translucent yellow, except some

specimens with pale yellow spots on body; males with yellow spots on dorsal and anal fins, and females without spots. Attains 20 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea (Suakin Archipelago, Sudan, and Saudi Arabia) to Comoros, Chagos and Maldives; elsewhere to Society Is. and Hawaii.

REMARKS Most specimens from Chagos were found in huge loose schools, in caves and on drop-offs, at 7–50 m.

Trimma unisquamis (Gosline 1959)

Blackmargin pygmy goby

PLATE 36

Hazeus unisquamis Gosline 1959: 70, Fig. 3 (reef off Oahu I., Hawaii).
Trimma sp. A: Winterbottom & Emery 1986.

Second dorsal fin 1 spine, 7 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 17–20 rays; pelvic fins joined by complete basal membrane, and pelvic frenum present. GR 1–3/11–15. LSS 23–27; TRB 5–7; predorsal scales 5–7; scales cycloid on head, opercle, predorsal midline, breast and pectoral-fin bases. Interorbital trench lined with 1 row of ctenoid scales; postorbital trench weak or absent.

Body with red vertical bars (their width twice eye diameter), and 4 bluish saddles over dorsum (white saddles in preserved specimens); both dorsal fins (and often other medial fins) with distinctive black margins. Attains 19 mm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: Comoros, Mauritius and Chagos; elsewhere, Cocos (Keeling) Is., Christmas I., New Caledonia, Easter I. and Hawaii.

Trimma volcana Winterbottom 2003

Volcano pygmy goby

PLATE 36

Trimma volcana Winterbottom 2003: 10, Figs. 1–3 (Pomanji I. [Pamandzi, Petite-Terre], Mayotte, Comoros).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 9–11 rays; pectoral fins 18–20 rays; 5th ray of pelvic fin branched dichotomously twice, its length 80–90% that of 4th ray. GR 2–4/11–15. LSS 21–25; TRB 6.5–8; pectoral-fin bases scaly, predorsal midline naked. Interorbital and postorbital trenches moderate to well-developed. Second spine of 1st dorsal fin elongate.

Head and body brown, with large amber to red spots (but no spots on cheek); small yellow spots on medial fins. Attains 19 mm SL.

DISTRIBUTION WIO: Tanzania, Mozambique and Comoros.

REMARKS Collected from 0.5–24 m.

Trimma winchi Winterbottom 1984

Winch's pygmy goby

PLATE 36

Trimma winchi Winterbottom 1984: 712, Figs. 9, 28 (Salomon Atoll, Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 14 or 15 rays; 5th ray of pelvic fins branched once. Distinguished by relatively few dorsal- and anal-fin rays. GR 3/13. LSS 24 or 25; TRB 7; predorsal scales 8 or 9; few large cycloid scales on cheek, opercle, and pectoral-fin bases.

Body plain yellow. Attains 19 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Chagos; elsewhere, Cocos (Keeling) Is., New Britain (Papua New Guinea) and Fiji.

REMARKS Collected from 33–43 m at Chagos.

Trimma winterbottomi Randall & Downing 1994

Winterbottom's pygmy goby

PLATE 36

Gobius townsendi Boulenger 1897: 421 (Makran coast, Iran).
Trimma winterbottomi Randall & Downing in Randall *et al.* 1994: 250 (Makran coast, Iran) [replacement name for *Gobius townsendi* Boulenger 1897, preoccupied]; Randall 1995*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin, 9 or 10 rays; pectoral fins 19–22 rays. GR 3 or 4/14–16. LSS 45; TRB 7–9; no predorsal scales; breast and pectoral-fin bases scaly.

Diffuse orange-red and white banding on upper part of body, paler orange on sides of head, and distinctive small oblong to triangular black spot just above opercle. Attains 26 mm SL.



Trimma winterbottomi, 25 mm SL (Persian/Arabian Gulf).
© JE Randall, Bishop Museum

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf, Gulf of Oman, Pakistan, India and Sri Lanka; elsewhere to west coast of Thailand.

REMARKS Collected at 4–21 m.

GENUS *Trimmatom* Winterbottom & Emery 1981

Richard Winterbottom and Margaret Zur

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 9–12 rays; anal fin 1 spine, 8–11 rays; pelvic fins 1 spine, 5 rays, and 5th ray unbranched and shortened (<20% length of 4th ray). LSS 19–25, or body entirely naked; head, pectoral-fin bases and breast always naked. Gill opening extends anteroventrally at least to below vertical limb of preopercle. Characterised by 1st element of the anal fin being bilaterally paired and sometimes segmented. In *T. offucius* and *T. nanus* the 1st element of both the 2nd dorsal fin and anal fin is a bilateral ‘ray’, not a segmented ray, and as such is referred to here as a ‘spine.’ At least 7 species, 3 in WIO.

KEY TO SPECIES

- | | | |
|----|--|--------------------|
| 1a | Scales present; first 4 pelvic-fin rays branched | <i>T. pharus</i> |
| 1b | No scales; no branched pelvic-fin rays | 2 |
| 2a | Second dorsal fin 1 ‘spine’, 10–12 (usually 10) rays; anal fin 1 ‘spine’, 10 or 11 rays; pectoral fins 17–22 (usually 20) rays; 7 or 8 small dark saddles over dorsum, including 2 across base of 2nd dorsal fin | <i>T. offucius</i> |
| 2b | Second dorsal fin usually 1 ‘spine’, 9 or 10 (usually 9) rays; anal fin 1 ‘spine’, 8 or 9 rays; pectoral fins 14–16 rays; no dark saddles over dorsum | <i>T. nanus</i> |

Trimmatom nanus Winterbottom & Emery 1981

Dwarf atom goby

PLATE 36

Trimmatom nanus Winterbottom & Emery 1981: 139, Figs. 5–6 (Salomon Atoll, Chagos Archipelago); Winterbottom & Emery 1986; Randall & Goren 1993; Bogorodsky *et al.* 2010*.

Second dorsal fin 1 ‘spine’, 9 or 10 rays; anal fin 1 ‘spine’, 8 or 9 rays; pectoral fins 14–16 rays; all pelvic-fin rays unbranched. GR 0 or 1/9 or 10. No scales on head or body.

Head and anterior body brick-red, shading to pale orange posteriorly; fins pale orange; no dark saddles over dorsum. Preserved specimens vary from off-white with few

melanophores on occiput, dorsal fins and anal fin, to entire body mottled, often with faint crossbars over dorsum. Attains ~10.5 mm (~1 cm) SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Maldives and Chagos; elsewhere to Society Is.

REMARKS Inhabits mainly oceanic drop-offs, at 20–30 m; also found in lagoons and outer reefs, at 5–35 m. One of the smallest vertebrates yet to be described. Mature by ~8 mm SL.

Trimmatom offucius Winterbottom & Emery 1981

Clown atom goby

Trimmatom offucius Winterbottom & Emery 1981: 139, Fig. 8 (Salomon Atoll, Chagos Archipelago); Winterbottom & Emery 1986.

Second dorsal fin 1 ‘spine’, 10–12 rays; anal fin 1 ‘spine’, 10 or 11 rays; pectoral fins 17–22; all pelvic-fin rays unbranched; lower GR 11 or 12. No scales on head or body.

Fresh specimens with pale orange-yellow background, and intense yellow pigment along midlateral septum and dorsal- and anal-fin bases; opercle suffused with orange-red; orange-red bar across cheek below eye (about eye diameter). Preserved specimens with straw-coloured body; bar beneath eye with well-defined margins, and scattering of melanophores between margins, on occiput, and on dorsal opercular regions; up to 8 short saddles over dorsum, with 2nd dorsal-fin base crossed by 2 of these saddles. Attains ~14.5 mm (~1.5 cm) SL.

DISTRIBUTION WIO: Chagos and possibly Maldives (photograph only).

REMARKS Inhabits oceanic drop-offs, at 20–50 m, particularly caves in drop-off walls; a large number of specimens in some collections indicates the species may form schools in some circumstances.

Trimmatom pharus Winterbottom 2001

Lighthouse atom goby

PLATE 36

Trimmatom pharus Winterbottom 2001: 22, Fig. 1 (Great Chagos Bank, Chagos Archipelago).

Trimma eviotops: Winterbottom & Emery 1986.

Second dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 17–20 rays; pelvic-fin rays 1–4 branched with single bifurcation. GR 1–3/8–11. LSS 19–25; TRB 7.

Body with orange bars over translucent background; bar crossing pectoral-fin bases and extending across dorsal surface in front of 1st dorsal fin; peduncle suffused with red-orange pigment (no bars clearly visible). Preserved specimens with numerous bars across head and body on pale straw-yellow background. Attains ~17.5 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Amirante Is. (Seychelles), St Brandon Shoals and Chagos; elsewhere to Indonesia (Sumatra), Japan and Solomon Is.

REMARKS Collected to ~28 m deep, from shoals, reefs and lagoons.

GENUS *Valenciennea* Bleeker 1856

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 11–19 rays; pectoral fins 18–23 rays; pelvic fins completely separate, and no pelvic frenum. Body scales ctenoid; cycloid scales on belly, but chest and pectoral-fin bases naked to completely covered with cycloid scales; nape midline and head naked; LSS 62–146; TRB 17–47. Body slender and compressed; head rounded to slightly compressed. Sensory papillae in reduced longitudinal pattern. Gill opening narrow, extending to pectoral-fin base; upper part of 1st gill arch with fleshy pads and short lobes. Teeth in upper jaw in 1 row with gap at centre; 2 rows of teeth anteriorly in lower jaw; 2 patches of slender moveable pharyngeal teeth on roof of mouth. Tongue adnate, rounded, with free tip. Fifteen species, 7 in WIO.

KEY TO SPECIES

- | | | |
|----|---|----------------------|
| 1a | Distinct black spot on or near tip of 1st dorsal fin | 2 |
| 1b | No black spot on 1st dorsal fin | 4 |
| 2a | Head with blue spots in life (brown in preservative), and no stripes; body with faint stripe and sometimes faint bars (often lost in preservative); black spot between tips of 3rd and 4th spines of 1st dorsal fin | <i>V. sexguttata</i> |
| 2b | Head with stripes, sometimes also with blue spots (brown spots in preserved specimens); body with bars and/or stripes; 1st dorsal-fin spot variable in position | 3 |
| 3a | Head stripe oblique; body with broad brown bars, dark at edges, but no prominent spots or stripe on body; large black spot surrounded by white on 1st dorsal fin, extending from 4th, 5th or 6th dorsal-fin spines; caudal-fin base with black bar; TRB 21–25 | <i>V. wardii</i> |

Continued ...

KEY TO SPECIES

- | | | |
|----|--|------------------------|
| 3b | Head stripes more or less horizontal; body with 2 brown to black stripes extending onto caudal fin, no bars; large elongate black spot on 1st dorsal fin, extending at least from 3rd–5th dorsal-fin spines (adults >30 mm SL); caudal-fin base pale or with scattered spots, but no distinct black bar; TRB 26–47 | <i>V. helsdingenii</i> |
| 4a | Second dorsal fin and anal fin each with usually 1 spine, 12 rays | 5 |
| 4b | Second dorsal fin and anal fin each with 1 spine, 13–19 rays | 6 |
| 5a | First dorsal fin elevated with pointed dorsal margin, 3rd spine longest; body with at most 1 stripe on lower half, and spots and broken bars may be present on upper half; maximum size ~104 mm SL | <i>V. puellaris</i> |
| 5b | First dorsal fin low with rounded margin; 3rd and 4th spines subequal or 4th slightly longer; body with 2 faint yellowish stripes in life (brown or obscure in preservative), and usually a few thin pale yellow or grey interconnecting thin vertical bars; maximum size ~55 mm SL | <i>V. parva</i> |
| 6a | First dorsal fin with 3rd spine and sometimes 2–4 spines filamentous; 2nd dorsal fin usually 1 spine, 18 rays; head with 1 or 2, horizontal or oblique, blue or brown stripes below eyes, and no stripe on body | <i>V. strigata</i> |
| 6b | First dorsal fin without filamentous spines in adults (juveniles sometimes with 3rd spine filamentous); 2nd dorsal fin 1 spine, 16–19 rays; head with elongate blue spots in life (brown spots in preservative), and body with single stripe posteriorly | <i>V. persica</i> |

Valenciennea helsdingenii (Bleeker 1858)

Railway glidergoby

PLATE 38

Eleotriodes helsdingenii Bleeker 1858: 212 (Pulau-Pulau Gorong, Moluccas, Indonesia); Smith 1958*; Smith & Smith 1963*.

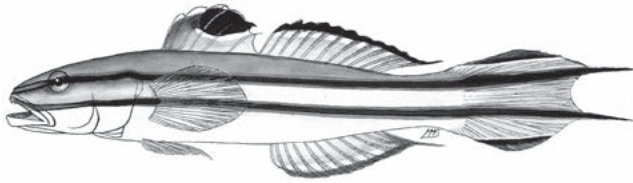
Calleleotris helsdingenii: SFSA No. 943*; Smith 1961*.

Valenciennea helsdingenii: Hoese & Winterbottom 1979; SSF No. 240.103*; Randall & Anderson 1993; Randall & Goren 1993*; Debelius 1993*, 1998*; Eichler & Lieske 1994* [as *helsdingenii*]; Hoese & Larson 1994*; Randall 1994*, 1995*; Randall & Van Egmond 1994; Kuitert 1998* [as *helsdingenii*]; Fricke 1999; Fricke *et al.* 2009.

Second dorsal fin and anal fin each with 1 spine, 11 rays; pectoral fins 21–23 rays; caudal fin of adults with 2 elongate rays forming long narrow lobes or filaments. LSS 127–146; TRB 37–47; pectoral-fin bases scaly in adults.

Body whitish to pale pearly grey, and dorsum grey; 2 dark brown to blackish stripes on sides of head and body,

continuing onto caudal fin; large oval black spot on 1st dorsal fin. Attains about 154 mm SL.



Valenciennesa helsdingenii, 165 mm TL (S Mozambique). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Red Sea, Mozambique, South Africa (Park Rynie, KwaZulu-Natal), Seychelles, Réunion and Maldives; elsewhere throughout western Pacific to Marquesas Is.

REMARKS Found over open silty sand flats or rubble, at 1–42 m; constructs a burrow leaving a large pile of rubble near entrance.

Valenciennesa parva Hoese & Larson 1994

Dwarf glidergoby

PLATE 38

Valenciennesa parva Hoese & Larson 1994: 37, Pls. 3a, 5h (Lizard I. lagoon, Great Barrier Reef, Australia); Anderson *et al.* 1998; Kuitert 1998*.
Valenciennesa sp.: Randall & Anderson 1993; Randall & Goren 1993*.

Second dorsal fin and anal fin each with 1 spine, 11–13 rays; pectoral fins 18–20 rays; caudal fin rounded. LSS 67–85; TRB 17–26; pectoral-fin bases naked. First dorsal fin rounded.

Head and body pearly white, with narrow yellow stripe from eyes to upper caudal-fin base, and similar less distinct stripe from above pectoral-fin bases to lower caudal-fin base; indistinct blue to yellow midlateral bars may join stripes; yellowish and bluish stripes and spotting also present; no black spot on 1st dorsal fin. Attains 54 mm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: Seychelles to Maldives; elsewhere to Ryukyu Is. and Great Barrier Reef.

REMARKS Occurs in pairs or small groups, over clean open sand patches among coral colonies, in lagoon habitats, at 1–15 m.

Valenciennesa persica Hoese & Larson 1994

Gulf glidergoby

PLATE 38

Valenciennesa persica Hoese & Larson 1994: 42, Pls. 3b, 4a (Sitra I., Bahrain, Persian/Arabian Gulf); Randall 1995*; Debelius 1998*.

Second dorsal fin 1 spine, 13 or 14 rays; anal fin 1 spine, 12 or 13 rays; pectoral fins 19–21 rays. LSS 80–102; TRB 28–32; pectoral-fin bases naked. First dorsal fin pointed, no filamentous spines in adults (young <50 mm SL may have short filament).

Body pale greyish to pearly white, with scattered pale blue spots and short streaks on head and upper half of body, similar diffuse brown markings on rear half of body, and pale blue stripe along lower rear half of body; no black spot on 1st dorsal fin; sometimes a few black spots on upper half of caudal fin. Attains 125 mm SL.



Valenciennesa persica, 100 mm SL, holotype (Bahrain).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Oman and Red Sea (last from photograph).

REMARKS Occurs in pairs, over sand near coral, at 2–12 m.

Valenciennesa puellaris (Tomiyama 1956)

Maiden glidergoby

PLATES 37 & 38

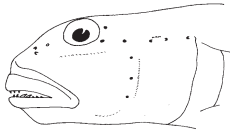
Eleotriodes puellaris Tomiyama in Tomiyama & Abe 1956: 1136, Pl. 224, Fig. 575 (Kiragawa, Kochi Prefecture, Japan).

Valenciennesa puellaris: Randall 1983*; Dor 1984: 251; Winterbottom & Emery 1986*; Cornic 1987*; Debelius 1993*, 1998*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Goren & Dor 1994; Hoese & Larson 1994*; Randall & Van Egmond 1994; Randall 1995*; Winterbottom & Anderson 1997; Field & Field 1998*; Terashima *et al.* 2001*.

Valenciennesa cf. *puellaris*: Kuitert 1998*.

Second dorsal fin and anal fin each with 1 spine, 11–13 rays; pectoral fins 19–22 rays. LSS 72–91; TRB 21–33; pectoral-fin bases naked. First dorsal fin pointed, 3rd spine longest.

Body pale pearly fawn, with scattered yellow-orange spots; head with orange and blue spots and blotches. Several colour forms exist (Hoese & Larson 1994). Attains 106 mm SL.



Valencienna puellaris, 87 mm SL (Chagos).
Source: Winterbottom & Emery 1986



Valencienna puellaris, 106 mm SL (Mauritius). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Red Sea (including Gulf of Aqaba) to South Africa, Madagascar, Comoros, Seychelles, Mauritius, Rodrigues, Chagos and Maldives; elsewhere widespread in western Pacific to Rapa Iti.

REMARKS Found in pairs, over fine clean sand, and constructs shallow burrows under large pieces of rubble, at 2–30 m.

Valencienna sexguttata (Valenciennes 1837)

Bluespotted glidergoby PLATES 37 & 38

Eleotris sexguttata Valenciennes in Cuv. & Val. 1837: 254
(Trincomalee, Sri Lanka).

Eleotris lantzii Thomiot 1878: 256 (Réunion, Mascarenes); Sauvage 1891.
Salarigobius stuhlmannii Pfeffer 1893: 13. Pl. 3, Figs. 6–7
(Kokotoni, Tanzania).

Eleotrides sexguttatus: Steinitz & Ben-Tuvia 1955; Smith 1958*;
Smith & Smith 1963*.

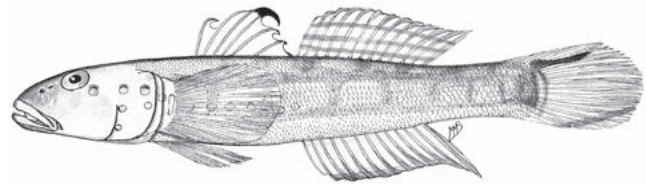
Eleotriodes pallidus Klausowitz 1960: 7, Figs. 1–2 (Madewaru I.,
Fadiffulu Atoll, Maldives).

Valencienna sexguttatus: Hoese & Winterbottom 1979.

Valencienna sexguttata: Randall 1983*, 1995*; Dor 1984; Goren & Spanier
1985; SSF No. 240.104*; Winterbottom & Emery 1986*; Debelius 1993*,
1998*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*;
Goren & Dor 1994; Hoese & Larson 1994*; Eichler & Lieske 1994*;
Randall *et al.* 1994*; Winterbottom & Anderson 1997; Field &
Field 1998*; Kuitert 1998*; Terashima *et al.* 2001*.

Second dorsal fin and anal fin each with 1 spine, 11–13 rays;
pectoral fins 19–21 rays. LSS 71–94; TRB 21–31; pectoral-
fin bases naked or partly scaly. First dorsal fin pointed, no
filamentous spines.

Body sandy white to pale brown, with indistinct pink
to reddish stripe along lower sides of body; scattered blue
rounded spots on head; distinct black spot between 3rd and
4th spines of 1st dorsal fin. Some colour forms exist over its
range (Hoese & Larson 1994). Attains 102 mm SL.



Valencienna sexguttata, 70 mm TL (Seychelles). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea to Mozambique (Bazaruto I.), Aldabra, Mascarenes, Chagos, Maldives and Sri Lanka; elsewhere in western Pacific to Tonga.

REMARKS Occurs in pairs or large groups, usually in lagoon habitats, over fine silty coral sands, at 1–25 m.

Valencienna strigata (Broussonet 1782)

Goldenheaded glidergoby

PLATE 38

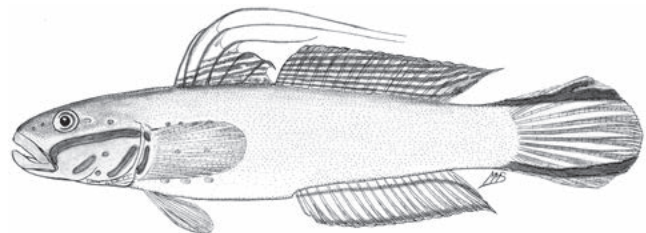
Gobius strigatus Broussonet (ex Forster) 1782: 11, Pl. 1 (Tahiti).

Eleotriodes strigatus: Roux-Esteve & Fourmanoir 1955; Smith 1958*;
Smith & Smith 1963*.

Valencienna strigata: SSF No. 240.105*; Winterbottom & Emery 1986*;
Allen & Steene 1987* [as *strigatus*]; Randall & Goren 1993*; Eichler &
Lieske 1994*; Hoese & Larson 1994*; King 1996*; Winterbottom &
Anderson 1997; Kuitert 1998*; Debelius 1999*; Terashima *et al.* 2001*.

Second dorsal fin 1 spine, 17–19 rays; anal fin 1 spine, 16–19
rays; pectoral fins 20–23 rays. LSS 101–126; TRB 28–40;
pectoral-fin bases fully scaly in adults. Spines 2–3 of 1st dorsal
fin filamentous (spine 4 also becoming filamentous in large
adults), and filaments may reach to front half of 2nd dorsal fin.

Body pearly grey above, becoming white below, with bright
yellow snout and lips; iridescent blue stripe along cheek and
opercle; some scattered pale blue-grey spots on lower part of
head and near pectoral-fin bases; no black spot on 1st dorsal
fin. Attains 131 mm SL.



Valencienna strigata, 135 mm TL (S Mozambique). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Kenya to South Africa (Aliwal Shoal), Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere in western Pacific to Tuamotu Is.

REMARKS Occurs over sand and coral rubble, in pairs, at 1–25 m (usually <6 m).

Valenciennea wardii (Playfair 1867)

Broad-barred glidergoby

PLATE 38

Eleotris wardii Playfair in Playfair & Günther 1867: 73, Pl. 9, Fig. 3 (Zanzibar, Tanzania).

Eleotriodes wardii: Smith 1958*; Dor 1970.

Valenciennea wardii: Dor 1984; Hoese & Larson 1994*; Randall & Van Egmond 1994; Anderson *et al.* 1998; Kuitert 1998*.

Second dorsal fin and anal fin 1 each with spine, 11 or 12 rays; pectoral fins 19–22 rays. LSS 70–88; TRB 19–25; pectoral-fin bases usually fully scaly. First dorsal fin rounded.

Head and body pale grey to pearly white, with 3 brown dark-margined bars on body and similar bar across distal half of caudal fin; oblique iridescent blue-white stripe on sides of head below eyes; large black spot on rear of 1st dorsal fin, and 2 black bars on lower part of 2nd dorsal fin (continuous with those on body). Attains 91 mm SL.



Valenciennea wardii, 70 mm SL (Seychelles). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (patchy). WIO: Red Sea, Tanzania (Zanzibar), Seychelles and Maldives; elsewhere, scattered localities from Andaman Is. to New Guinea.

REMARKS Rarely observed; found over open silty sand, to ~16 m deep.

GENUS *Vanderhorstia* Smith 1949

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11–16 rays; anal fin 1 spine, 11–17 rays; pectoral fins 17–20 rays; caudal fin longer than head and usually pointed. Body scales usually

cycloid; ctenoid scales (if present) restricted to rear half of body; predorsal area and sides of head naked; LSS 36–73; TRB 10–26. Lateral canal and pores on head, with rear portion of oculoscapular canal isolated over opercle. Sensory papillae in longitudinal pattern, usually with 2 papillae behind chin (but 1 species with short row). Gill opening wide, extends to below preopercle margin or to eye; gill membranes united across isthmus. Colour pattern can be complex and usually includes yellow and brown spots and often vertical yellow or blue bars. Most species may live commensally with alpheid shrimps at times. At least 27 species, 5 in WIO.

KEY TO SPECIES

- 1a Second dorsal fin 1 spine, 16 rays; anal fin 1 spine, 17 or 18 rays; head and body pale, with narrow dark vertical mark on sides below 1st dorsal fin; dense black line along edge of preorbital area, just above upper lip *V. mertensi*
- 1b Second dorsal fin and anal fin each with 1 spine, 12 or 13 rays; colour not as above 2
- 2a Opercle with dense black blotch, set within broad dusky blackish band from 1st dorsal-fin origin; body stout, snout rounded *V. opercularis*
- 2b Opercle with blue and yellow bars and spots, but no black blotch; body slender, snout pointed 3
- 3a Head and body white, with 8 or 9 black spots or blotches along upper half of body; LSS 71–85; 4 or 5 papillae behind chin *V. ambanoro*
- 3b Body without black spots and blotches along upper half, but with dusky spots, diffuse dusky pale-bordered blotches, or series of oblique pale-bordered dusky bars on sides crossing onto lower half of body; 2 papillae behind chin 4
- 4a Fifth dorsal-fin spine longest; 7 or 8 pale-bordered dark bars on body *V. delagoae*
- 4b Third dorsal-fin spine longest; body with pale-bordered, round to elongate spots on sides, and sometimes with oblique bars on anterior half of body *V. ornatissima*

Vanderhorstia ambanoro (Fourmanoir 1957)

Twin-spot shrimpgoby

PLATES 37 & 38

Cryptocentrus ambanoro Fourmanoir 1957: 245, Fig. 159 (Ambanoro Bay, Nosy Be, Madagascar).

Cryptocentrus fasciiventris Smith 1959: 194, Fig. 5a, Pl. 9f (Nosy Be, Madagascar).

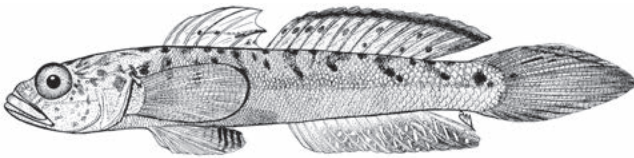
Vanderhorstia ambanoro: Randall & Goren 1993*; Winterbottom & Anderson 1997; Kuitert 1998*.

Vanderhorstia ambanora: Debelius 1998*.

Ctenogobiops feroculus: Field & Field 1998*.

Second dorsal fin and anal fin each with 1 spine, 13 rays; pectoral fins 17–19 rays; caudal fin rounded. LSS 71–85; TRB 22–26; scales cycloid except for few rows of ctenoid scales along caudal-fin base. Gill opening wide, extending forward of rear edge of preopercle.

Head and body whitish to pearly grey, with 2 or 3 rows of small dark brown spots along body, lowermost row (along midside) with largest spots; in some specimens, midside spots partly joined to dorsal spots by short, mostly oblique bars; small iridescent blue spots and streaks on head and dorsal half of body. Attains 81 mm SL.



Vanderhorstia ambanoro, 107 mm TL, male paratype of *Cryptocentrus fasciiventris* (Madagascar). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Arabian Sea, Kenya to Madagascar, Chagos and Maldives; elsewhere, Indonesia to Samoa.

REMARKS Occurs in coral-reef habitats, over sandy to muddy substrates, at 1–21 m; commensal with alpheid shrimps.

Vanderhorstia delagoae (Barnard 1937)

Candystick shrimpgoby PLATES 37 & 38

Gobius delagoae Barnard 1937: 62, Fig. 3 (Inhaca I., Maputo Bay, Mozambique); SFSA No. 930*; Smith 1961*.

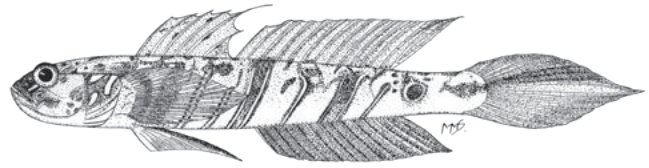
Vanderhorstia delagoae: Smith 1949, 1959*; Goren 1979*; Hoese & Winterbottom 1979; Dor 1984; SSF No. 240.106*; Goren & Dor 1994; Heemstra *et al.* 2004.

?*Amblyeleotris* (*Fereleotris*) *delicatulus* Smith 1958: 152, Fig. 9, Pl. 2a (Zanzibar, Tanzania); Smith & Smith 1963*.

Vanderhorstia ornatissima: Debelius 1998*.

Second dorsal fin and anal fin each with 1 spine, 13 or 14 rays; pectoral fins 18–20 rays; caudal fin long and pointed. LSS 44–60; TRB 14–18; scales all cycloid; nape scaly on sides above opercle, but midline naked. Gill opening to well under preopercle. Fifth spine of 1st dorsal fin longest.

Head and body greenish white, with 8 or 9 oblique blue-bordered pink to orange bars and ocellate spots posteriorly; sides of head with oblique orange and blue stripes and spots; caudal fin with similarly coloured streaks and rows of spots. Attains 60 mm SL.



Vanderhorstia delagoae, 70 mm TL, male holotype (S Mozambique). Source: SFSA

DISTRIBUTION WIO: Red Sea to Mozambique (Inhaca I.), Seychelles and Rodrigues.

REMARKS Commensal with alpheid shrimps, in sandy to silty lagoon habitats or seagrass beds, at 2–12 m.

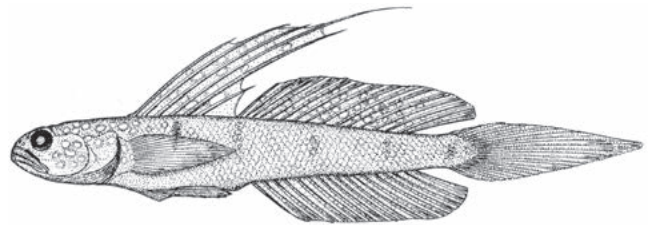
Vanderhorstia mertensi Klausowitz 1974

Mertens' shrimpgoby PLATES 37 & 38

Vanderhorstia mertensi Klausowitz 1974: 209, Figs. 5–7 (Gulf of Aqaba, Sinai, Egypt, Red Sea); Goren 1979*; Dor 1984; Goren & Dor 1994; Randall 1995*; Debelius 1998*.

Second dorsal fin 1 spine, 16 rays; anal fin 1 spine, 17 or 18 rays; pectoral fins 18 or 19 rays; caudal fin pointed. LSS 49–62; TRB 9–1; scales mostly cycloid, but ctenoid scales present posteriorly from gap between dorsal fins. Gill opening wide, extending to below eye. Spines of 1st dorsal fin filamentous.

Head and body pale greenish white, with ocellate orange spots anteriorly; vertical black bar on sides below 1st dorsal fin, and 4 round to vertically oval blackish spots along midside (sometimes indistinct); black line in groove just above upper lip. Attains 72 mm SL.



Vanderhorstia mertensi, 60 mm SL, female paratype (Red Sea). Source: Klausowitz 1974

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, and Lessepsian migrant to eastern Mediterranean Sea; elsewhere, Japan and Australia.

REMARKS Found on sand and silt substrates near coral reefs, at 4–5 m; commensal with alpheid shrimps.

Vanderhorstia opercularis Randall 2007

Blackgill shrimpgoby

PLATE 37

Vanderhorstia opercularis Randall 2007: 20, Figs. 1–3 (Eilat, Israel, Gulf of Aqaba, Red Sea).

Second dorsal fin and anal fin each with 1 spine, 12 rays; pectoral fins 18–20 rays; caudal fin pointed. LSS 40; TRB 19; predorsal scales small, embedded; sides of head naked; body scales cycloid anterior to 2nd dorsal-fin origin, and ctenoid posteriorly. Gill opening wide, reaching to below mideye. Third spine of 1st dorsal fin longest (filamentous in males).

Head and body whitish, covered with tiny yellow spots; 4 or 5 dusky brown blotches or diffuse and slightly oblique bars along midsides of body (more diffuse posteriorly), with bar at 1st dorsal-fin origin connecting with dense black blotch on opercle, and short iridescent blue bar anterior to this blotch; pectoral fins transparent, all other fins covered with small blue-margined yellow spots and short streaks. Attains 51 mm SL.

DISTRIBUTION Known only from two specimens collected from northern Red Sea.

REMARKS Taken from sandy patch of reef, at 27–40 m.

Vanderhorstia ornatissima Smith 1959

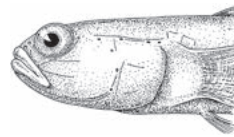
Blue-barred shrimpgoby

PLATES 38 & 39

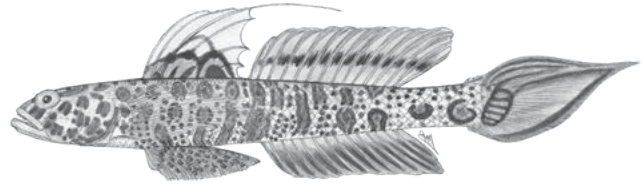
Vanderhorstia ornatissima Smith 1959: 192, Pl. 10c (Pinda, Mozambique); Smith & Smith 1963*; Winterbottom & Emery 1986*; Allen & Steene 1987*; Randall & Goren 1993*; Winterbottom & Anderson 1997; Kuitert 1998*; Terashima *et al.* 2001*; Heemstra *et al.* 2004; Fricke *et al.* 2009; Bogorodsky *et al.* 2011*.

Second dorsal fin and anal fin each with 1 spine, 13 or 14 rays; pectoral fins 17–19 rays; caudal fin pointed, long, asymmetric. LSS 52–65; TRB 14–16; scales cycloid. Gill opening wide, reaching anterior to preopercle margin. Third spine of 1st dorsal fin filamentous.

Head and body yellowish white to whitish, with complex and variable pattern of yellow (or red) and blue oblique to vertical stripes, spots and irregular ocelli, ~5 rows of similar oblique stripes and spots crossing sides of head. Attains 45 mm SL.



Vanderhorstia ornatissima, lateral head to show sensory papillae and pores (Seychelles). Source: Polunin & Lubbock 1977



Vanderhorstia ornatissima, 57 mm TL, holotype (Mozambique).

Source: Smith 1959

DISTRIBUTION WIO: Red Sea, Mozambique, Seychelles, Réunion (photographs only), Mauritius, Rodrigues, Chagos and Maldives.

REMARKS Occurs in protected coral-reef habitats, such as lagoons, over sand substrate or among seagrasses, at 1.5–7 m; commensal with alpheid shrimps.

GENUS *Yongeichthys* Whitley 1932

First dorsal fin 6 spines, 2nd and 3rd spines often elongate and filamentous; 2nd dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15–19. LSS 24–33; predorsal scales 10 or 11, but predorsal area usually naked; cheek and (usually) opercle naked. Snout oblique, not overhanging oblique mouth. Chin with distinctive fleshy pad, with one to several longitudinal rows of papillae. Gill membranes attached behind preopercle margin. Occur usually in shallow coastal waters or estuaries, with a few species entering freshwater. The genus is currently under revision and most species belong elsewhere. About 9 species at present, 4 in WIO.

KEY TO SPECIES

- 1a Predorsal scales 9–12, extending forward in dorsal midline to above preopercle *Y. audax*
- 1b Predorsal area naked, or else only 1 or 2 scales over opercle and predorsal midline naked 2
- 2a Head and body pale, with 3 large rounded brown blotches along midsides of body, last blotch on caudal-fin base; 7–9 rows of sensory papillae on cheek, and papillae rows may be multiple *Y. nebulosus*

Continued...

KEY TO SPECIES

- 2b If brown blotches on body, then 5 narrowly rectangular blotches along midsides; sensory papillae on cheek in 4 or 5 rows 3
- 3a First dorsal fin with 1 or 2 dusky bands, and no distinct blackish spot posteriorly; thin red-brown lines above and below midlateral blotches on body *Y. suluensis*
- 3b First dorsal fin with distinct black or blue-black spot posteriorly; no thin lines on either side of midlateral blotches on body *Y. signatus*

Yongeichthys audax (Smith 1959)

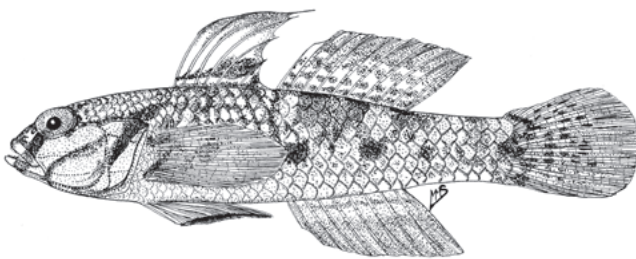
Mangrove goby

PLATE 39

Acentrogobius audax Smith 1959: 201, Fig. 17 (Ibo I., Mozambique); SSF No. 240.1*.

Second dorsal fin and anal fin each with 1 spine, 9 rays; pectoral fins 16 or 17 rays. LSS 24 or 25; TRB 9 or 10; predorsal scales 10 or 11, extending to above rear edge of preopercle; cheek and opercle naked.

Distinct broad brown to blackish bar from eyes to lips (may be indistinct on lips) and continuing onto chin; row of round blue spots on cheek below eye, and similar spots scattered on opercle; oblique brown band across opercle, extending from mottled dark saddle on nape, and blue line along rear edge of opercle, partly overlying dark band; 5 rectangular brown blotches along midsides of body, and 1 or 2 irregular rows of blue spots along midline. Attains 61 mm SL.



Yongeichthys audax, 55 mm TL, holotype (N Mozambique).
Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: South Africa (KwaZulu-Natal), Mozambique, Madagascar and Seychelles; elsewhere to Indonesia and Japan.

REMARKS Possibly a junior synonym of *Y. viganensis*.

Yongeichthys nebulosus (Forsskål 1775)

Shadow goby

PLATE 39

Gobius nebulosus Forsskål in Niebuhr 1775: 24 (Jeddah, Saudi Arabia, Red Sea); SFSA No. 917*; Smith 1961*.

Gobius auchenotaenia Bleeker 1867: 415 (Madagascar); Sauvage 1891*.

Gobius caninus var. *africana* Playfair 1867: 71, Pl. 9, Fig. 1 (Zanzibar, Tanzania).

Gobius caninus: Playfair 1867*.

Gobius leucomelas Peters 1868: 147 (Red Sea); Smith 1959.

Gobius brevifilis: Sauvage 1891*.

Gobius criniger: Regan 1902; Barnard 1927.

Ctenogobius criniger: Koumans 1953.

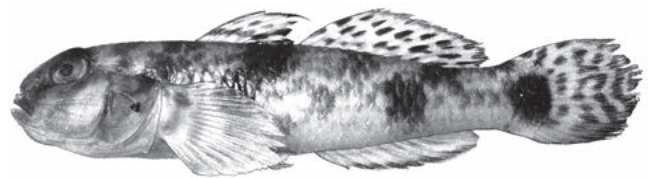
Ctenogobius nebulosus: Morrow 1954; Smith 1959*; Smith & Smith 1963*.

Acentrogobius caninus: Smith 1959; Smith & Smith 1963; Mauge 1986; Stiassny & Raminosoa 1994.

Yongeichthys nebulosus: Hoese & Winterbottom 1979; Hoda 1980*; Dor 1984; Mauge 1986; SSF No. 240.107*; Stiassny & Raminosoa 1994; Randall 1995*.

Second dorsal fin 1 spine, 8–10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 18 or 19 rays; caudal fin rounded. LSS 26–33; TRB 10–12; predorsal area, cheek and opercle naked. Longitudinal papillae on cheek in 7–9 rows, and papillae rows may be multiple. Spines 2–3 of 1st dorsal fin may be filamentous in adults.

Head and body whitish to pale brownish grey, with yellowish brown to brownish fine speckling and indistinct mottled lines along back and sides; most distinctive markings are 3 large brown rounded blotches along midsides of body, with last blotch on caudal-fin base; 2 broad diffuse brownish bars from edge of eye across jaw and cheek; dorsal-fin spines blackish. Attains 123 mm SL.



Yongeichthys nebulosus, 130 mm TL (WIO). Source: Smith 1959

DISTRIBUTION Indo-Pacific (widespread). WIO: Gulf of Oman, Pakistan to India, Red Sea, East Africa to South Africa, Tanzania (Zanzibar), Madagascar, Seychelles and Maldives; elsewhere, Indonesia to Society Is.

REMARKS Found over mud, silt, sand and rock bottoms, in mangroves, estuaries and shallow marine reefs, at 1–30 m. Contains tetrodotoxin, especially concentrated in the skin.

Yongeichthys signatus (Peters 1855)

Tusk goby

PLATES 5 & 39

Gobius signatus Peters 1855: 444 (Mozambique); Sauvage 1891*;
Smith 1949.

Ctenogobius pavidus Smith 1959: 196, Figs. 9–10 (Palma, Mozambique);
Harmelin-Vivien 1976.

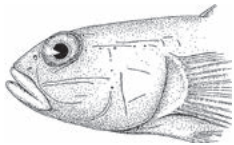
Yongeichthys pavidus: Polunin & Lubbock 1977; Goren 1979*; Dor 1984.

Acentrogobius signatus: Smith 1959; Hoese & Winterbottom 1979.

Amoya signatus: SSF No. 240.6*; Fricke 1999; Fricke *et al.* 2009 [as *signata*].

Second dorsal fin and anal fin each with 1 spine, 10 rays;
pectoral fins 15 or 16 rays. LSS 26–30; TRB 7–9; head mostly
naked, few scales reach above opercle.

Head and body pale greenish with irregular dark markings,
and pale bluish spots on sides of head; large blackish blue
ocellus between 5th and 6th dorsal-fin spines. Attains
46 mm TL.



Yongeichthys signatus, lateral head to show
sensory papillae and pores (Seychelles).

Source: Polunin & Lubbock 1977

DISTRIBUTION WIO: Red Sea, Tanzania (Zanzibar), East
Africa to Mozambique, Madagascar, Seychelles and Réunion.

REMARKS In the Seychelles known to live in association
with an alpheid shrimp, on sandy seagrass beds in shallow
water, to ~2 m deep.

Yongeichthys suluensis (Herre 1927)

Sulu goby

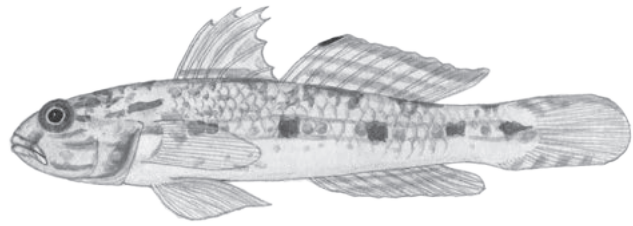
PLATE 39

Rhinogobius suluensis Herre 1927: 193, Pl. 14, Fig. 3
(Bungau, Sulu Province, Philippines).

Acentrogobius suluensis: Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 9 rays;
pectoral fins 15–17 rays. LSS 27–29; TRB 8; predorsal area,
cheek and opercle naked. Spines 1–3 of 1st dorsal fin usually
with free tips, and 2nd spine filamentous and reaching at least
to middle of 2nd dorsal fin.

Body pale grey; brown bar from below eyes to lips (may
be indistinct on lips) and continuing as blackish onto chin;
oblique brown band across opercle; predorsal region with
many dark spots and blotches; 5 rectangular dark blotches
along midsides of body, contained within 2 brown stripes;
2nd spine of dorsal fin with black tip (most conspicuous
in life). Attains 36 mm SL.



Yongeichthys suluensis, 36 mm SL (W Pacific).

DISTRIBUTION Indo-Pacific. WIO: Rodrigues; elsewhere,
Indonesia to Society Is.

REMARKS Inhabits shallow estuarine and soft-substrate
habitats.

SUBFAMILY GOBIONELLINAE

Estuarine gobies

Body slender to stocky; scales present. First dorsal fin 6 spines;
2nd dorsal fin usually 1 spine, 6–13 rays; anal fin usually
1 spine, 5–13 rays; pectoral fins 12–28 rays; pelvic fins 1 spine,
5 rays, with 5th rays joined by membrane and forming a disc,
and pelvic frenum present; caudal fin 16 or 17 segmented rays.
Head may be scaly, scales cycloid or ctenoid; head usually with
sensory canals and pores as well as cutaneous papillae; 1 pair
anterior interorbital pores. Teeth usually small, sharp, arranged
in 1 to several rows in jaws. Worldwide; generally occur in
freshwater or estuarine habitats, but the widespread genus
Oxyurichthys is marine to estuarine, and the genus *Gnatholepis*
comprises coral-reef species. At least 70 genera and over 440
species; 10 genera and 31 species in WIO.

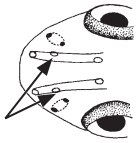
KEY TO GENERA

- | | | |
|----|--|---------------------|
| 1a | No head pores | 2 |
| 1b | Head pores present (sometimes preopercular pores only) | 4 |
| 2a | All elements of 2nd dorsal fin and anal fin segmented;
tiny, attains maximum ~15 mm SL [estuaries; mangroves] | <i>Pandaka</i> |
| 2b | First elements of 2nd dorsal fin and anal fin always
unsegmented; adults attain >15 mm SL | 3 |
| 3a | Papillae in interorbital space small, numerous and close-set,
forming long curved row above each eye; mouth of males
enlarged [estuaries; mangroves] | <i>Mugilogobius</i> |

Continued ...

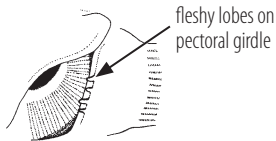
KEY TO GENERA

- 3b Papillae in interorbital space few, widely spaced, in loose row around each eye; mouth of males may be somewhat enlarged [mangroves] *Eugnathogobius*
- 4a Snout with 1 pair of pores or no pores 5
- 4b Snout with 2 pairs of pores 6



- 5a No pores over opercle; head compressed; mouth small and terminal in females, large and subterminal in males; 2nd dorsal fin usually with 1 more ray than rays in anal fin *Redigobius*
- 5b Two or 3 pores over opercle; head somewhat depressed; mouth terminal, similarly sized in males and females; 2nd dorsal fin and anal fin with same number of rays *Rhinogobius* [introduced to Persian/Arabian Gulf in WIO]

- 6a Pectoral girdle (anterior edge of cleithrum) under gill cover with 1–5 distinct fleshy lobes (finger-like flaps) 7



- 6b Pectoral girdle (anterior edge of cleithrum) under gill cover smooth, without fleshy lobes 8
- 7a Head broader than deep; mouth inferior, lips fleshy; predorsal scales 16–42; gill rakers with small papillae along axis of each filament; body with rows of blotches and spots [freshwater to estuaries] *Awaous*
- 7b Head compressed, narrower than deep; mouth terminal, lips not particularly fleshy; predorsal scales 0–23; no small papillae along gill-raker filaments; body with variably developed transverse bands [freshwater to estuaries] *Stenogobius*

- 8a Cheek with large scales, and anterior interorbital pore paired; mouth horizontal and inferior, and teeth at sides of upper jaw directed medially [coral reefs] *Gnatholepis*

- 8b Cheek naked; teeth at sides of jaws vertical or directed backward 9

- 9a Median membranous crest or ridge present on nape; teeth in upper jaw usually in 1 row, sometimes a few teeth also in inner row anteriorly; tongue rounded [estuaries; coral reefs and offshore] *Oxyurichthys*

- 9b No crest or ridge on nape; teeth in upper jaw typically in 2 or 3 rows; tongue truncate [estuaries] *Oligolepis*

GENUS *Awaous* Valenciennes 1837

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 9–11 rays; pectoral fins 14–17 rays; pelvic fins fused, and pelvic frenum thick and fleshy; caudal fin 17 segments rays. Pectoral girdle (anterior edge of cleithrum) usually with 3 lobes or short fleshy knobs. LSS 52–86; predorsal area, sides of head, breast and pectoral-fin bases variably covered with ctenoid or cycloid scales. Lateral canal system on head mostly complete; sensory papillae in transverse pattern. Snout long; upper lip thickened and extending over lower jaw. Gill opening restricted to just under opercle; diagnostic small fleshy papillae on gill filaments of outer arch. Circumtropical, inhabiting freshwater streams as adults but with a marine larval stage. About 18 nominal species, possibly 4 in WIO (the names used here are provisional).

KEY TO SPECIES

- 1a Cheek scaly, but opercle may be naked *A. madagascariensis*
- 1b Cheek and opercle both naked 2
- 2a If breast and pectoral-fin bases both naked, then most predorsal scales ctenoid; 1st dorsal fin with ocellate black spot or series of dark spots and blotches 3
- 2b Breast naked, and pectoral-fin bases naked or with 1–3 scales in adults, and all predorsal scales cycloid; 1st dorsal fin with small brown spots and no distinct black spot in young or adults *A. jayakari*
- 3a Pectoral fins 16 or (usually) 17 rays; predorsal scales cycloid, but may be ctenoid at sides; pectoral-fin bases usually fully scaly; 1st dorsal fin with marbling of small black spots and blotches, especially pronounced posteriorly, but no distinct white-edged black spot *A. aeneofuscus*
- 3b Pectoral fins 15 or 16 rays; predorsal scales all ctenoid; pectoral-fin bases naked or with only small patch of scales; 1st dorsal fin with single large ocellate black spot posteriorly (most prominent in young and small females, becoming indistinct in adults) *A. commersoni*

Awaous aeneofuscus (Peters 1852)

Freshwater goby

PLATES 40 & 42

Gobius aeneofuscus Peters 1852: 681 (Sena, Zambezi River, Mozambique); SFSA No. 925*; Smith 1961*.

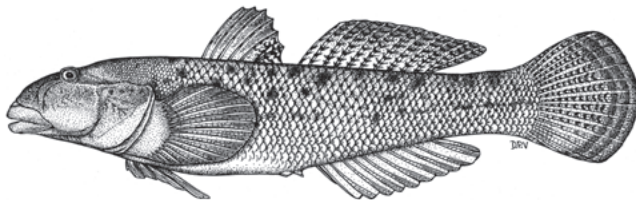
Gobius macrorhynchus Bleeker 1867: 403 (Samberano River, Madagascar); Sauvage 1891.

Gobius hypselosoma Bleeker 1867: 407 (Samberano River, Madagascar); Sauvage 1891*; Maugé 1986; Stiassny & Raminosoa 1994.

Gobius melanopterus Bleeker 1867: 409 (Samberano River, Madagascar).
Gobius isognathus Bleeker 1867: 411 (Samberano River, Madagascar);
 Sauvage 1891*; Smith 1959.
 ?*Gobius vergeri* Bleeker 1867: 418 (Samberano River, Madagascar);
 Bleeker 1875*; Smith 1959.
Gobius banana: Sauvage 1891*.
Gobius ocellaris: Sauvage 1891*; Boulenger 1916; Teugels *et al.* 1985.
 ?*Awaous ocellaris*: Pellegrin 1932.
 ?*Gobius (Awaous) louveli* Petit 1936: 388, Figs. 1–2
 (Kamoro River, Madagascar).
Chonophorus melanocephalus: Smith 1959*.
 ?*Gobius louvali*: Smith 1959.
Platygobius aeneofuscus: Smith 1959*; Hoese & Winterbottom 1979;
 Teugels *et al.* 1985*.
Chonophorus aeneofuscus: Maugé 1986; Stiassny & Raminosoa 1994.
Chonophorus macrorhynchus: Maugé 1986; Stiassny & Raminosoa 1994.
Awaous aeneofuscus: SSF No. 240.9*; Skelton 1993*; Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 16 or 17 rays. LSS 56–62; TRB 15–20; predorsal scales 26–40, cycloid, but rarely with ctenoid scales on sides; pectoral-fin bases usually fully scaly; breast scaly, but anterior third may be naked. Breeding males often with larger and longer mouth, and consequently bigger head (smallest large-mouthed male observed: 106 mm SL), giving fish distinctive appearance.

Head and body yellowish brown, with ~8 elongate dark blotches along midsides of body, tending to become oblique anteriorly; upper half of body with irregular spots and blotches, sometimes coalescing with midlateral blotches; 1st dorsal fin spotted and marbled with red to orange, brown, white and black markings, especially pronounced posteriorly (but no single enlarged black spot present); juveniles also with red and bright orange markings and 5–8 narrow oblique to vertical dark bars on sides. Attains 21.5 cm SL.



Awaous aeneofuscus, 16 cm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: Kenya (Sabaki River), Mozambique, South Africa (Swartkops River), Madagascar, Comoros and Rodrigues.

REMARKS Inhabits freshwater streams and brackish rivers.

Awaous commersoni (Schneider 1801)

Mascarene freshwater goby

PLATE 40

Gobius niger Lacepède (ex Commerson) 1800: 537, 568
 [Mauritius, Mascarenes] [objectively invalid: preoccupied by
Gobius niger Linnaeus 1758].
Gobius commersoni Schneider in Bloch & Schneider 1801: 548
 (at river mouths [in Mascarenes]).
Gobius nigripinnis Valenciennes in Cuv. & Val. 1837: 101
 (Réunion, Mascarenes).
Gobius pallidus Valenciennes in Cuv. & Val. 1837: 102
 (Mauritius, Mascarenes).
Gobius commersonii Valenciennes in Cuv. & Val. 1837: 136
 (Mauritius, Mascarenes).
Gobius grammepomus: Peters 1876 (Mauritius, Mascarenes).
Chonophorus stamineus: Smith 1959.
Chonophorus melanocephalus: Maugé 1986.
Chonophorus pallidus: Maugé 1986; Fricke 1999.
Awaous commersoni: Fricke 1999.
Awaous nigripinnis: Keith *et al.* 1999.*

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 15 or 16 rays. LSS 50–54; TRB 14–20; predorsal scales 17–29, ctenoid, and reaching to just behind rear edge of preopercle; pectoral-fin bases naked or with small patch of scales; breast partly scaly before pelvic fins (scales may be in small embedded patch).

Head and body yellowish, becoming darker with age; 8 or 9 dark blotches along midsides of body; upper half of body with indistinct short bars, saddles and spots; 1st dorsal fin dusky to marbled with brown and white, with 1 large ocellate black spot posteriorly (most prominent in young and small specimens, indistinct in adults >85 mm SL). Attains 130 mm SL.

DISTRIBUTION WIO: Réunion and Mauritius.

REMARKS Found in freshwater streams and brackish rivers.

Awaous jayakari (Boulenger 1888)

Arabian freshwater goby

PLATE 40

Gobius jayakari Boulenger 1888: 663, Pl. 54, Fig. 2 (freshwater near Muscat, Oman); Smith 1959.
Gobius percivali Boulenger 1901: 152, Fig. 9 (freshwater near Lahej, southern Yemen).

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 16 or 17 rays. LSS 55–63; TRB 18–20; predorsal scales cycloid, 21–24, reaching forward over opercle but not to rear edge of preopercle; breast naked; pectoral-fin bases naked or with 1–3 scales on upper part of base in adults.

Preserved specimens with yellowish brown head and body; upper half of body with scattered pale brown mottling and spotting, and 4–6 short vertical brown bars along middles, becoming darker posteriorly; 1st dorsal fin translucent with scattered small brown spots, which may be arranged in irregular rows, becoming darker posteriorly (but no single dark spot posteriorly); caudal-fin base with brown triangular to rounded spot, and fin crossed by 5–7 vertical to slightly oblique wavy brown lines. Attains 135 mm SL.

DISTRIBUTION WIO: Iran, Yemen and Oman; possibly also from a *wadi* in United Arab Emirates (Hatta, Hajar Mountains).

REMARKS Occurs in freshwater streams and ephemeral riverbeds (*wadis*).

Awaous madagascariensis (Bleeker 1867)

Madagascar freshwater goby

Gobius madagascariensis Bleeker 1867: 405 (Samberano River, Madagascar); Bleeker 1875*; Sauvage 1891*; Boulenger 1916; Pellegrin 1933*; Arnould 1959*; Smith 1959.

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 17 rays. LSS 60; TRB 19; predorsal scales 28, cycloid, and reaching to close behind eyes; cheek below eye with cycloid scales; opercle apparently naked.

Body olive-brown above, greenish white below; fins purplish brown, with orange rays in dorsal, caudal and pectoral fins. Attains at least 160 mm SL.

DISTRIBUTION Known only from the holotype collected from Madagascar.

REMARKS Additional specimens are needed to confirm whether this designation is based on an aberrant specimen of *Awaous aeneofuscus*.

GENUS *Eugnathogobius* Smith 1931

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6–9 rays; anal fin 1 spine, 5–8 rays; pectoral fins 14–18 rays; caudal fin 16 rays. Pectoral girdle (anterior edge of cleithrum) smooth or with bony or fleshy flange (but usually no fleshy lobes). LSS 27–63; TRB 8–22; predorsal scales 2–25, or predorsal area naked. Snout short, flat, profile slightly pointed; mouth terminal, tip of lower jaw usually anteriormost. Sensory

papillae in longitudinal pattern; several rows of papillae composed of few large widely spaced papillae, and other papillae small and close-set; uppermost row of cheek papillae broken under eye, rear portion consisting of just 1 papilla; head pores reduced if present. Nine species, 1 in WIO.

Eugnathogobius indicus Larson 2009

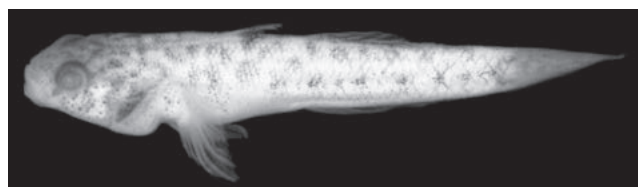
Mangrove mud goby

Calamiana sp. n.: Heemstra *et al.* 2004.

Eugnathogobius indicus Larson 2009: 133, Figs. 3–4 (Bazaruto I., off Inhossoro, Mozambique).

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 15 or 16 rays. LSS 32–36; TRB 10–13; predorsal scales 14–20, extending forward at least to rear of preopercle; scales on sides of body ctenoid; scales on breast cycloid; a few scales on pectoral-fin bases and opercle. Pectoral girdle (anterior edge of cleithrum) with bony flange that may bear 2 flat fleshy lobes or bumps. No head pores. Slender-bodied.

Preserved specimens pale with narrow, dusky scale margins; indistinct line of small elongate dark spots along middles, and dusky narrow saddles or bars across dorsum. Attains at least 33 mm SL.



Eugnathogobius indicus, 14 mm SL, male paratype (Aldabra).

© R Williams, MAGNT

DISTRIBUTION WIO: Kenya, Mozambique and Seychelles (Aldabra).

REMARKS Known only from a few specimens collected from mangroves, as well as a freshwater well on Aldabra.

GENUS *Gnatholepis* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 11 or 12 rays; pectoral fins 14–19 rays; pelvic fins fused, and pelvic frenum with fine fringe; caudal fin 17 segmented rays. LSS 28–31; TRB 9 or 9½; sides of head covered with scales in most species. Body and head compressed; snout

short and steep. Mouth rather small, horizontal, subterminal to inferior, with the rounded snout often partly overhanging tips of jaws; lower lip with distinctive thin fold or ventroposteriorly directed flap in most species; teeth at sides of upper jaw directed medially. Eyes set high on head, partly protruding above dorsal profile. Sensory papillae on head in transverse pattern; anterior interorbital pore paired. Characteristic colour pattern includes thin black vertical line from eye to across cheek, a dark or pale spot above pectoral-fin bases, and rows of spots and/or fine lines on sides on body. Ten species, 3 in WIO, found on sand or silty sand, always near corals.

KEY TO SPECIES

- 1a Predorsal scales mostly ctenoid, but often cycloid toward midline and anteriorly; pectoral fins covered with many rows of fine dark and white spots; transverse black line on upper part of eyes, rarely extending across interorbital space *G. anjerensis*
- 1b Predorsal scales all cycloid or predorsal midline naked, some ctenoid scales may be present above opercle; pectoral fins may have dusky lines at their base, but not covered with fine dark spots; transverse black line on upper part of eyes may extend towards interorbital space 2
- 2a Distinctive vertically oval blackish to dark grey blotch across caudal-fin base; oblique, black, curved or comma-shaped line across eyes; body whitish with finely speckled dorsum, and 2 broad ladder-like orange to reddish stripes along lower midside in life; predorsal scales usually 8 (7–9) *G. caudimaculata*
- 2b No distinctive oval blackish to dark grey blotch across caudal-fin base; black line on top of eye relatively horizontal, not curved or comma-shaped, and may join its counterpart across interorbital space; body colour variable in life, but not as above; predorsal scales usually 9 or 10 (7–12) *G. cauerensis*

Gnatholepis anjerensis (Bleeker 1851)

Weeper

PLATE 40

Gobius anjerensis Bleeker 1851: 251, Pl. 1, Fig. 11 (Boenakeng I., Sulawesi, Indonesia).

?*Gobius capistratus* Peters 1855: 443 (Ibo I., Mozambique).

Gobius ophthalmotaenia: Jatzow & Lenz 1898.

Acentrogobius cauerensis: Smith 1959* [in part]; Smith & Smith 1963* [in part].

Gnatholepis anjerensis: Randall 1983*; Randall & Goren 1993*; Winterbottom & Anderson 1997; Debelius 1998*; Randall & Greenfield 2001*.

Gnatholepis cauerensis: Winterbottom & Emery 1986*.

Gnatholepis sp. 1: SSF No. 240.45*.

?*Acentrogobius cauerensis*: Cornic 1987*.

Cryptocentrus sp.: Field & Field 1998*.

Gnatholepis cf. *adjerensis*: Kuitert 1998*.

Second dorsal fin and anal fin each with 1 spine, 11 rays; pectoral fins 14–17 rays. LSS 25–30; TRB 10 or 11; predorsal scales 9–11, scales ctenoid at sides, and usually cycloid only on nape midline; cheek scales often extending forward of eye and in front of blackish cheek bar.

Head and body yellowish to greyish, with brown spots and blotches; diffuse dusky blotch or bar sometimes above pectoral-fin bases (small round dark-gold spot in life); blackish line from eyes to just beyond jaw, usually with 1 or 2 short branches and often surrounded by diffuse dusky region; 1st dorsal-fin spine with 3 blackish spots. Attains 84 mm SL (usually smaller).

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea (including Gulf of Aqaba), Kenya to South Africa (Transkei region), Tanzania (Zanzibar), Madagascar, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, Tuamotu Is. and Hawaii.

REMARKS Usually found in small groups, on sand near corals, at 3–46 m (often <2 m).

Gnatholepis caudimaculata Larson & Buckle 2012

Red Sea weeper

PLATE 40

Gnatholepis anjerensis: Randall 1995*; Debelius 1998*.

Gnatholepis caudimaculata Larson & Buckle 2012: 23, Figs. 9–11 (reef at Marsa el Muqabila, Egypt, Gulf of Aqaba, Red Sea).

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 10–12 rays; pectoral fins 15–17 rays. LSS 25–28; predorsal scales 7–10; cycloid scales on head and pectoral-fin bases; predorsal midline usually naked.

Body whitish, with finely speckled dorsum; oblique black comma-shaped mark across eyes; 2 broad ladder-like orange to reddish stripes along lower midside; characteristic vertical oval blackish to dark grey blotch across caudal-fin base. Attains 43 mm SL.

DISTRIBUTION WIO: Persian/Arabian Gulf (Saudi Arabia), Oman and Red Sea (Ethiopia and Gulf of Aqaba).

REMARKS Found on white to blackish sand near corals, to ~17 m deep.

Gnatholepis cauerensis (Bleeker 1853)

Slender weeper

PLATE 40

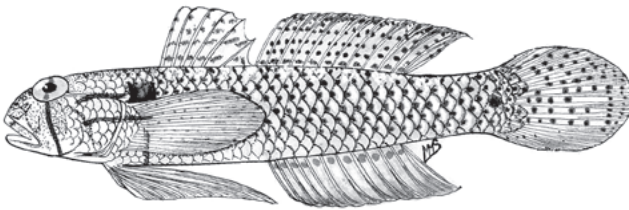
Gobius cauerensis Bleeker 1853: 269 (Cauer, Sumatra, Indonesia).

?*Gobius capistratus*: Smith 1949*.

Acentrogobius cauerensis: Koumans 1953.
Acentrogobius kauerensis: Steinitz & Ben-Tuvia 1955.
Acentrogobius cauerensis: Smith 1959* [in part]; Smith & Smith 1963* [in part]; Goren 1979.
Gnatholepis cauerensis: Hoese & Winterbottom 1979; Kuronuma & Abe 1986; Maugé 1986; Winterbottom & Emery 1986*; Kuitert 1998*; Heemstra *et al.* 2004.
Gnatholepis sp. 2: SSF No. 240.46*.
Gnatholepis anjerensis: Debelius 1993*; Field & Field 1998*.
Gnatholepis scapulostigma: Randall & Goren 1993*; Eichler & Lieske 1994*.
Gnatholepis cauerensis cauerensis: Randall & Greenfield 2001*.

Second dorsal fin and anal fin each with 1 spine, 11 rays; pectoral fins 16–18 rays. LSS 25 or 26; TRB 10 or 11; predorsal scales 10–13.

Head and body usually whitish, with 5 or 6 rows of red to brown spots on sides, and dusky to blackish ocellate spot or U-shaped blotch above pectoral-fin bases (spot has bright yellow to yellowish white centre in life); distinct dark brown to gold-brown unbranched line from eye to just beyond jaw. Attains 41 mm SL.



Gnatholepis cauerensis, 50 mm TL (N Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Tanzania to South Africa (Transkei region), Comoros, Seychelles, Réunion, Rodrigues, Chagos and Maldives; elsewhere to Society Is.

REMARKS Found on sand and rubble patches among corals, at 7–46 m.

GENUS *Mugilogobius* Smitt 1900

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6–10 rays; anal fin 1 spine, 6–12 rays; pectoral fins 12–20 rays; caudal fin 16 segmented rays. Pectoral girdle (anterior edge of cleithrum) usually with several small fleshy knobs or lobes or at least a fleshy ridge. LSS 24–65; TRB 6–22; predorsal scales 0–36, all evenly sized and relatively small, or anteriormost nape scale enlarged and placed close behind eyes. No head pores; sensory papillae on head in longitudinal pattern, with rows composed of small and evenly sized papillae. Snout usually broad, rounded and overhanging tips of jaws. Mouth subterminal

to terminal; jaws often enlarged in mature males, sometimes considerably so. Anterior nostrils tube-like, oriented downward and forward over upper lip, and preorbital area usually curving outward slightly around base of nostril. Gill opening restricted to pectoral-fin base or just under opercle. Twenty-six species currently known, 2 in WIO.

KEY TO SPECIES

- 1a Ctenoid scales on body extend to above pectoral-fin bases or further, and predorsal and opercular scales usually ctenoid; LSS 28–32; predorsal scales 9–11; body dark brown with diffuse reticulate pattern, and indistinct pair of spots at caudal-fin base *M. fuscus*
- 1b Ctenoid scales on body extend to behind pectoral fins; predorsal and opercular scales cycloid; LSS 26–37; predorsal scales 9–19; body with distinctive alternating pale and dark blotches (chequered or banded pattern), plus indistinct bars underlying this, and 2 or 3 indistinct spots or marks at caudal-fin base *M. mertoni*

Mugilogobius fuscus (Herre 1940)

Dusky mangrove goby

PLATE 40

?*Gobius samberanoensis* Bleeker 1867: 417 (Samberano River, Madagascar); Bleeker 1875*.

?*Gobius sambiranoensis*: Sauvage 1891.

Vaimosa fusca Herre 1940: 359, Pl. 3 (tidepool at Dumaguete, Oriental Negros, Philippines).

Mugilogobius fuscus: Larson 2001*.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 6–8 rays; pectoral fins 14–16 rays. LSS 28–32; TRB 9–11; predorsal scales 9–11, and reaching to behind eyes, anteriormost scale enlarged; scales on body ctenoid, extending forward at least to above opercle and often onto predorsal area, and opercle usually with ctenoid scales. First dorsal fin low, without filamentous spines, but spines 2–4 may be longest.

Preserved specimens with dark brown reticulate pattern on body and diffuse cross-hatched barring or reticulations along midsides (more distinct posteriorly); pair of brown spots at caudal-fin base. Attains 47 mm SL.

DISTRIBUTION WIO: Seychelles; elsewhere only from Sri Lanka, Philippines, New Guinea and Japan.

REMARKS The types of Bleeker's species are apparently lost, and his description and subsequent figure could refer to either *M. fuscus* or *M. mertoni*. Occurs in mangrove creeks and muddy river estuaries.

Mugilogobius mertoni (Weber 1911)

Chequered mangrove goby

PLATE 41

?*Gobius samberanoensis* Bleeker 1867: 417 (Samberano River, Madagascar); Bleeker 1875*.

?*Gobius sambiranoensis*: Sauvage 1891*.

Gobius mertoni Weber 1911: 37, Figs. 5–6 (Aru Is., Moluccas, Indonesia) [in part].

Gobius durbanensis Barnard 1927: 70 (Durban Bay, KwaZulu-Natal, South Africa); Barnard 1927; SFSA No. 915*; Smith 1961*.

Stigmatogobius inhacae Smith 1959: 198, Pl. 9, Fig. G (Inhaca I., Mozambique); Smith & Smith 1963.

Stigmatogobius durbanensis: Smith 1960.

Mugilogobius durbanensis: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.62*.

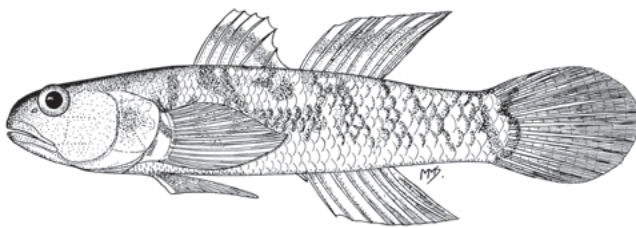
Mugilogobius inhacae: Hoese & Winterbottom 1979; SSF No. 240.63*.

Mugilogobius valigouva: Hoda 1980*.

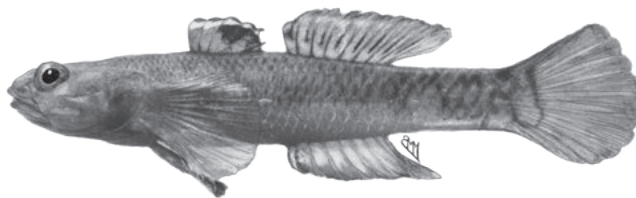
Mugilogobius mertoni: Larson 2001*; Heemstra *et al.* 2004.

Second dorsal fin and anal fin each with 1 spine, 6–8 rays; pectoral fins 14–17 rays. LSS 26–37; TRB 8–13; predorsal scales 9–19, mostly small, and anteriormost middle scale immediately behind eyes always largest; body scales mostly ctenoid, but nape scales cycloid. Third spine of 1st dorsal fin usually longest (first spine may be longest and somewhat filamentous).

Body grey to violet-grey, with 7–11 narrow, diagonal, darker grey bars, chevrons or X-shaped markings along sides, and greyish yellow interspaces between chevrons or bars, forming chequered or banded pattern; 2 or 3 dark grey to brownish grey spots or short diagonal bars at caudal-fin base. Attains 49 mm SL.



Mugilogobius mertoni, 35 mm TL (South Africa). Source: SSF



Mugilogobius mertoni, 35 mm TL, holotype of *Stigmatogobius inhacae* (South Africa). Source: Smith 1959

DISTRIBUTION WIO: Pakistan, Gulf of Aden (Djibouti), Somalia to South Africa (Transkei region), Madagascar, Seychelles and Rodrigues; elsewhere, many localities in western Pacific to New Caledonia.

REMARKS This species is actually a species-complex. Occurs in shallow water in mangroves and estuaries, and in small coastal freshwater streams.

GENUS *Oligolepis* Bleeker 1874

First dorsal fin 6 spines (elongate in males); 2nd dorsal fin 1 spine, 10 rays; anal fin 1 spine, 11 rays; pectoral fins 19–28 rays; caudal fin 17 segmented rays. LSS 24–28. Oculoscaphular lateral canal disjunct; preopercle with only 2 pores. Sensory papillae in transverse pattern, rows on cheek variably reduced, and rows below eyes may be lacking. Distinguished by single fleshy lobe on upper portion of 1st gill arch. Colour includes characteristic, variously developed, black or blackish teardrop-shaped mark or vertical bar crossing cheek below eye. The generic and specific names of these gobies are confused and a revision is underway. Four species presently recognised in Indo-Pacific, with probably several more undescribed; at least 2 species in WIO, 1 of these undescribed.

KEY TO SPECIES

- 1a Small dense black spots on head and around jaws (more distinct in males), and some spots on jaw membranes; spines of 1st dorsal fin may be greatly elongate in males, and third spine often longest *O. acutipennis*
- 1b No small black spots on head or jaw membranes; fourth spine of 1st dorsal fin often longest *Oligolepis* sp.

Oligolepis acutipennis (Valenciennes 1837)

Black-spotted teardrop goby

PLATE 42

Gobius acutipennis Valenciennes *in* Cuv. & Val. 1837: 80 (Malabar, India); SFSA No. 923 [in part].

Oligolepis acutipennis: ?Koumans *in* Blegvad & Løppenthin 1944; Hoese & Winterbottom 1979 [in part]; Kuronuma & Abe 1986; Maugé 1986; SSF No. 240.65* [in part].

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 11 rays; pectoral fins 20 or 21 rays. LSS 24–27; TRB 7–9; nape and sides of head naked. Spines of 1st dorsal fin greatly elongate in males, reaching past 2nd dorsal-fin insertion.

Head and body pearly white to pale grey, with row of black blotches along sides and red-brown bars and blotches on nape and upper part of body; head with dense black, white-rimmed spots; black bar from eye to behind jaws. Preserved specimens with brownish head and body; head, anterodorsal part of body and jaw membranes with small scattered dense black spots; diffuse irregular blackish stripe from eye meets upper jaw (sometimes forks to join with end of jaw); first spines of both dorsal fins banded with black and white, all other fins with rows of diffuse blackish spots and elongate streaks. Attains 95 mm SL.

DISTRIBUTION Indo-Pacific (range uncertain due to taxonomic confusion). WIO: probably Persian/Arabian Gulf to west coast of India; elsewhere in western Pacific to New Guinea.

REMARKS Records of this species in southern Africa are confused with those for '*Oligolepis* sp.' and *Oxyurichthys keiensis*.

Oligolepis sp.

Plain teardrop goby

PLATES 41 & 42

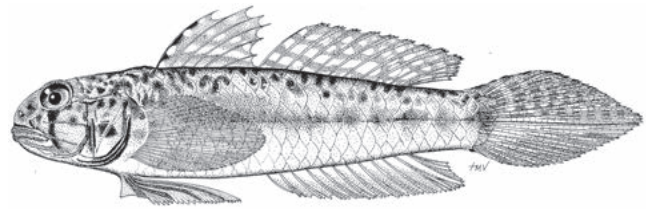
?*Oligolepis acutipennis*: Koumans in Blegvad & Løppenthin 1944.

Ctenogobius acutipinnis: Smith 1959 [in part], 1960; Smith & Smith 1963* [in part].

Oligolepis acutipennis: Hoese & Winterbottom 1979 [in part]; Maugé 1986; SSF No. 240.65* [in part]; Stiassny & Raminosa 1994; Whitfield 1998*.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 11 rays; pectoral fins 19–21 rays. LSS 26–28; TRB 7 or 8; nape and sides of head naked. Spines of 1st dorsal fin elongate in adult males.

Head and body pale yellowish white to pinkish brown, with diffuse red-brown to brown spots and small blotches over nape and dorsum, darkest along dorsal-fin bases; about 5 indistinct brown spots along midsides of body; dark brown to blackish narrow vertical bar from below eye to end of jaws; no small dense black spots on head; 1st dorsal fin whitish to pinkish, with 5 or 6 bands of black and white spots (black most intense on 1st spine), plus 2nd black band often with small oval black spot just behind 1st spine; 2nd dorsal fin with ~7 black and white oblique bands or rows of spots; caudal fin banded on dorsal half, pinkish on ventral half. Attains 78 mm SL.



Oligolepis sp., 47 mm SL (South Africa). Source: SSF

DISTRIBUTION Indian Ocean (range uncertain). WIO: Kenya, South Africa (St Lucia to Amanzimtoti), Madagascar and Seychelles.

REMARKS Collected from mangrove streams. It is not possible to assign a name to this species with certainty at present; records of this species are confused with those for *O. acutipennis* and *Oxyurichthys keiensis*.

GENUS *Oxyurichthys* Bleeker 1857

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 11–13 rays, but always one more ray in anal fin than in 2nd dorsal fin; pectoral fins 19–26 rays; caudal fin 17 rays. Distinguished by predorsal fleshy crest or ridge, reduced in some species, and fleshy knob or membranous tentacle on posterodorsal surface of eyes. LSS 37–92. No preopercular canal, and oculoscapular canal without rear part over opercle. Sensory papillae in transverse pattern, with some variation in arrangement of papilla rows *cp* and *a*. Gill opening to just under opercle. Most species found in shallow estuarine and coastal habitats, usually over soft substrates. Nineteen species known, 12 in WIO.

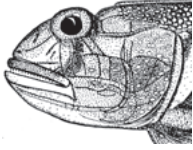
KEY TO SPECIES

- | | | |
|----|--|--------------------|
| 1a | Second dorsal fin 1 spine, 11 rays; anal fin 1 spine, 12 rays; teeth in upper jaw in 2 to 3 rows | <i>O. keiensis</i> |
| 1b | Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; teeth in upper jaw in 1 row, occasionally 1 to a few teeth behind row at front of jaw | 2 |
| 2a | Tentacle, pale fleshy knob or callus present posterodorsally on cornea of eyes | 3 |
| 2b | No tentacle or knob on eyes (except dark-pigmented callus present on some specimens) | 7 |
| 3a | Fleshy knob or callus present on eyes | 4 |
| 3b | Membranous tentacle on eyes | 5 |

Continued ...

KEY TO SPECIES

- 4a Most specimens with one to several short papilla rows on cheek below row *d*; body with distinct dark vertical bars interspersed with 5 lateral blotches *O. papuensis*



- 4b Never any extra papilla rows on cheek below row *d*; lateral blotches on body, no distinct vertical bars; anterior nostril tube with small black spot at base; distinct dark rounded to triangular spot at caudal-fin base; LSS 57–92 *O. petersii*

- 5a Upper lip not constricted at premaxillary symphysis, or only slightly so; scales on dorsum with few indistinct dark round spots; pectoral fins with indistinct dark spots *O. ophthalmonema*

- 5b Upper lip constricted at premaxillary symphysis, 1/3–1/2 width of greatest lip width; no dark round spots on dorsum; lower pectoral-fin rays plain dusky 6

- 6a Spines of 1st dorsal fin elongate, longest spine ~57% SL; 4 narrow vertical bars along midsides of body, but bars may be indistinct or reduced to oval spots *O. longicauda*

- 6b Spines of 1st dorsal fin short, longest spine ≤20% SL; 4 broad vertical bars along midsides of body *O. paulae*

- 7a All scales cycloid *O. takagi*

- 7b Scales mostly ctenoid, with cycloid scales limited to nape, abdomen and anterior trunk 8

- 8a Distinct black spot present posterodorsally on cornea of eye 9

- 8b No black spot on cornea of eye, but may have orange spot in life 10

- 9a Scales of dorsum with dark spots on posterior margins; all body scales cycloid; no dark gular spots *O. microlepis*

- 9b No dark spots on scales of dorsum; some scales ctenoid posteriorly on body; 2 pairs of dark gular spots (may be concealed by lower edge of preopercle) *O. lonchotus*

- 10a LSS 67–92; pelvic fins with 4 or 5 distinct irregular dark bars and/or oval blotches crossing rays; dusky blotch may be present on rear of 1st dorsal fin; 2 rows of small round brownish spots along sides of nape and body 11

- 10b LSS 45–59; pelvic fins plain dusky or with blackish streaks parallel to pelvic-fin rays; dusky blotch at rear of 1st dorsal fin; midsides of body with indistinct yellow-brown blotches and scattered pale markings on upper part of nape and body *O. nuchalis*

Continued ...

KEY TO SPECIES

- 11a Pelvic fins pale to dusky, variably mottled, or with ill-defined bars or oval blotches crossing rays; first 5 spines of 1st dorsal fin roughly the same size (spines 4–5 may be slightly longer); nape scaly, but with naked median along low fleshy crest *O. limophilus*

- 11b Pelvic fins pale, with 4 or 5 distinct irregular dark bars and oval blotches completely crossing rays; spines 1–4 of 1st dorsal fin long (length of first 3 spines ~1/3 SL), and spines 5–6 shorter; nape naked or variably scaly, but with naked median along low fleshy crest *O. notonema*

Oxyurichthys keiensis (Smith 1938)

Kei goby

PLATES 41 & 42

Gobius keiensis Smith 1938: 319, Fig. 1 (Great Kei River mouth, Eastern Cape, South Africa); SFSA No. 928*; Smith 1961*.

Ctenogobius acutipennis: Smith 1959* [in part]; Smith & Smith 1963*.

Ctenogobius keiensis: Smith 1960.

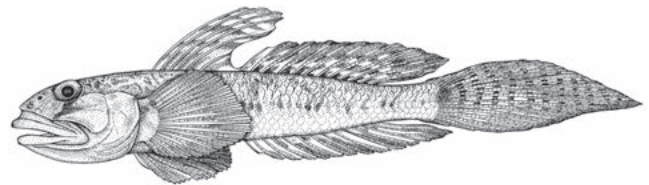
Gobius acutipennis: Barnard 1927 [in part]; Winterbottom 1976 [in part].

Gobionellus keiensis: Hoese & Winterbottom 1979; Maugé 1986.

Oligolepis keiensis: SSF No. 240.66*; Whitfield 1998*.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 12 rays; pectoral fins 20–22 rays. LSS 26–40; TRB 8–12; no predorsal scales. No tentacle or knob on eyes. Males with enormous mouth, extending back beyond eyes.

Head and body pale yellowish, with dusky scale margins on back, and ~22 small brown chevrons or elongate spots along midsides of body; distinctive black irregular to Y-shaped mark from eyes to upper jaw; dorsal fins with rows of dark brown spots; anal fin barred dark brown and yellowish white. Attains 58 mm SL.



Oxyurichthys keiensis, 43 mm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: Mozambique (Inhaca I.) to South Africa (Sundays River), Madagascar and Seychelles.

REMARKS Found in the upper reaches of estuaries, but never freshwater; some records have been confused with '*Oligolepis* sp.' Likely belongs in a monotypic subgenus of *Oxyurichthys*.

Oxyurichthys limophilus Pezold & Larson 2015

Mudloving tentacle goby

PLATE 41

Oxyurichthys limophilus Pezold & Larson 2015: 31, Figs. 14–16
(Mombasa Yacht Club, Kenya).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 22 or 23 rays; caudal fin long, slightly pointed. LSS 61–69; TRB 15–22; predorsal scales 9–17; nape scaly except for median area around low fleshy crest. No tentacle or knob on eyes. First dorsal-fin spines low, similar in height, none filamentous.

Preserved specimens with 4 large rounded to elongate blotches along midsides, and small round to triangular blotch at caudal-fin base; some specimens with diffuse small brownish blotches interspersed with midlateral blotches or forming irregular rows below them; 2 irregular longitudinal rows of spots on each side of dorsal midline, from nape above opercle, upper row running along bases of fin rays, and spots more distinct anteriorly; pelvic fins pale to dusky, variably mottled or with ill-defined bars or oval blotches crossing the rays. Attains 95 mm SL.



Oxyurichthys limophilus, 58 mm SL (Kenya). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Kenya; elsewhere, Japan.

REMARKS Types collected from muddy substrate, in 6–12 m.

Oxyurichthys lonchotus (Jenkins 1903)

Throat-spot tentacle goby

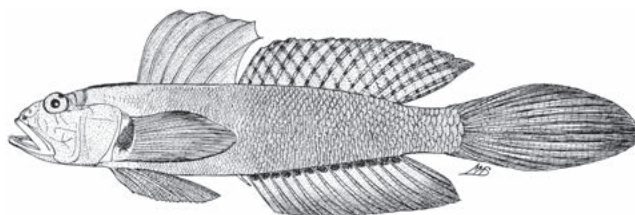
PLATES 41 & 42

Gobionellus lonchotus Jenkins 1903: 503, Fig. 44 (Oahu I., Hawaii).
Oxyurichthys guibei Smith 1959: 215, Fig. 33a (Mauritius [Réunion], Mascarenes); Maugé 1986; Fricke 1999.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 or 14 rays; pectoral fins 17–20 rays. LSS 51–93; TRB 15–27; predorsal scales 0–21. No tentacle or knob on eyes.

Head and body pale yellowish grey to pale brownish grey, with 5 square brown to red-brown blotches along midsides of body; anterior nostril tubes black; black spot on top of eyes,

and dark brown crescent-shaped mark on nape behind eyes; irregular brownish broad blotch below eyes, may reach to rear of jaw; 2 round dark brown spots on gular region below lower jaw (partly concealed by gill cover); fins pinkish to pale pinkish brown, with pale brown spots and streaks, plus blue-edged brown blotch on pectoral-fin bases. Attains 106 mm SL.



Oxyurichthys lonchotus, 130 mm TL, holotype of *O. guibei* (Mauritius).
Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique, Comoros, Mauritius and Réunion; elsewhere to Indonesia, Japan and Hawaii.

REMARKS Found near mangroves, intertidal muddy reef flats and shallow estuaries, at 0.5–2 m; may dig their own burrows.

Oxyurichthys longicauda (Steindachner 1893)

Long-tailed tentacle goby

PLATE 42

Gobius longicauda Steindachner 1893: 151 (Swatow, China).
Oxyurichthys longicauda: Larson & Pezold 2016.

Second dorsal fin 1 spine, 11–13 rays; anal fin 1 spine, 13 rays; pectoral fins 22–26 rays. LSS 37–49; TRB 10–16; predorsal scales 9–16. Eye with long tentacle.

Preserved specimens with pale yellowish to whitish head and body, with 5–10 brownish round to oval spots along midsides, and 4 short vertical bars or oval blotches overlying 4 of these spots; dorsal midline with ≤12 indistinct brownish blotches; 1st dorsal fin with distinct blackish spot at rear of fin; caudal fin transparent, with brown to blackish teardrop-shaped spot at base, partly extending onto fin. Attains 77 mm SL.

DISTRIBUTION Indo-Pacific. WIO: India (one specimen from Mumbai); elsewhere, Indonesia, China and northern Australia.

REMARKS All known specimens trawled from 4–55 m, over fine coral sand to mud, in harbours or off the coast.

Oxyurichthys microlepis (Bleeker 1849)

Blackspotted goby

PLATE 42

Gobius microlepis Bleeker 1849: 35 (Madura Strait, Surabaya, Java, Indonesia).

Euctenogobius cristatus Day 1873: 109 (Mumbai, India); Hoda 1980*; Kottelat *et al.* 1993 [in part].

Oxyurichthys microlepis: Maugé 1986*; Manilo & Bogorodsky 2003.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 20–23 rays. LSS 40–58; TRB 13–18; predorsal scales 11–25. No knob or tentacle on eyes.

Head and body grey to pale yellowish grey, scales on nape and back with dense black spot, and these scales also margined with black; 5 diffuse grey midlateral blotches, posteriormost darkest, and up to 7 greyish bars may extend ventrally from midlateral blotches; nape crest with blackish or dark brown margin; sides of head with dark brown irregular teardrop-shaped blotch below eyes, and distinctive round black spot on upper rear part of eyes; dorsal fins and caudal fin with rows of blackish spots and short streaks. Attains 94 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Pakistan and India; elsewhere, Indonesia to eastern Australia.

REMARKS Inhabits harbours, estuaries and mangrove habitats, at 1–10 m. Reports from South Africa are of *O. nuchalis*.

Oxyurichthys notonema (Weber 1909)

Elegant tentacle goby

PLATE 42

Gobius (Oxyurichthys) notonema Weber 1909: 154 (beach at Menado, Indonesia).

Gobiichthys lemayi Smith 1947: 811 (Maputo, Mozambique); SFSA No. 913*; Smith 1961*.

Oxyurichthys lemayi: Smith 1959*; Hoese & Winterbottom 1979; SSF No. 240.68*.

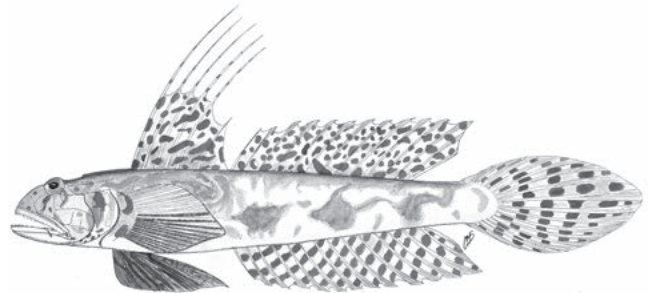
Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11–13 rays; pectoral fins 21–23 rays; centre ray of caudal fin occasionally filamentous. LSS 63–96; TRB 19–28; predorsal scales 0–21. No tentacle or knob on eyes. First 4 or 5 spines of 1st dorsal fin elongate and filamentous in both sexes.

Head and body pale yellowish white, back and snout greyish blue; 4 dark brown oval midlateral blotches, partly bordered with blue-grey and orange irregular lines and blotches, posteriormost blotch on peduncle blackish; 2 irregular rows of small brown to dark brown spots, often elongate, on back and nape; bright orange margin on crest; dark brown rectangular

blotch just below eyes; sides of head with scattered blue spots and short streaks; pectoral-fin bases with black irregular blotch bordered with orange; 1st dorsal fin with ~8 wavy bluish-bordered, bright orange to reddish orange stripes, and blackish membrane near 6th spine; pelvic fins orange to honey-brown, with several bright blue streaks along fin rays, and at least 3 oval blue blotches or streaks crossing membrane at rear of fin. Attains 127 mm SL.



Oxyurichthys notonema, 50 mm SL (Mauritius). © JE Randall, Bishop Museum



Oxyurichthys notonema, 150 mm TL, holotype of *O. lemayi* (Mozambique).

Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Kenya to Mozambique and Mauritius; elsewhere, Indonesia to Tahiti.

REMARKS Inhabits burrows over silty sand and mud, at 3.5–20 m.

Oxyurichthys nuchalis (Barnard 1927)

African tentacle goby

PLATE 41

Gobius (Oxyurichthys) nuchalis Barnard 1927: 72 (KwaZulu-Natal, South Africa); Barnard 1927.

Gobius cristatus: SFSA No. 929*; Smith 1961*.

Oxyurichthys microlepis [in part]: Smith 1959, 1960; Maugé 1986; SSF No. 240.69*.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11–13 rays; pectoral fins 22–25 rays. LSS 41–53; TRB 12–18; predorsal scales 0–16. No knob or tentacle on eyes.

Fresh specimens whitish yellow, with white chest and

blue-margined yellow blotches, large round spots and broad wavy lines on head and anterior part of body; 2 oblique yellow stripes across opercle; 5 round large yellow blotches on sides (last blotch at caudal-fin base), joined by midlateral yellow stripe; dusky grey blotch across bases of caudal-fin rays; fins dusky grey with yellow spots and streaks. Preserved specimens brownish, with 4 indistinct rounded brown blotches along midsides; faint whitish spots and vermiform streaks on nape and upper part of opercle; small brown blotch below eyes; pectoral-fin bases with pale and dark patches, possibly similar to vermiform lines as on nape; indistinct dark blotch or streak on rear of 1st dorsal fin. Attains 111 mm SL.



Oxyurichthys nuchalis, 80 mm SL (Mozambique). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: South Africa (Thukela River, KwaZulu-Natal), Mozambique and Madagascar.

REMARKS Trawled from 25–85 m. In Africa, this species has been confused in the literature with *O. microlepis* from the Indo-Pacific.

Oxyurichthys ophthalmonema (Bleeker 1856)

Tentacle goby PLATE 42

Gobius ophthalmonema Bleeker 1856: 208 (Ternate, Moluccas, Indonesia).

Oxyurichthys tentacularis: Blegvad & Løppenthin 1944; Smith 1959*;

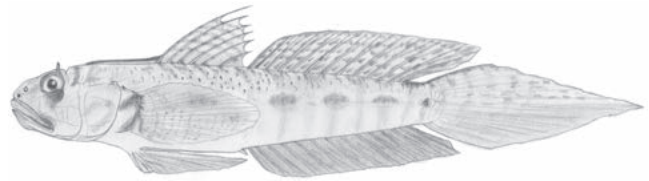
Hoese & Winterbottom 1979; Kuronuma & Abe 1986;

Stiassny & Raminosoa 1994.

Oxyurichthys ophthalmonema: SSF No. 240.70*.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 22 or 23 rays. LSS 47–55; TRB 14–18; predorsal scales 11–25. Slender tentacle on rear part of eyes.

Head and body pale greyish, with 5 brown midlateral blotches and 5 or 6 dorsal saddles, posteriormost darkest, and sometimes 5 or 6 grey vertical bars along sides; scales on dorsum may show small diffuse dusky grey spotting; dark brown teardrop-shaped mark below eyes; dark brown to orange-brown streak across opercle; dark comma-shaped mark on pectoral-fin bases; dorsal fins greyish pink; caudal fin greyish pink with rows of short grey streaks. Attains 91 mm SL.



Oxyurichthys ophthalmonema. © HK Larson

DISTRIBUTION Indo-Pacific (widespread). WIO: Gulf of Oman, Kenya to South Africa (Xora River, Eastern Cape), Tanzania (Zanzibar), Madagascar and Réunion; elsewhere, Sri Lanka to Fiji.

REMARKS Inhabits shallow estuaries, mangroves and muddy river mouths, at 0.5–11 m.

Oxyurichthys papuensis (Valenciennes 1837)

Frogface tentacle goby PLATES 41 & 42

Gobius papuensis Valenciennes in Cuv. & Val. 1837: 106 (New Guinea).

Oxyurichthys papuensis: Koumans in Blegvad & Løppenthin 1944;

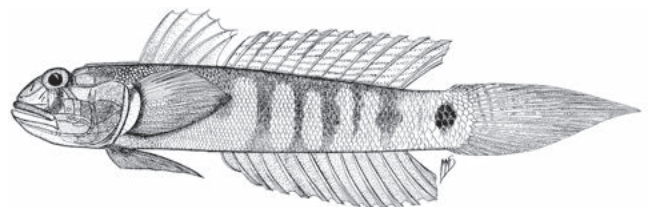
SFSA No. 913a*; Smith 1959* [in part]; Smith & Smith 1963*; Hoese &

Winterbottom 1979; Kuronuma & Abe 1986; Maugé 1986 [in part];

SSF No. 240.71*; Randall 1995*.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 21–24 rays; pelvic fins united, and pelvic frenum well-developed; caudal fin long and pointed. LSS 62–79; TRB 16–28; predorsal scales 18–25. Fleshy knob on rear of eyes.

Head and body greenish grey to yellowish grey; scales on back with pale bluish white spot at centres; 4 yellowish brown midlateral oval blotches, ending with black triangular spot at caudal-fin base, and interspersed with indistinct broad to narrow yellowish brown or greyish brown vertical bars; fleshy knob on eyes and crest of nape orange-red; opercle with scattered dusky-margined small pale orange spots; distinct blackish comma-shaped marks across bases of pectoral-fin rays. Attains 167 mm SL.



Oxyurichthys papuensis, 180 mm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf, Gulf of Oman, Ethiopia to South Africa (KwaZulu-Natal), Madagascar, Comoros and Seychelles; elsewhere, Indonesia to New Caledonia.

REMARKS Found at 1–20 m.

Oxyurichthys paulae Pezold 1998

Paula's tentacle goby

PLATES 42 & 43

Oxyurichthys paulae Pezold 1998: 689, Fig. 3 (off Kochi, India).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 24–26 rays. LSS 43–46; TRB 11–16; predorsal scales 13–16. Short tentacle on each eye.

Head and body whitish, dull purplish brown on back; 4 narrow grey bars on sides; tentacle on eyes orange; opercle dusky with diffuse yellow-brown blotch; pectoral-fin bases with large dark yellowish blotch, bordered above and below by bluish white stripes; rounded dark grey blotch on caudal-fin base. Attains 71 mm SL.



Oxyurichthys paulae (India). © HK Larson

DISTRIBUTION WIO: India (coast of Kerala).

REMARKS Trawled from over bottom with mud and some shell, at 34–120 m.

Oxyurichthys petersii (Klunzinger 1871)

Red Sea tentacle goby

PLATES 42 & 43

Apocryptes (Gobiichthys) petersii Klunzinger 1871: 480

(Al-Qusayr, Egypt, Red Sea).

Apocryptes papuensis: Borsieri 1904.

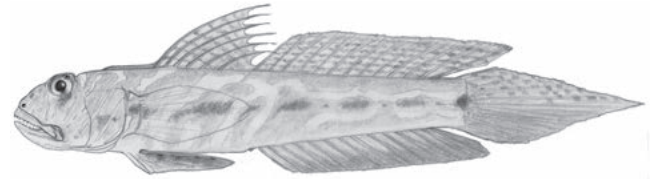
Oxyurichthys papuensis: Smith 1959 [in part]; Goren 1979*; Dor 1984;

Goren 1986; Maugé 1986 [in part]; Goren & Dor 1994.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 12 or 13 rays; pectoral fins 21–24 rays. LSS 57–92; TRB 22–29; predorsal scales 19–33. Fleshy knob on eyes.

Head and body dull yellowish, with pale blue oblique lines and streaks on sides of head and abdomen; body with broad pale blue wavy lines above and below elongate midlateral

brown blotches, and 3 smaller brown blotches in between these; crest on nape and knob on eyes orange; iris pale golden orange; pectoral-fin bases with brown spot just above centre, and with pale bluish white markings above and below; blackish triangular blotch on caudal-fin base. Attains 170 mm SL.



Oxyurichthys petersii. © HK Larson

DISTRIBUTION WIO: Red Sea and Lessepsian migrant to Mediterranean Sea.

REMARKS Known at 33–35 m.

Oxyurichthys takagi Pezold 1998

Takagi's tentacle goby

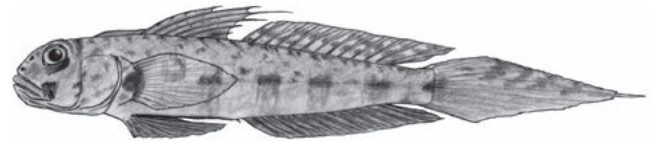
PLATE 43

Oxyurichthys microlepis: Morrow 1954.

Oxyurichthys takagi Pezold 1998: 691, Fig. 4 (Madali District, Koror I., Palau).

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 13 rays; pectoral fins 18–21 rays. LSS 54–70; TRB 15–23; predorsal area naked; all scales cycloid. No tentacle or knob on eyes.

Preserved specimens with yellowish brown head and body, with 5 darker brown, somewhat rectangular blotches along midsides of body, and blotch at caudal-fin base smallest and usually triangular; dorsal midline with 12–20 paired dark brown spots or small saddles; dark brown irregular teardrop-shaped mark on cheek just below eyes, and square dark brown blotch just above corners of mouth; diffuse brown spot on top of eyes (may be indiscernible). Attains 49 mm SL.



Oxyurichthys takagi. © HK Larson

DISTRIBUTION Indo-Pacific. WIO: Kenya; elsewhere, Indonesia to Fiji.

REMARKS Estuarine, in mangroves and shallow mudflats.

GENUS *Pandaka* Herre 1927

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 6–8 rays, all segmented; pectoral fins 14–16 rays; caudal fin 17 segmented rays. LSS 20–24; nape naked. Body small and slender, with small short-based fins. Mouth terminal; jaws short, lower jaw anteriormost, and no sexual dimorphism in jaw length. No head pores; sensory papillae sparse, arranged in reduced longitudinal or transverse pattern. Pectoral girdle smooth or with narrow bony ridge; distinct lobe or fleshy spur on rear edge of branchiostegal membrane. Gill opening restricted to just under opercle. At least 5 species, in Indo-Pacific, 1 in WIO.

Pandaka silvana (Barnard 1943)

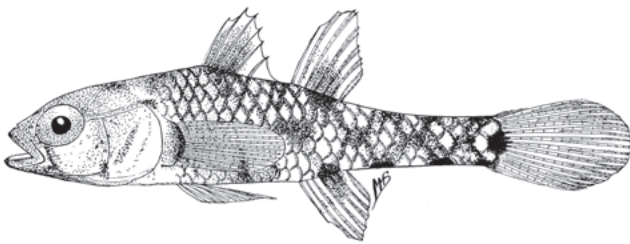
African dwarf goby

PLATES 42 & 43

Gobius silvanus Barnard 1943: 258, Fig. 33 (Knysna Lagoon, South Africa).*Pandaka minuta* Smith 1959: 205, Fig. 23 (Wamizi I., Mozambique).*Pandaka silvana*: Penrith & Penrith 1972*; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.72*.

Second dorsal fin and anal fin each with 6 or 7 rays; pectoral fins 14–16 rays. LSS 20–22; TRB 5–7; predorsal scales 0–3.

Head and body yellowish to whitish, scale margins outlined brown, creating reticulate network pattern; 3–5 brown blotches along midsides of body, and 3 dark brown spots along ventral midline of peduncle; dark brown spot on upper and lower edges of caudal-fin base, and dark round spot on middle of caudal-fin base. Attains 18 mm SL.



Pandaka silvana, 15 mm TL, holotype of *P. minuta* (N Mozambique). Source: Smith 1959

DISTRIBUTION WIO: northern Mozambique to South Africa (Knysna) and Seychelles.

REMARKS Tiny; occurs in estuarine to lower reaches of freshwater habitats, often in mangroves; free-swimming in small schools, over sand and mud bottoms. The Seychelles population may be a different species.

GENUS *Redigobius* Herre 1927

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6–8 rays; anal fin 1 spine, 6 or 7 rays, and nearly always with one ray less than in 2nd dorsal fin; pectoral fins 15–20 rays; caudal fin 17 segmented rays. Pectoral girdle (anterior edge of cleithrum) smooth or with a few fleshy knobs or lobes, or with low bony flange. LSS 22–30; predorsal scales 6–16, extending to close behind eyes. Mouth terminal; males with (sometimes greatly) enlarged mouths, which may reach back to behind eyes. Oculoscaphular and preopercular canals and pores complete; sensory papillae in longitudinal pattern (except 1 species with partly transverse pattern). Anterior nostrils tube-like, close to edge of upper lip or distinctly overhanging lip. Gill opening reaches to under opercle. Twelve species, 3 in WIO.

KEY TO SPECIES

- 1a Single broad black band extending downward and backward from 1st dorsal fin; distinct black band extends from eye diagonally across opercle to lower edge of pectoral-fin bases *R. balteatus*
- 1b Any body band or bar present (at most 1) is brown, not dense black; no black band from eye to lower pectoral-fin bases 2
- 2a Predorsal scales 7 or 8; ventral midline with 4 distinct black bars between caudal-fin base and anal-fin origin, and often 2 similar black bars on lower abdomen between anal fin and pelvic fins *R. bikolanus*
- 2b Predorsal scales 9–13; body with 6 or 7 indistinct oblique brown bars along sides of body (most prominent in males) *R. dewaali*

Redigobius balteatus (Herre 1935)

Belted goby

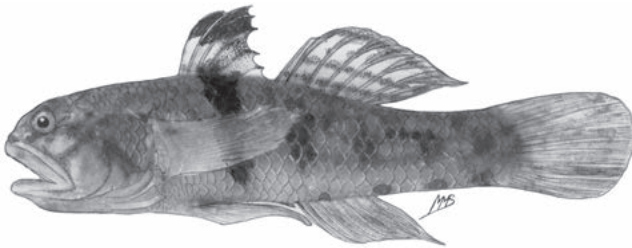
PLATE 43

Vaimosa balteata Herre 1935: 419 (Majalibit Inlet, Waigeo I., West Papua, Indonesia).*Acentrogobius balteatops* Smith 1959: 200, Pl. 9g (Inhaca I., Mozambique); Smith 1960; Kiener 1963*.*Redigobius balteatops*: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 240.91*.

Second dorsal fin 1 spine, 6 or 7 rays; anal fin 1 spine, 6 rays; pectoral fins 15–18 rays. LSS 23–25; TRB 9 or 10; predorsal scales 9–12, ctenoid; ctenoid scales on opercle; circumpeduncular scales 14 or 15; cycloid scales on breast, belly and pectoral-fin bases. Second spine of 1st dorsal fin longest, often filamentous.

Head and body brownish to yellowish brown, with broad black band extending downward and backward from rear

half of 1st dorsal fin; distinct black band from top of eyes diagonally across opercle to lower edge of pectoral-fin bases; blackish bar crosses interorbital space. Attains 36 mm SL.



Redigobius balteatus, 38 mm TL, holotype of *Acentrogobius balteatops* (S Mozambique). Source: Smith 1959

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Madagascar, Comoros (Mayotte) and Sri Lanka; elsewhere to New Guinea and northern Australia.

REMARKS Inhabits lower reaches of rivers and estuaries.

Redigobius bikolanus (Herre 1927)

Bigmouth goby

PLATE 43

?*Gobius vergeri* Bleeker 1867: 418 (Samberano River, Madagascar); Bleeker 1875*.

Vaimosa bikolana Herre 1927: 151, Pl. 11, Fig. 2 (creek at Puru, Legaspi, Albay Province, Philippines).

Stigmatogobius versicolor Smith 1959: 197, Fig. 12 (tidal stream at Mahé, Seychelles); Smith & Smith 1963*.

?*Bathygobius samberanoensis*: Kiener 1963; Maugé 1986.

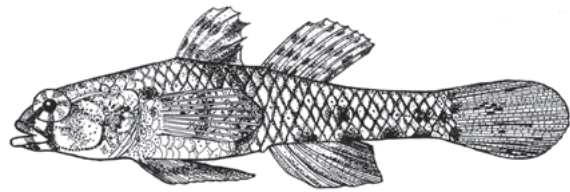
?*Bathygobius vergeri*: Kiener 1963; Maugé 1986.

Redigobius versicolor: Maugé 1986; Stiassny & Raminoso 1994.

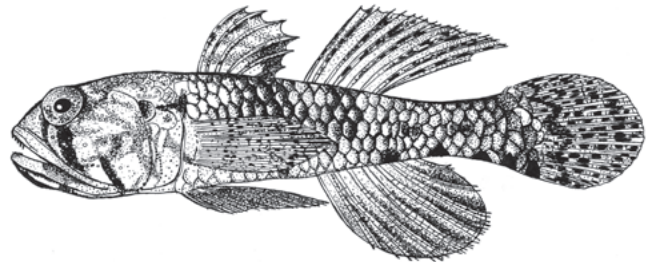
Redigobius bikolanus: SSF No. 240.92*.

Second dorsal fin 1 spine, 6 or 7 rays; anal fin 1 spine, 6 rays; pectoral fins 15–17 rays. LSS 22–24; TRB 7–8½; predorsal scales 6–8, cycloid; opercle with large cycloid scales; circumpeduncular scales 10–13. First spine of 1st dorsal fin longest, sometimes filamentous.

Head and body pale greyish, with indistinct dusky mottling, and 2 blackish curved bands across sides of head; most pronounced marks are blackish vertical bars across abdomen, including 4 black spots on ventral midline between caudal-fin base and anal-fin origin, and 2 or 3 blackish spots at caudal-fin base; 1st dorsal fin with 2 blackish stripes and black blotch on rear part of fin. Attains 37 mm SL.



Redigobius bikolanus, 20 mm TL, female paratype of *Stigmatogobius versicolor* (Seychelles). Source: Smith 1959



Redigobius bikolanus, 30 mm TL, male holotype (Seychelles). Source: Smith 1959

DISTRIBUTION Indo-Pacific (appears widespread). WIO: South Africa (Coffee Bay to Breede River), Seychelles and Mauritius; elsewhere, Sri Lanka to Fiji.

REMARKS Found in freshwater, estuaries and mangroves, away from strong currents. Feeds on small fishes and invertebrates. The identity of *Gobius vergeri* is uncertain (Larson 2010).

Redigobius dewaali (Weber 1897)

Checked goby

PLATE 43

Gobius dewaali Weber 1897: 144 (Umngeni River, KwaZulu-Natal, South Africa); SFSA No. 918.

Gobius maxillaris Davies 1948: 375, Pl. 9, Fig. 2 (Knysna River, South Africa); SFSA No. 915a*; Smith 1961*.

Stigmatogobius dewaali: Smith 1960.

Mugilogobius pongolensis Kok & Blaber 1977: 163, Figs. 1–2 (Nsimbu River, Pongolo floodplain, KwaZulu-Natal, South Africa).

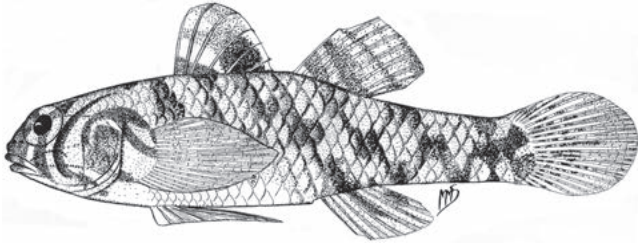
Redigobius dewaali: Hoese & Winterbottom 1979; SSF No. 240.93*; Skelton 1993*; Whitfield 1998*.

Redigobius pongolensis: Hoese & Winterbottom 1979.

Redigobius dewaali: Maugé 1986.

Second dorsal fin 1 spine, 6–8 rays; anal fin 1 spine, 5–7 rays; pectoral fins 16–18 rays. LSS 23–26; TRB 9 or 10; predorsal scales 9–11, mostly ctenoid, may be cycloid just behind eyes; cycloid scales on breast and pectoral-fin bases; opercle scales ctenoid, and belly scales mostly ctenoid; circumpeduncular scales 12–14. Spines 2–4 of 1st dorsal fin longest, but not filamentous.

Head and body yellowish brown, with 6 or 7 indistinct oblique dark brown bands or blotches and some cross-hatching along sides of body, and 4 or 5 slightly curved oblique brown bands on sides of head; dusky blotch above pectoral-fin bases; 1st dorsal fin reddish or pinkish, with elongate blue spot (may be black spot surrounded by blue in life). Attains 56 mm SL.



Redigobius dewaali, 35 mm TL (South Africa). Source: SFSA

DISTRIBUTION WIO: Mozambique (Limpopo River) to South Africa (KwaZulu-Natal; Kariega Estuary, Eastern Cape; Knysna, Western Cape).

REMARKS May be locally abundant; inhabits estuaries and coastal rivers and lakes.

GENUS *Rhinogobius* Gill 1859

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–10 rays; anal fin 1 spine, 7–10 rays; pectoral fins 14–23 rays; caudal fin 17 segmented rays; pelvic fins fused, and pelvic frenum fleshy. LSS 27–40; TRB 9–14; predorsal scales 0–19; snout and sides of head naked. Body compressed, head depressed; snout relatively long, mouth reaching to below eyes; lips fleshy. Eyes dorsolateral. Lateral-line pores on head, with rear part of oculoscapular canal nearly always present over opercle; sensory papillae on head in transverse or (usually) longitudinal pattern. At least 85 species in great need of review, occurring in freshwaters of Southeast Asia and mainland China; 1 species accidentally introduced into Persian/Arabian Gulf.

Rhinogobius brunneus (Temminck & Schlegel 1845)

Brown rivergoby

Gobius brunneus Temminck & Schlegel 1845: 142, Pl. 74, Fig. 2 (Nagasaki, Japan).

Rhinogobius brunneus: Al-Hassan & Miller 1987*.

Diagnosis as for genus. Data from Al-Hassan & Miller: second dorsal fin and anal fin each with 1 spine, 8–10 rays; pectoral fins 18–20 rays. LSS 30–31.

Head and body brown, with variable darker markings (either spots, square blotches or bars), but sides of head relatively plain; caudal fin and usually 2nd dorsal fin and anal fin finely barred with dark spots. Attains 53 mm SL.

DISTRIBUTION Subtropical freshwater, from Korea to Japan; introduced into Persian/Arabian Gulf in WIO region, probably through ballast water.

REMARKS Usually found in lakes and streams; feeds on insects and algae. Often misidentified; this record may refer to a different species.

GENUS *Stenogobius* Bleeker 1874

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 10 or 11 rays; pectoral fins 14–17 rays; caudal fin 17 segmented rays. Pectoral girdle (anterior edge of cleithrum) with 1–5 short finger-like lobes. LSS 45–62; predorsal area naked or with cycloid scales nearly to eyes; cycloid scales (if present) on head, breast, belly and pectoral-fin bases, and body scales otherwise ctenoid. Body and head generally compressed; head rounded in profile; mouth terminal to slightly subterminal. Sensory papillae in transverse pattern. Gill opening restricted to pectoral-fin base. Colour pattern usually includes dark barring along sides, dark spot on upper part of pectoral-fin bases, and dark teardrop-shaped mark under eyes; colour may be sexually dichromatic. Inhabit coastal rivers and estuaries, often over sand or gravel, and may dive into substrate when threatened. At least 27 species, presently recognised in Indo-Pacific, in great need of review; 2 in WIO.

KEY TO SPECIES

- | | |
|----|---|
| 1a | Second dorsal fin and anal fin each usually with 1 spine, 10 (or rarely 11) rays; diffuse short blackish bar (may be indistinct) reaching from eyes vertically towards corner of jaw <i>S. hilgendorfi</i> |
| 1b | Second dorsal fin and anal fin each usually with 1 spine, 11 (or rarely 10) rays; distinct black teardrop-shaped mark extending obliquely from eye towards lower rear corner of preopercle <i>S. polyzona</i> |

Stenogobius hilgendorffii (Pfeffer 1896)

Africa rivergoby

PLATE 42

Gobius hilgendorffii Pfeffer 1896: 5 (Kingani River, Tanzania).

Gobius gymnopomus: Tortonese 1941.

*Stenogobius kenya*e Smith 1959: 190, Pl. 9i (Sabaki River, Kenya);

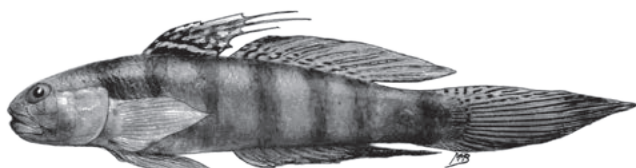
SSF No. 240.96*.

Stenogobius gymnopomus: Maugé 1986.

*Stenogobius (Stenogobius) kenya*e: Watson 1991*.

Second dorsal fin and anal fin each with 1 spine, 10 or 11 rays; pectoral fins 15 or 16 rays. LSS 47–53; TRB 11 or 12; predorsal scales 10–15, and midline scaly; cheek naked, and opercle naked or with a few large scales.

Head and body pale whitish, faintly yellowish dorsally, and with diffuse greyish to blackish bars along sides; dorsal fins with several rows of fine black spots and indistinct reddish tinge; blackish irregular teardrop-shaped mark from eyes to corner of mouth; iris golden brown. Preserved specimens with yellowish to brown head and body, with 5 curved dark brown bars on sides of body; broad diffuse brownish bar, often indistinct, from eyes to rear of jaws; 1st dorsal fin with 2 blackish bands along lower part of fin. Attains 84 mm SL.



Stenogobius hilgendorffii, 105 mm TL, male holotype of *S. kenya*e (Kenya). Source: Smith 1959

DISTRIBUTION WIO: Somalia to South Africa (Mhlatuze River, KwaZulu-Natal).

REMARKS Occurs in freshwater to marine habitats (rivers and bays).

Stenogobius polyzona (Bleeker 1867)

Banded rivergoby

PLATE 42

Gobius polyzona Bleeker 1867: 413 (Samberano River, Madagascar);

Sauvage 1891*; Boulenger 1916*.

Stenogobius genivittatus: Smith 1959; Maugé 1986; Balon & Bruton 1994;

Stiassny & Raminosoa 1994.

Stenogobius (Insularigobius) polyzona: Watson 1991*.

Stenogobius polyzona: Keith *et al.* 1999*.

Second dorsal fin 1 spine, 10 or 11 rays; anal fin 1 spine, 11 rays; pectoral fins 14 or 15 rays. LSS 44–50; TRB 11–15; predorsal scales 15–19, reaching to just above rear edge of preopercle. Spines of 1st dorsal fin filamentous in males.

Head and body pale sandy-brown, and whitish ventrally; prominent black teardrop-shaped mark from eyes, running obliquely to near lower rear corner of preopercle; males with 7–19 narrow black bars variably developed on sides of body (darkest anteriorly), and females with indistinct vertical bars (faint and tend to be replaced by series of short blackish bars along midsides of body, and may join up to form zigzag pattern); 1st dorsal fin with dark irregular streaks in males, or rows of spots in females. Attains 111 mm SL.

DISTRIBUTION WIO: Madagascar, Comoros, Réunion, Mauritius and (rarely) South Africa (Port St Johns, Eastern Cape).

REMARKS Found in brackish and freshwater rivers and streams.

SUBFAMILY OXUDERCINAE

Mudskippers

First dorsal fin 4–17 spines; 2nd dorsal fin 1 spine (or first element may be segmented ‘spine’), 9–32 rays; anal fin 1 spine, 8–30 rays; pectoral fins 11–25 rays; pelvic fins 1 spine, 5 rays; caudal fin 14–17 segmented rays. LSS few to 275; predorsal scales 0–113; scales cycloid, very small to moderate. Eyes dorsally set. Jaws moderate to wide. Teeth caninoid, bluntly pointed or bifid; in 1 row in both jaws (except in *Periophthalmodon*, which is not present in WIO), plus pair of large curved teeth just behind symphysis of lower jaw. Tongue adnate. Associated with muddy bottoms and mangrove habitats, and capable of breathing air. Ten genera, worldwide; 4 genera and at least 8 species in WIO.

KEY TO GENERA

- | | | |
|----|--|-----------------------|
| 1a | Two canine teeth behind lower jaw symphysis; anal-fin base and 2nd dorsal-fin base each $\geq 34\%$ SL | 2 |
| 1b | No canine teeth behind lower jaw symphysis; anal-fin base and 2nd dorsal-fin base each $\leq 27\%$ SL | <i>Periophthalmus</i> |
| 2a | Barbels on underside of head | <i>Scartelaos</i> |
| 2b | No barbels on underside of head | 3 |

Continued ...

KEY TO GENERA

- 3a No lower eyelid or fleshy dermal cup; skin of head and nape smooth and thin *Oxuderces*
 3b Lower eyelid or fleshy dermal cup present; skin of head and nape thickened and fleshy *Boleophthalmus*

GENUS *Boleophthalmus* Valenciennes 1837

First dorsal fin 5 spines; 2nd dorsal fin 0 or 1 spine, 23–28 rays; anal fin 0 or 1 spine, 23–27 rays; pectoral fins 16–21 rays; caudal fin pointed. LSS 61–185; TRB 18–38; predorsal scales 25–60; scales cover entire body and head except snout and chin; thick papillose epidermis covers scales on anterior half of body. Dermal cup covers lower half of eye. Jaws large, reaching to rear half of eyes. Teeth in upper jaw blunt; teeth in lower jaw notched. Mainly herbivorous, grazing on algae and diatoms from surface mud. Six species, 2 in WIO.

KEY TO SPECIES

- 1a Second dorsal fin and anal fin each usually with 1 spine, 26 or 27 rays; no white or bluish spots on head or body, but white spots present on fins, and head and body bluish grey with dark blotches on nape and along dorsal-fin bases *B. dussumieri*
 1b Second dorsal fin usually 1 spine, 23–25 rays, and anal fin usually 1 spine, 24 or 25 rays; head and body with scattered white to bluish white spots, and upper half of body with 7 or 8 dark brown saddles or bars *B. boddarti*

Boleophthalmus boddarti (Pallas 1770)

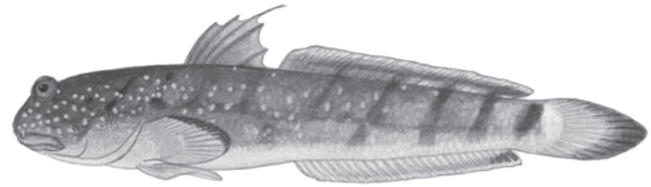
Blue-spotted mudskipper

PLATE 44

Gobius boddarti Pallas 1770: 11, Pl. 2, Figs. 4–5 (Indian Ocean).
Gobius striatus Bloch & Schneider 1801: 71, Pl. 16 (Tharangambadi, India).
Boleophthalmus boddaerti: Valenciennes in Cuv. & Val. 1837.
Boleophthalmus sculptus Günther 1861: 104 (India).
Boleophthalmus dentatus: Khalaf 1961; Hoda 1980*.
Boleophthalmus boddarti: Murdy 1989*, 2011.

Second dorsal fin and anal fin each with 1 spine, 23–25 rays; pectoral fins 17–21 rays. LSS 61–79; predorsal scales 25–35. First dorsal fin relatively narrow, spine tips free from membrane, and 3rd spine may be somewhat filamentous.

Head and body grey, and yellowish white ventrally; white to bluish white spots scattered on sides of body; ~7 dark brown diagonal bars running obliquely forward from dorsal midline, sometimes forming brown blotches along midline. Attains 135 mm SL.

*Boleophthalmus boddarti*, 100 mm SL.

DISTRIBUTION Indo-Pacific. WIO: west coast of India; elsewhere to Bangladesh and Indonesia (Borneo).

REMARKS Found in estuaries, mangroves, mudflats and intertidal zone; occurs in burrows, into which the fish retreat during high tide.

Boleophthalmus dussumieri Valenciennes 1837

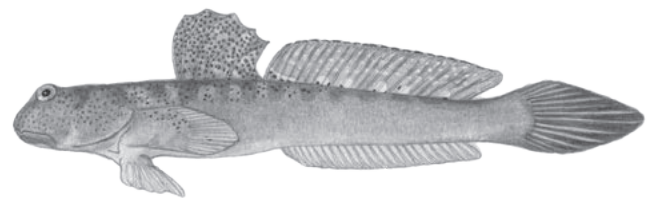
Dussumier's mudskipper

PLATE 44

Boleophthalmus dussumieri Valenciennes in Cuv. & Val. 1837: 207, Pl. 354 (Mumbai, India); Khalaf 1961; Kuronuma & Abe 1986; Murdy 1989*; Randall 1995*.
Boleophthalmus dentatus Valenciennes in Cuv. & Val. 1837: 208, Pl. 355 (Mumbai, India); Day 1876.
Boleophthalmus chamiri Holly 1929: 64 (opposite Tawilah I., Strait of Hormuz, Iran).
Boleophthalmus boddarti: Clayton & Vaughan 1982.
Pseudapocryptes dentatus: Kuronuma & Abe 1986*.

Second dorsal fin 1 spine, 23–27 rays; anal fin 1 spine, 23–26 rays; pectoral fins 16–20 rays. LSS 103–185; predorsal scales 48–56. First dorsal fin relatively broad and rounded, spine tips not free from membrane.

Head and body bluish grey, with greenish brown blotches on nape and along dorsal-fin bases; 1st dorsal fin with small greenish and blue spots, and 2nd dorsal fin with rows of white spots. Attains 139 mm SL.

*Boleophthalmus dussumieri*, 90 mm SL (Persian/Arabian Gulf).

DISTRIBUTION WIO: Kuwait Bay and Persian/Arabian Gulf to Pakistan and India.

REMARKS Found on open mudflats, in burrows; constructs walled territories in some localities (such as Kuwait Bay).

GENUS *Oxuderces* Eydoux & Souleyet 1850

First dorsal fin 6 spines; 2nd dorsal fin 24–27 rays, and 1st and 2nd rays connected by membrane; anal fin 24–30 rays; pectoral fins 20–25 rays; caudal fin pointed. LSS 50–59; TRB 18–38; predorsal scales 16–25; scales cycloid; head with scales or naked. Head and jaws flattened anteriorly; jaws large, horizontal, reaching back well past eyes. Teeth blunt, in 1 row in each jaw; long canine-like tooth at each side of upper-jaw symphysis; teeth in upper jaw protrude over lower lip. Inhabit intertidal mudflats, slithering through surface layer of soft mud, with only their eyes protruding. Two species, 1 in WIO.

Oxuderces nexipinnis (Cantor 1849)

Belodok mudskipper

PLATE 44

Apocryptes nexipinnis Cantor 1849: 1170 (Sea of Penang).

Oxuderces nexipinnis: Jaafar & Parenti 2016.

Diagnosis as for genus. Second dorsal fin 24–27 rays; anal fin 24–26 rays; pectoral fins 21–24 rays. LSS 50–54; predorsal scales 0–14.

Head and body greyish blue, with ~6 darker blotches or saddles across dorsal midline, and ~7 darker blotches or broad bars on sides of body; may have iridescent bluish marks on scales on rear half of body; most distinctive marking a blackish ocellus or spot at rear of 2nd dorsal fin; fins mostly translucent. Attains 93 mm SL.



Oxuderces nexipinnis, 53 mm SL (India).

© SJ Raredon, Smithsonian Institution

DISTRIBUTION Indo-Pacific. WIO: Pakistan; elsewhere, India, Sri Lanka, Malaysia, Thailand and Indonesia.

REMARKS Found on open mudflats, often where very soft sloppy mud overlays firmer substrate; often occurs with species of *Scartelaos*.

GENUS *Periophthalmus*

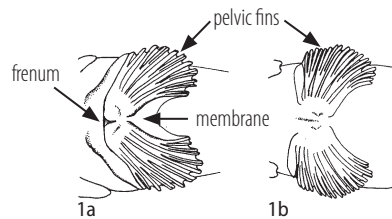
Bloch & Schneider 1801

First dorsal fin 4–17 spines; 2nd dorsal fin 1 spine, 9–13 rays; anal fin 1 spine, 8–13 rays, usually unbranched; pectoral fins

11–16 rays, and fin base relatively long and muscular. Scales cover entire body and head, except snout and interorbital area, but scales on head very small; predorsal scales 18–40; LSS 46–121; TRB 11–30. Dermal cup covers lower half of protuberant eyes. Jaws moderate, reaching back to below eyes; teeth canine-like, in 1 row in both jaws. Commonly found in mangroves and mudflats. Mainly carnivorous (diet includes terrestrial organisms such as insects and spiders). Nineteen species, 3 in WIO; these species names may change in the future.

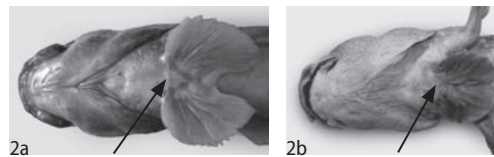
KEY TO SPECIES

1a Pelvic frenum present, may be reduced but visible without magnification as flat ridge; 5th ray of pelvic fins joined by membrane for ~½ length 2



1b No pelvic frenum; 5th ray of pelvic fins with almost no membrane joining them *P. argentilineatus*

2a Pelvic frenum very low but visible; 1st dorsal fin 11–14 spines, and fin with black stripe below whitish margin, rest of fin grey with white spots *P. kalolo*



2b Pelvic frenum distinctly developed; 1st dorsal fin 10–13 spines, and no black submarginal stripe, but fin dusky grey with narrow black margin or row of small black spots anteriorly and a few white spots along base *P. waltoni*

Periophthalmus argentilineatus

Valenciennes 1837

Silverbarred mudskipper

PLATE 44

Periophthalmus argentilineatus Valenciennes in Cuv. & Val. 1837: 191

(Moluccas, Indonesia); Murdy 1989*; Goren & Dor 1994; Whitfield 1998*.

Periophthalmus sobrinus Eggert 1935: 95, Pl. 9, Figs. 37–38

(southwestern Red Sea); Smith 1959*; Smith & Smith 1963*;

Hoesle & Winterbottom 1979; Dor 1984; Maugé 1986; SSF No. 240.79*;

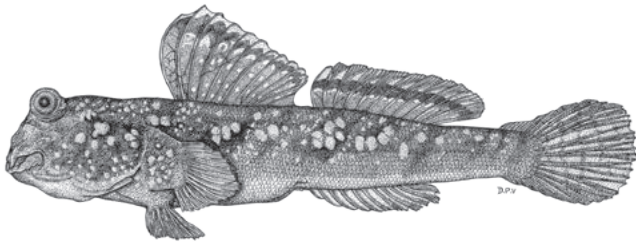
Branch *et al.* 1994*.

Periophthalmus cantonensis: Fourmanoir 1955; SFSA No. 936*;

Smith 1955, 1961*.

First dorsal fin with 11–16 spines; 2nd dorsal fin 1 spine, 10–12 rays; anal fin 1 spine, 8–11 rays; pectoral fins 11–14 rays; pelvic fins united only at base, and no pelvic frenum. LSS 64–100; predorsal scales 22–37. First dorsal fin moderately tall, margin convex to straight, and fin higher anteriorly.

Body with silvery white short vertical lines and spots along lower half; 1st dorsal fin with wide submarginal black stripe, white margin, and rest of fin grey with small white spots; 2nd dorsal fin with red to whitish margin, and broad black stripe through approximate centre of fin. Attains 95 mm SL.



Periophthalmus argentilineatus, 81 mm SL (South Africa).
Source: Whitfield 1998

DISTRIBUTION Indo-Pacific (widespread). WIO: Pakistan, Red Sea to South Africa (Kariega River), Madagascar, Comoros, Aldabra and Seychelles; elsewhere to Samoa.

REMARKS Found in a range of mangrove habitats.

Periophthalmus kalolo Lesson 1831

Kalolo mudskipper

PLATE 45

Periophthalmus kalolo Lesson 1831: 146 (Moluccas, Indonesia); Murdy 1989*; Goren & Dor 1994.

Periophthalmus koelreuteri: Playfair 1867; Koumans *in* Blegvad & Løppenthin 1944; Hoda 1980; Kuronuma & Abe 1986; Allen & Steene 1987*; Branch *et al.* 1994.

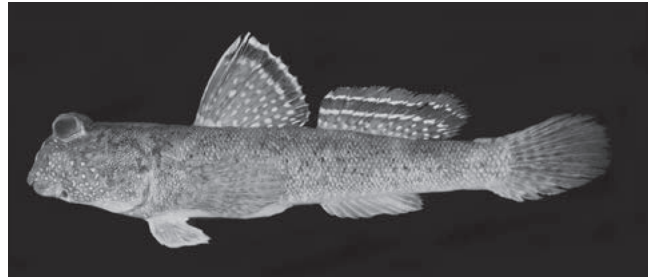
Periophthalmus koelreuteri africanus Eggert 1935: 78, Pl. 5, Fig. 21 (Dar es Salaam, Tanzania); Smith 1959*; Smith & Smith 1963*; Hoese & Winterbottom 1979; Dor 1984; Maugé 1986; SSF No. 240.78*.

Periophthalmodon schlosseri: Smith 1959; Smith & Smith 1963.

First dorsal fin with 11–15 spines; 2nd dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 12–14 rays; pelvic fins joined by membrane for $< \frac{1}{2}$ length of 5th ray, and pelvic frenum vestigial yet visible as low flat fold. LSS 66–86; predorsal scales 27–40. First dorsal fin low to moderate, with convex margin.

Body greyish, scales with dark edges, and belly white; snout, cheeks and lower portion of opercle with many dark-ringed

white spots; 1st dorsal fin with translucent or whitish margin, submarginal black stripe, proximally bordered by narrower white stripe, plus white spots over lower half of fin, and reddish spot on distal membrane between 1st dorsal-fin spines; 2nd dorsal fin with submarginal dusky to reddish or blackish stripe, then a white, a black and a white stripe, with 1 or 2 rows of dusky spots (which may partly join up) below; pectoral fins and caudal fin with pale grey spots; pelvic fins and anal fin whitish. Attains 140 mm SL.



Periophthalmus kalolo, 95 mm SL (Djibouti). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (widespread). WIO: India, Pakistan, Persian/Arabian Gulf, Oman, Red Sea, Gulf of Aden (Djibouti), Tanzania (Zanzibar), Kenya to South Africa (Eastern Cape), Madagascar, Aldabra, Seychelles and Réunion; elsewhere to Samoa.

REMARKS Common in mangroves and on mudflats.

Periophthalmus waltoni Koumans 1941

Arabian mudskipper

PLATE 45

Periophthalmus waltoni Koumans 1941: 288 (Shatt al-Arab [Iraq]; Karachi [Pakistan]); Koumans *in* Blegvad & Løppenthin 1944; Khalaf 1961; Hoda 1980*; Kuronuma & Abe 1986*; Murdy 1989*; Randall 1995*; Rahimian & Pehpuri 2006.

First dorsal fin with 10–13 spines; 2nd dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 13–15 rays; pelvic fins joined by membrane for $\sim \frac{1}{2}$ their length, and pelvic frenum moderate. LSS 91–121; predorsal scales 27–37. First dorsal fin broad and margin convex.

Head and body grey, with darker blotches and irregular bars across back; 1st dorsal fin mostly plain grey, with narrow black margin or row of small black spots anteriorly, and few white spots along fin base (may be indistinct); 2nd dorsal fin pale grey, with black horizontal stripe through centre, and white border below stripe; sides of body sometimes with silvery white oblique to vertical bars anteriorly. Attains 123 mm SL.



Periophthalmus waltoni, 100 mm SL (Persian/Arabian Gulf).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf and Oman to Pakistan.

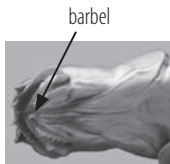
REMARKS Found in burrows or under rocks on mudflats.

GENUS *Scartelaos* Swainson 1839

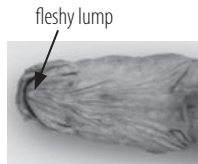
First dorsal fin 5 spines, and fin short (~5–10% SL); 2nd dorsal fin 23–27 rays, or 1 spine and 25–27 rays; anal fin 24–27 rays, or 1 spine and 24 or 25 rays; pectoral fins 18–22 rays; caudal fin lanceolate (anal fin attached to caudal fin in 3 species). Scales cycloid, tiny and partly embedded (difficult to see); anterior half of body naked; LSS 90–100. Dermal cup covers lower edge of eyes. Large upper lip, overlain by flap of skin covering most of upper jaw. Single barbel or else several fleshy knobs on chin; 6–12 short barbels ventrally on each side of head, near rear edge of lower jaw. Four species, 2 in WIO.

KEY TO SPECIES

- 1a Single barbel on underside of head behind lower jaw; teeth in upper jaw usually <30; 4–7 thin vertical greenish grey lines on sides of body *S. histophorus*
- 1b Fleshy lumps and no single barbel on chin; teeth in upper jaw >30 (usually 33); 15–18 diffuse vertical brown bars on sides of body *S. tenuis*



1a



1b

Scartelaos histophorus (Valenciennes 1837)

Blue mud-slipper

PLATE 45

Gobius viridis Hamilton 1822: 42, 366, Pl. 32, Fig. 12 (Ganges River estuary, India) [primary homonym of *Gobius viridis* Otto 1821].

Boleophthalmus histophorus Valenciennes in Cuv. & Val. 1837: 210 (Mumbai, India).

Scartelaos viridis: Hoda 1980*.

Scartelaos histophorus: Murdy 1989*.

Second dorsal fin 25–27 rays; anal fin 24–27 rays (occasionally first element of 2nd dorsal fin and anal fin may be unsegmented 'spine'); pectoral fins 18–22 rays. LSS embedded and difficult to see. Distinct single barbel on underside of head, behind chin. First dorsal fin short-based, tall and pennant-like.

Body greenish grey to bluish grey, with 4–7 greenish to dark grey narrow vertical lines on trunk, first line above anus; 1st dorsal fin plain greenish grey; 2nd dorsal fin and caudal fin with small blue to blackish spots. Attains 105 mm SL.



Scartelaos histophorus, 82 mm SL, male (New Guinea). © G Polgar

DISTRIBUTION Indo-Pacific. WIO: Pakistan to India (Mumbai); elsewhere, Malaysia to Australia.

REMARKS Occurs in freshwater tidal zone and typically on mudflats or where fine mud layer overlies sand, typically 'rowing' through the mud and diving into it for concealment.

Scartelaos tenuis (Day 1876)

Slender mud-slipper

PLATE 45

Boleophthalmus tenuis Day 1876: 305, Pl. 65, Fig. 1 (estuaries of Karachi, Sindh, Pakistan).

Scartelaos tenuis: Koumans in Blegvad & Løppenthin 1944; Khalaf 1961; Hoda 1980*; Kuronuma & Abe 1986*; Murdy 1989*; Randall 1995*; Rahimian & Pehpuri 2006.

Second dorsal fin 26–28 rays; anal fin 25–26 rays (occasionally first elements of 2nd dorsal fin and anal fin may be unsegmented 'spine'); pectoral fins 18–22 rays; anal fin free from caudal fin. LSS 90–100 (but difficult to see). No distinct single barbel on chin. First dorsal fin short-based and relatively tall.

Head and body pale grey, with 15–18 irregular vertical brownish grey bars on sides of body (may be indistinct in life); 1st dorsal fin black at least on outer half, with white spot near fin tip. Attains 155 mm SL.



Scartelaos tenuis, type (Pakistan). Source: Day 1876

DISTRIBUTION WIO: Persian/Arabian Gulf and Oman to Pakistan.

REMARKS Found in burrows on mudflats or sand flats.

SUBFAMILY SICYDIINAE

River gobies

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 9–11 rays; pectoral fins 13–22 rays; pelvic-fin rays thickened, and with a many-branched fleshy pad at tip of spine, pelvic disc rounded, fleshy, and partly fused to belly; caudal fin 17 rays. LSS 10–74; predorsal area variably scaly. Upper lip margin may have clefts or papillae. Teeth specialised, may be stout, curved, fine, bicuspid to multicuspid, or labial, depending on genus. Tongue entirely fused to floor of mouth or only tip free. Lateral canals and pores present; 2 or 3 preopercular pores. Sensory papillae in transverse pattern, and rows of papillae also on body. Sexual dimorphism in colour may be considerable. Inhabit upper reaches of rivers and migrate downstream to spawn; when spawning is complete, the fertilised eggs drift with currents to develop at sea, and adults return to their upstream habitat, often overcoming torrential stream flows. Worldwide in tropical and subtropical streams. This group is in need of revision. Nine genera and 110+ species; 2 genera and at least 5 species in WIO.

KEY TO GENERA

- 1a Upper margin of lip with 3 distinct clefts; nape of adults scaly to above rear edge of preopercle; 25–70 teeth in upper jaw *Sicyopterus*
- 1b Upper margin of lip entirely smooth; nape of large adults naked or with a few scattered scales before 1st dorsal fin; 7–23 teeth in upper jaw *Cotylopus*

GENUS *Cotylopus* Guichenot 1863

First dorsal fin 6 spines; 2nd dorsal fin and anal fin each with 1 spine, 9 or 10 rays; pectoral fins 15–17 rays. LSS 37–71; nape usually naked, may have a few scales before 1st dorsal fin. Upper lip margin entire, smooth; 7–23 tricuspid teeth in upper jaw, forming nearly continuous band, separated by narrow median frenum to lip, and fleshy lobe may be visible behind tooth row at symphysis; lower jaw with 1 row of stout conical teeth. No gill rakers on outer faces of gill arches, but present on inner faces of 4th and 5th arches. At least 2 species, both endemic to WIO.

KEY TO SPECIES

- 1a LSS 46–71; TRB 12–23; scales on sides of body mostly cycloid in both sexes *C. acutipinnis*
- 1b LSS 37–51; TRB 6–11; scales on sides of body mostly ctenoid, especially in males *C. rubripinnis*

Cotylopus acutipinnis Guichenot 1863

Cascade goby

PLATE 46

Cotylopus acutipinnis Guichenot 1863: 10 (Réunion, Mascarenes); Maugé 1986; Stiassny & Raminosoa 1994; Watson 1995; Keith *et al.* 1999*.

Cotylopus parvipinnis Guichenot 1863: 11 (Réunion, Mascarenes).

Sicydium parvipinnis: Boulenger 1916.

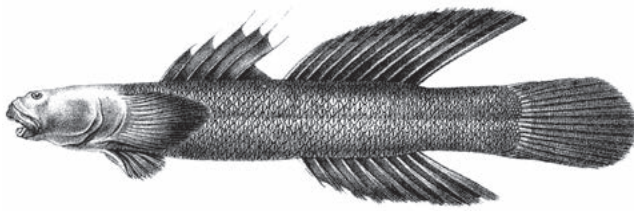
Sicyopterus acutipinnis: Smith 1959.

Sicyopterus parvipinnis: Smith 1959.

Cotylopus sp.: Fricke 1999.

Second dorsal fin 1 spine, 10 rays; anal fin 1 spine, 9 or 10 rays; pectoral fins 15–17. LSS 46–71; TRB 12–23; predorsal scales 0–7 (only large adults with a few scales crossing nape); body scales cycloid, but becoming strongly ctenoid (mostly anteriorly) at ~70 mm SL. Upper lip large and fleshy, overhanging lower jaw.

Head and body yellowish brown, with reddish brown spots on scales and ~10 narrow bars along sides (may be obscured by scale pattern); head brighter yellow than body, with oblique red-brown streaks and spotting; breeding males become very dark, obscuring colour pattern. Attains 105 mm SL.



Cotylopus acutipinnis (WIO). Source: Sauvage 1891

DISTRIBUTION WIO: Réunion and Mauritius (freshwater streams and rivers).

Cotylopus rubripinnis Keith, Hoareau & Bosc 2005

Redfinned cascade goby PLATE 46

Cotylopus rubripinnis Keith, Hoareau & Bosc 2005: 1397, Figs. 1–3 (Koualé River, Mayotte I., Comoros).

Second dorsal fin 1 spine, 9 or 10 rays; anal fin 1 spine, 10 rays; pectoral fins 15 or 16 rays. LSS 37–51; TRB 6–11; body scales sexually dimorphic: mostly ctenoid in males; females with cycloid scales on anterior third of body, and ctenoid scales on rear two-thirds of body; head, predorsal area, belly, pectoral-fin bases and usually anterior third of body naked.

Body grey to bluish grey, becoming yellow to reddish posteriorly; dorsal, caudal and pectoral fins orange to reddish, and 2nd dorsal fin and caudal fin with narrow black margin; anal fin with dusky rays, creamy membranes and blackish margin. Attains 48 mm SL.

DISTRIBUTION WIO: recorded from Mayotte and other small islands in Comoros.

GENUS *Sicyopterus* Gill 1860

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11 rays; anal fin 1 spine, 10 rays; pectoral fins 15–22. LSS 43–75; nape scaly, but naked in juveniles. Upper lip margin papillose, crenulate or with distinct deep clefts; 25–70 fine multicuspid teeth in upper jaw, separated at front of jaw by protrusion of soft tissue. No gill rakers on lower limb of 1st gill arch. Caudal fin with characteristic colour pattern in adults: fin whitish with oblique submarginal dusky streak dorsally and ventrally, and similar dusky streak from fin base to margin. About 35 species, in Indo-Pacific, in need of revision; possibly 3 species in WIO, all of which have been confused in the past and still require review (the names used here are provisional).

KEY TO SPECIES

- 1a Scales on predorsal area and belly much smaller than those on sides of body; LSS 58–63 2
- 1b Scales on predorsal area and belly more or less same size as those on sides of body; LSS 49–59 (usually 51–54) *S. punctissimus*

- 2a Ventral midline of belly fully scaly; pectoral fins plain greyish brown *S. lagocephalus*
- 2b Ventral midline of belly lacking scales; pectoral fins brown, paler distally, forming crescent-shaped dark band over fin *S. franouxi*

Sicyopterus franouxi (Pellegrin 1935)

Banded stream-goby PLATE 46

Sicydium franouxi Pellegrin 1935: 71 (Ankondro River, Ranopitso region, Madagascar).

Sicyopterus fasciatus: Smith 1959*; Maugé 1986; Bauchot *et al.* 1991; Stiassny & Raminosoa 1994.

Sicyopterus lagocephalus: Watson *et al.* 2000* [in part].

Sicyopterus franouxi: Stiassny & Harrison 2000; Sparks & Nelson 2004*.

Second dorsal fin and anal fin each with 1 spine, 10 rays; pectoral fins 18–19 rays. LSS 58–71; TRB 14–18; predorsal scales 18–31; scales on nape, abdomen and behind pectoral fins much smaller than those on sides of body. Third spine of 1st dorsal fin longest (very elongate in males).

Head and body brownish, with broad midlateral dark brown stripe extending onto caudal fin; females also with indistinct brownish vertical bars on sides of body; head with thin blackish curved teardrop-shaped mark from eyes to above corner of mouth; no horseshoe-shaped inframarginal mark on caudal fin. Breeding males almost black, but whitish ventrally. Attains 131 mm SL.



Sicyopterus franouxi, 83 mm SL, adult female (NE Madagascar). JS Sparks © AMNH

DISTRIBUTION WIO: Madagascar (mostly east coast; 1 record from northwest, in vicinity of Majunga).

REMARKS Apparently restricted to freshwater. Identified as *Sicyopterus fasciatus* in earlier publications.

Sicyopterus lagocephalus (Pallas 1770)

Blue stream-goby

PLATE 46

Gobius lagocephalus Pallas 1770: 14, Pl. 2, Figs. 6–7 (Ravine St Gilles, Réunion, Mascarenes).

Gobius caeruleus Lacepède 1800: 537 (Réunion, Mascarenes); Sauvage 1891.

Sicydium laticeps Valenciennes in Cuv. & Val. 1837: 177 (Réunion, Mascarenes); Sauvage 1891; Boulenger 1916*.

Gobius lienardi Bleeker 1875: 77 (Mauritius, Mascarenes) [based on *Gobius caeruleus* of Liénard].

Sicydium lagocephalum: Boulenger 1916.

?*Sicyopterus maritimus* Fourmanoir 1955: 205 (Comoros) [Fig. 1 depicts *Istigobius ornatus*].

Sicyopterus lagocephalus: Smith 1959; Teugels *et al.* 1985*; Maugé 1986 [in part]; Bauchot *et al.* 1991; Balon & Bruton 1994*; Keith *et al.* 1999*; Watson *et al.* 2000* [in part].

Sicyopterus caeruleus: Maugé 1986.

Second dorsal fin 1 spine, 10–12 (usually 11) rays; anal fin 1 spine, 10 rays; pectoral fins 17–21 rays. LSS 50–56; TRB 14–20; predorsal scales 3–20; scales on nape, abdomen and behind pectoral fins much smaller than those on sides of body. First dorsal fin pointed in adult males, and spines 3–4 longest.

Head and body with 8 or 9 brown bars or saddles across nape and back; midsides of body with ~8 brown blotches (may be indistinct), sometimes joining to form lateral stripe; head with blackish curved teardrop-shaped mark from eyes to above corner of mouth; caudal fin with dark horseshoe-shaped inframarginal mark. Breeding males bright blue, especially on ventral half of body, and caudal fin yellowish with black inframarginal line. Attains 107 mm SL.



Sicyopterus lagocephalus, 97 mm SL, adult male (Réunion). JS Sparks © AMNH

DISTRIBUTION Indo-Pacific region (freshwater). WIO: Madagascar, Comoros, Mauritius and Réunion; elsewhere to New Caledonia and French Polynesia.

REMARKS Found in freshwater; adults migrate downstream to breed, and juveniles migrate upstream in dense schools in summer (referred to as *bichiques* in catches on Réunion). May

have been confused with *S. punctissimus* in earlier publications. The correct name to apply to this species has been under considerable discussion, although designation of a neotype collected from Réunion has stabilised the name.

Sicyopterus punctissimus Sparks & Nelson 2004

Madagascar stream-goby

PLATE 46

Sicyopterus punctissimus Sparks & Nelson 2004: 10, Figs. 5–7

(large cascading tributary of Ankavanana River, Masoala Peninsula, Madagascar).

Sicyopterus lagocephalus: Maugé 1986 [in part]; Stiassny & Harrison 2000; Watson *et al.* 2000* [in part].

Second dorsal fin 1 spine, 10–11 rays; anal fin 1 spine, 10–11 rays; pectoral fins 18 or 19 rays. LSS 49–55; TRB 16 or 17; predorsal scales 11–18; scales on nape, abdomen and behind pectoral fins about same size as those on sides of body. First dorsal fin pointed, 3rd spine longest, more so in males.

Head and body brown, with wide dark brown midlateral stripe, and dark brown spotting on rear half of body and 2nd dorsal fin; pectoral fins and caudal fin brownish, with yellow upper and lower margins, and caudal fin without dark U-shaped inframarginal mark; head with distinct black curved mark from eyes to corner of mouth. Not strongly sexually dichromatic: females similar to males, but colouring duller. Attains 122 mm SL.



Sicyopterus punctissimus, 78 mm SL, male holotype (NE Madagascar). JS Sparks © AMNH

DISTRIBUTION WIO: northern Madagascar (freshwater).

REMARKS This species may have been confused with *S. lagocephalus* in earlier publications.

GLOSSARY

adnate – joined together.

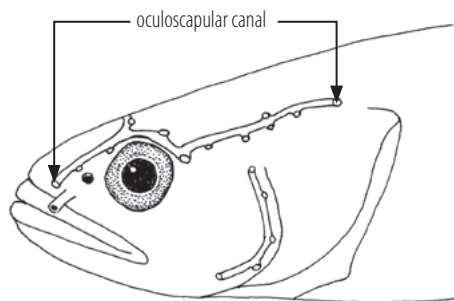
frenum – a connecting or restraining membrane.

FAMILY ELEOTRIDAE

Sleepers or gudgeons

Helen K Larson

Tiny to small-sized (~3–50 cm SL), gobioids with fusiform to oblong body, head usually short and broad, snout blunt to rounded, and 2 separate dorsal fins. First dorsal fin 2–10 spines; 2nd dorsal fin 1 spine, 6–17 rays; anal fin 1 weak spine, 6–12 rays; caudal fin broad and rounded, with 15–17 segmented rays, some branched; pectoral fins broad, with 11–25 rays; pelvic fins long, with 1 spine, 1–5 (usually 5) rays, and fins always separate at base. Last ray of 2nd dorsal fin and anal fin each divided to base but counted as single ray. Teeth usually small, sharp, and in several rows on both jaws. Branchiostegal rays 6; gill membranes broadly joined to isthmus. No lateral line on body. Scales small to large, cycloid or ctenoid; head usually scaly and with series of sensory canals and pores as well as cutaneous papillae.

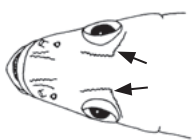


Eleotrid oculoscapular canal position.

Most inhabit fresh and brackish waters, although a few species are marine; members of *Calumia* are found on coral reefs. Occur worldwide in tropical to subtropical waters (except Mediterranean Sea). Two subfamilies (Butinae and Eleotridinae) with ~35 genera and 200 species; 7 genera and 12 species in WIO.

KEY TO GENERA

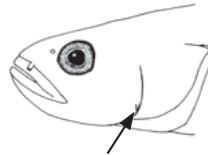
- 1a No bony ridge above eyes, and interorbital space smooth or scaly 2
- 1b Bony ridge or row of spiny serrations above eyes; several species with distinctly flattened and elongate snout [estuarine] *Butis*



Continued...

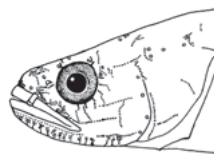
KEY TO GENERA

- 2a Preopercle margin smooth, without partly concealed sharp spine; transverse or longitudinal pattern of papillae on head 3
- 2b Preopercle with partly concealed downward-pointing sharp spine on lower rear margin; distinctly transverse pattern of papillae on head [estuarine to freshwater] *Eleotris*



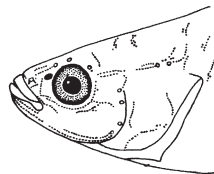
- 3a Head pores present, may be small or present only along preopercle margin 4
- 3b No head pores 6

- 4a Cheek with several distinct vertical rows of papillae below eyes; sides of body with dark brown or pale spots, and white bands across back (only in live fish, and very conspicuous in young) [estuarine to freshwater] *Ophiocara*



- 4b Cheek papillae in longitudinal pattern (may be difficult to see); body relatively plain or with dark lateral stripe 5

- 5a Cheek below eyes narrow, with ~2 rows of scales and few papillae; body brownish, with black mark on pectoral-fin bases and white spots on 2nd dorsal fin [estuarine to freshwater] *Hypseleotris*



- 5b Cheek below eyes relatively broad, with 5 or 6 rows of scales and longitudinal rows of papillae; body with orange, blue and yellow markings (live fish), and often with single dark lateral stripe and irregular black double blotch on pectoral-fin bases [estuarine to freshwater] *Giuris*

- 6a Predorsal area with 7–9 scales, and single large interorbital scale [coral reefs] *Calumia*

- 6b Predorsal area with 18–21 small scales, and interorbital space naked or with several small scales entering space posteriorly [freshwater] *Ratsirakia*

GENUS *Butis* Bleeker 1856

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 18–22 rays; caudal fin 17 segmented rays. LSS 24–31; head and body with strongly ctenoid scales (which enter interorbital space); snout scaly in some species, and auxiliary scales present in some species. Characteristic bony ridge or row of spiny serrations above eyes. Lower jaw protruding, especially in slender-bodied species. Gill opening wide, can reach to below rear of eye or to front of eye. Species of this genus are known for their unusual stalking behaviour, such as by hanging upside-down under a floating leaf or leaning against a twig, so as to ambush prey. Found in estuarine and marine habitats. Indo-Pacific; ~7 species, 3 in WIO.

KEY TO SPECIES

- 1a Head long and flattened anteriorly, jaws long and reach back past eyes in adults; no additional bony ridges on either side of snout 2
- 1b Head deep, with short jaws reaching to below front half of eyes; 2 short bony ridges on each side of snout beside nostrils *B. koilomatodon*
- 2a Teeth in outermost row in each jaw enlarged and pointed (can be nearly equal in size to innermost teeth); interopercle naked, or rarely with few scattered scales, and front half of chest nearly always naked *B. butis*
- 2b Teeth in outermost row in each jaw smaller than innermost teeth, which may be enlarged; interopercle with at least 1 row of scales, and chest usually fully scaly *B. humeralis*

Butis butis (Hamilton 1822)

Crimson-tipped sleeper

PLATE 47

Cheilodipterus butis Hamilton 1822: 57, 367 (Ganges River, below Kolkata, India).

Eleotris butis: Playfair 1867; Steindachner 1881; Sauvage 1891*.

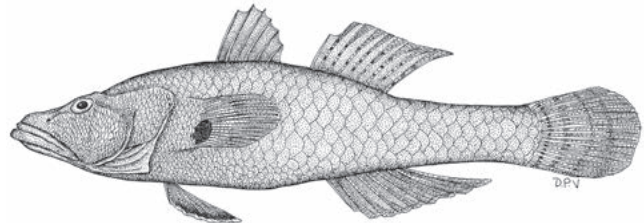
Butis butis: Smith 1949, 1958*; Maugé 1986; SSF No. 241.1*;

Stiassny & Raminosa 1994; Fricke *et al.* 2009.

Butis melanostigma (*non* Bleeker 1849): Hoese 1986*.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 8 rays; pectoral fins 18–21 rays. LSS 26–31; TRB 9–11; auxiliary scales present on body; predorsal scales extend onto snout. Large specimens relatively slender. Gill opening to below rear edge of eye or mid-eye.

Head and body of live fish usually with orange to reddish spots (preserved specimens may have fine black spots scattered over body); bright scarlet tips on 2nd dorsal fin and anal fin, and scarlet patch around dense black blotch at pectoral-fin bases; lips plain or spotted and mottled, but not distinctly banded. Attains 10 cm SL.



Butis butis, 9 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Mozambique to South Africa (Port St Johns, Eastern Cape), Madagascar, Comoros, Seychelles, Réunion, St Brandon Shoals and Sri Lanka; elsewhere to Bangladesh, South China Sea, New Guinea, Australia, Solomon Is., New Caledonia and Fiji.

Butis humeralis (Valenciennes 1837)

Flathead sleeper

PLATE 47

Eleotris humeralis Valenciennes in Cuv. & Val. 1837: 246 (Bengal, India).

Butis humeralis: Larson & Murdy in Carpenter & Niem 2001.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 8 rays; pectoral fins 18–20 rays. LSS 27–30; TRB 9–11; predorsal scales extend onto snout, but snout tip naked. Large specimens robust. Gill opening wide, to below front edge of eye.

Head and body of live fish pale brown to brownish, with several darker broad bars or blotches, more prominent in smaller fish; sides of body occasionally flecked with small black spots; tips of 2nd dorsal fin and anal fin often red; pectoral-fin bases with dark brown to black blotch in centre, with broad dull orange to red short horizontal bar above and below the blotch; lips distinctly banded, not plain or mottled. Attains 11 cm SL.

DISTRIBUTION Indo-Pacific. WIO: India; elsewhere to east coast of India, Thailand, Indonesia, Vietnam, Singapore and New Guinea.

REMARKS Found in estuarine habitats, such as mangroves.

Butis koilomatodon (Bleeker 1849)

Crested sleeper

PLATE 47

Eleotris koilomatodon Bleeker 1849: 21 (Madura Straits, Java, Indonesia).

Scorpaena diepiptera Bianconi 1862: 390, Pl. 11, Fig. 1 (Mozambique).

Eleotris delagoensis Barnard 1927: 70 (Maputo Bay, Mozambique).

Prionobutis koilomatodon: Smith 1958*; Smith & Smith 1963*;

Hoese & Winterbottom 1979; SSF No. 241.9*; Maugé 1986;

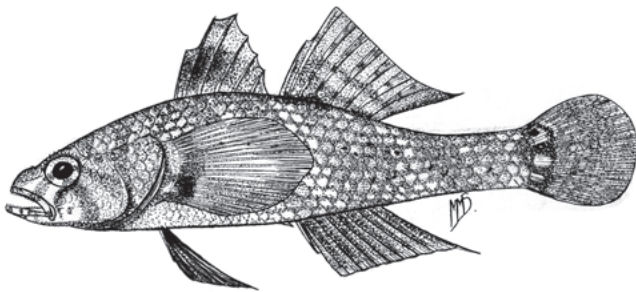
Stiassny & Raminosa 1994.

Butis caperatus: SFSA No. 939*; Smith 1961*.

Butis koilomatodon: Miller & Wongrat 1990.

Second dorsal fin 1 spine, 7 or 8 rays; anal fin 1 spine, 7–9 rays; pectoral fins 19–22. LSS 24–29; TRB 9 or 10; predorsal scales 11–15. Adults with deep body and head, and strongly serrated bony ridges on head and short snout, and eyes proportionally smaller in large specimens.

Body grey to brownish grey, with ~3 dark oblique bands (bands may be split forming 6 or 7 narrower bands); pale-edged black spot on pectoral-fin bases; blackish spot on 1st dorsal fin. Attains ~8.5 cm SL.



Butis koilomatodon, 6 cm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Mozambique (Maputo Bay) and Madagascar; elsewhere to India, Thailand, Indonesia, Philippines, China and northern Australia.

REMARKS Found in turbid estuarine waters, on rocky or muddy substrates. Accidentally introduced in West Africa (Niger Delta) and Brazil.

GENUS *Calumia* Smith 1958

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 6 or 7 rays; anal fin 1 spine, 6 or 7 rays; pectoral fins 13–17 rays, all unbranched; caudal fin 15 segmented rays. LSS 21–26; top and

sides of head with cycloid scales, and 1 enlarged interorbital scale; body scales ctenoid. Body compressed, head depressed. No sensory pores on head. Anterior nostril long and slender, placed on snout just behind upper lip. Gill opening wide, to below rear edge of preopercle or to below eye. Marine, found on coral reefs. At least 4 species, 1 in WIO.

Calumia godeffroyi (Günther 1877)

Godeffroy's calumia

PLATE 47

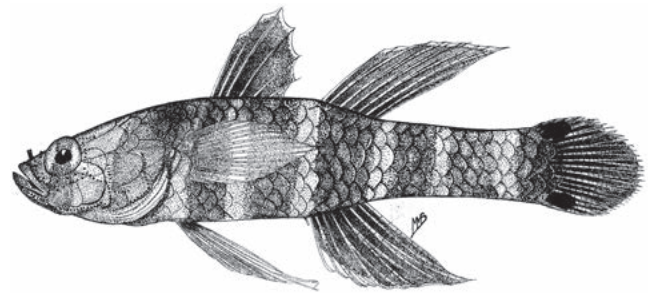
Eleotris godeffroyi Günther 1877: 188, Pl. 122b (Raiatea and Tahiti, Society Is.).

Calumia biocellata Smith 1958: 148, Pl. 2k, Fig. 8 (Zanzibar, Tanzania); Smith & Smith 1963*.

Calumia godeffroyi: Hoese & Winterbottom 1979; Larson & Hoese 1980*; SSF No. 241.3*; Winterbottom & Emery 1986*; Winterbottom & Anderson 1997.

First dorsal fin with 3rd and 4th spines longest; 2nd dorsal fin and anal fin each with 1 spine, 6 or 7 rays; pectoral fins 16 or 17 rays; pelvic-fin rays branched. LSS 21–23; TRB 7 or 8. Gill opening to below rear edge of preopercle.

Body fawn to orange-brown, with 5 dark greyish bands and 1 blackish bar across nape; both dorsal fins and anal fin black; large black spot at upper and lower edge of caudal-fin base. Attains ~3 cm SL.



Calumia godeffroyi, ~3 cm TL, holotype of *C. biocellata* (Tanzania).

Source: Smith 1958

DISTRIBUTION Indo-Pacific (widespread). WIO: Tanzania (Zanzibar) to Mozambique, Comoros, Seychelles and Chagos; elsewhere to Thailand, Indonesia, Philippines, southern Japan, Micronesia, New Guinea, Solomon Is., Australia, Great Barrier Reef, New Caledonia, Tonga and French Polynesia.

REMARKS Found in crevices on coral reefs or on coral rubble, at 4–30 m.

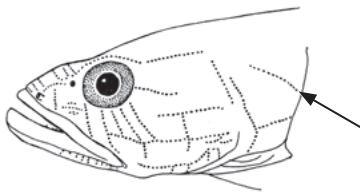
GENUS *Eleotris* Bloch & Schneider 1801

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7–9 rays; pectoral fins 14–20 rays; caudal fin 15 segmented rays. LSS 43–65; predorsal area fully scaled. Distinctive transverse pattern of sensory papillae on cheek and preopercle margins (species best distinguished by papillae pattern). Preopercle with characteristic, stout, down-curved

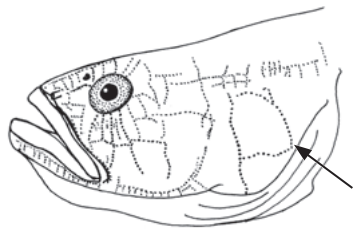
spine on lower rear margin (spine covered with skin in live fish). Mouth large, lower jaw protruding. Gill opening moderate, reaching forward to below rear margin of preopercle. Body dark brown with few distinguishing markings, often with fine darker lines following scale rows, and dark streaks radiating from eye across cheek. Inhabits fresh to brackish waters. This genus is in need of revision. At least 22 species worldwide, 4 in WIO at time of going to press, all in need of study.

KEY TO SPECIES

- 1a Upper oblique row of papillae on opercle nearly reaches rear edge of opercle, does not curve down to meet lower oblique row of papillae 2

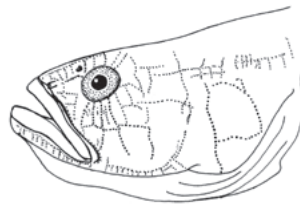


- 1b Upper oblique row of papillae on opercle curves downward to touch rear of lower oblique row of papillae 3

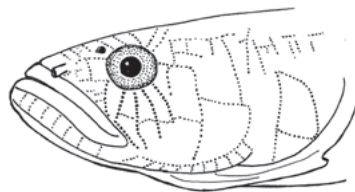


- 2a Patch of teeth on vomer; only anteriormost tip of 1st gill arch bound by membrane to inner face of opercle *E. vomerodentata*
- 2b No teeth on vomer; anterior third to half of 1st gill arch bound by membrane to inner face of preopercle *E. pellegrini*

- 3a Transverse rows of papillae numbering 8–12 along lower edge of preopercle, between preopercle spine and end of jaws; rows 2, 4 and 6 of the seven papillae transverse rows below eye extending ventrally past horizontal row on cheek (rows 3 and 5 may be very short and not reach horizontal row); usually extra papillae or short rows in between main rows on cheek and along preopercle edge; only anteriormost tip of 1st gill arch bound by membrane to inner face of opercle *E. fusca*



- 3b Transverse rows of papillae numbering 6–9 along lower edge of preopercle between preopercular spine and end of jaws; rows 2–4 of the five transverse papillae rows below eye extending ventrally past horizontal row on cheek; very rarely with extra papillae or short rows in between main rows along preopercular edge or on cheek; anterior quarter to third of 1st gill arch bound by membrane to inner face of preopercle *E. melanosoma*

*Eleotris fusca* (Bloch & Schneider 1801)

Dusky sleeper

PLATE 47

Poecilia fusca Bloch & Schneider ex Forster 1801: 453 ([Raiatea] Society Is., French Polynesia).

?*Eleotris mauritanus* Bennett 1832: 166 (Mauritius, Mascarenes).

Eleotris fornasini Bianconi 1857: 267, Pl. 8 (Mozambique).

Eleotris fusca: Playfair 1867; Sauvage 1891*; Smith 1949* [in part], 1958* [in part]; Hoese & Winterbottom 1979; Teugels *et al.* 1985;

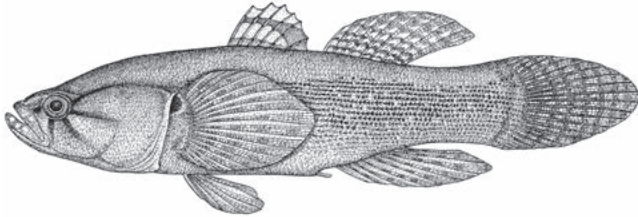
SSF No. 241.4*; Maugé 1986; Skelton 1993*; Whitfield 1998*; Keith *et al.* 1999*; Stiassny & Harrison 2000; Seegers *et al.* 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009.

Eleotris klunzingerii Pfeffer 1893: 142 [14], Pl. 3, Fig. 8 (Zanzibar, Tanzania).

Eleotris fusca: Stiassny & Raminosa 1994.

Second dorsal fin 1 spine, 8 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 17–19 rays. LSS 55–65; TRB 17–21; predorsal scales 33–53. Head width always greater than head depth.

Head and body dark brown; each body scale with dark spot, giving impression of many fine dark lines along sides, and sometimes with scattered small blackish spots; black spot on upper part of pectoral-fin bases (may be partly hidden by gill membrane), remainder of bases with pale and dark marbled or ocellated pattern. Attains 22 cm SL.



Eleotris fusca, 8 cm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (Sundays River, Eastern Cape), Madagascar, Comoros, Aldabra, Seychelles, Mascarenes, Maldives and India; elsewhere to China, Rapa Iti and Hawaii.

REMARKS Found in estuaries, mangroves and freshwater streams entering coastal lagoons. This species is in need of review; specimens from Madagascar, the Mascarenes and Réunion may represent separate species.

Eleotris melanosoma Bleeker 1853

Broadhead sleeper

Eleotris melanosoma Bleeker 1853: 705 (Wahai, Sumatra, Indonesia); Smith 1958*.

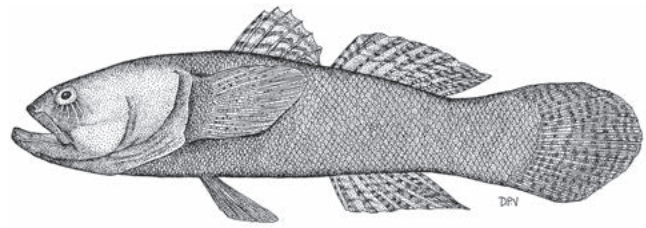
Eleotris soaresi Playfair in Playfair & Günther 1867: 74, Pl. 9, Fig. 4 (Mozambique) [in part].

Eleotris fusca: Smith 1949 [in part].

Eleotris melanosoma: Hoese & Winterbottom 1979; Maugé 1986; SSF No. 241.6*; Randall & Goren 1993; Skelton 1993*.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8 rays; pectoral fins 16–20 rays. LSS 46–60; TRB 22–24; predorsal scales 37–62.

Head and body dark brown to blackish, body usually plain dark brown with scattered small black spots; 3 blackish short oblique lines crossing preopercle from eye; 1st dorsal fin hyaline to whitish, with 2 blackish bands, one along fin base and one along centre of fin, bands may be mottled or coalesced; 2nd dorsal fin and anal fin speckled or plain brown, fin margins whitish or translucent; caudal fin plain dark brown. Attains 12 cm SL.



Eleotris melanosoma, 10 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Tanzania (Zanzibar) to South Africa (Qora River mouth), Madagascar, Seychelles and Maldives; elsewhere to Indonesia, Malaysia, Philippines, Timor-Leste, southern Japan, Micronesia, New Guinea, Solomon Is., Australia, New Caledonia, Tonga and French Polynesia.

REMARKS May represent more than one species; the name *E. soaresi* Playfair may apply to the WIO population.

Eleotris pellegrini Maugé 1984

Widehead sleeper

PLATES 47 & 48

Eleotris (Culius) vittata: Pellegrin 1932*, 1933*.

Eleotris vittata: Arnoult 1959*.

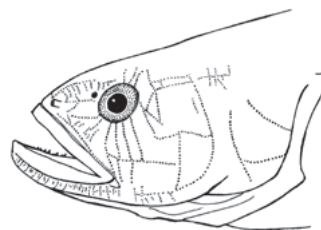
Eleotris fusca: SFSA No. 938* [in part]; Smith 1958 [in part]; Keith *et al.* 1999*.

Eleotris pellegrini Maugé 1984: 98 (near Fort Dauphin, Madagascar) [in part]; Maugé 1986; Stiassny & Raminosoa 1994.

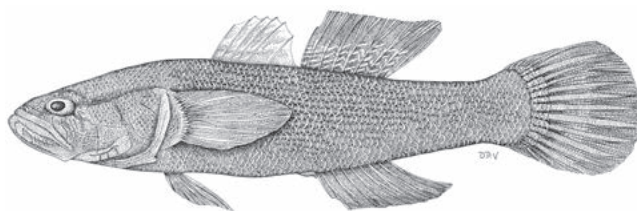
Eleotris mauritanus: SSF No. 241.5*; Terashima *et al.* 2001*; Fricke *et al.* 2009.

Second dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 7 or 8 rays; pectoral fins 14–17 rays. LSS 51–61; TRB 17–20; predorsal scales 37–47. Head width may be less than head depth.

Body dark brown with black speckles and indistinct dark mottling, or pale brown and patterned with spots, saddles, irregular, marbled paired bars (bars sometimes unpaired, narrow and oblique); pectoral-fin bases with pale and dark brown ocellated pattern, and black blotch often present dorsally (usually distinct in small specimens); 2–4 dark brown oblique stripes from eye across preopercle, often relatively conspicuous. Attains ~10 cm SL.



Eleotris pellegrini, 10 cm SL (Réunion).



Eleotris pellegrini, 11 cm SL (South Africa). Source: SSF

DISTRIBUTION WIO: Mozambique, South Africa (Mthatha River mouth), Madagascar, Comoros, Seychelles and Mascarenes.

REMARKS Maugé's (1984) syntypes consist of two species.

Eleotris vomerodentata Maugé 1984

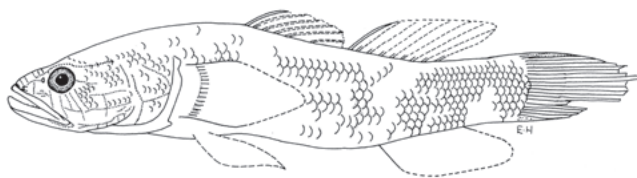
Toothed sleeper

Eleotris (*Kieneria*) *vomerodentata* Maugé 1984: 98 (Pangalanes at Andavoranto, east coast of Madagascar); Maugé 1986.

Eleotris vomerodentata: Stiassny & Raminosoa 1994.

Second dorsal fin and anal fin each with 1 spine, 8 rays; pectoral fins 15 or 16 rays. LSS 57; TRB 17; predorsal scales 37. Sensory papillae in 5 transverse rows below eye, row behind eye not reaching longitudinal row on preopercle, and few short transverse rows along ventral edge of preopercle. Irregular oval patch of small pointed teeth on vomer. Gill opening reaching forward to rear margin of preopercle.

Head and body dark brown, with 3 dark brown oblique streaks from ventral and rear edges of eye to across preopercle. Attains ~7.5 cm SL.



Eleotris vomerodentata, 8 cm SL, holotype (E Madagascar).

DISTRIBUTION WIO: Madagascar.

REMARKS Known from few specimens collected from freshwater. Possesses vomerine teeth, unlike all other *Eleotris* species.

GENUS *Giuris* Sauvage 1880

First dorsal fin 5 or 6 spines; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8–10 rays; pectoral fins 13–15; caudal fin 15 segmented rays. LSS 28–32; scales on head large, even those in interorbital space. Head pores reduced, with no oculoscapular canal or pores, and only 2 preopercular pores; sensory papillae in longitudinal pattern. Short anterior nostril. Gill opening moderate, reaching rear margin of preopercle or slightly further forward. Inhabits estuaries and freshwater habitats. Indo-Pacific; 11 nominal species, all in great need of revision, 1 species in WIO.

Giuris margaritaceus (Valenciennes 1837)

Snakehead sleeper

Eleotris margaritacea Valenciennes in Cuv. & Val. 1837: 240 (Vanikoro I., Santa Cruz Is., Solomon Is.).

Eleotris ophiocephalus: Day 1876; Peters 1876.

Eleotris macrolepidotus var. *tumifrons*: Steindachner 1881.

Eleotris ophiocephalus: Sauvage 1891* [in part].

Ophiocara aporos: Smith 1958*, 1961.

Eleotris macrolepidota: Arnoult 1959*.

Ophiocara macrolepidota: Maugé 1986; Stiassny & Raminosoa 1994.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 8–10 rays; pectoral fins 13–15 rays. LSS 28–32; TRB 9–12; predorsal scales 13–21.

Preserved specimens with pale to dark brown head and body, with single greyish brown stripe (~1 scale width) on each side of body; 2 dark oblique streaks from rear of eye to posteroventral corner of preopercle; pectoral-fin bases with slightly oblique dark bar across centre. Attains 22 cm SL.



Giuris margaritaceus (India). Source: Day 1876

DISTRIBUTION Indo-Pacific (widespread). WIO: South Africa (KwaZulu-Natal), Madagascar, Seychelles and India; elsewhere to Andaman Is., Indonesia, Philippines, Timor-Leste, Palau, New Guinea, Solomon Is., Australia and Fiji.

REMARKS Occurs in freshwater, less often in estuaries. The WIO population may represent an undescribed species.

GENUS *Hypseleotris* Gill 1863

First dorsal fin 5–7 (usually 6) spines; 2nd dorsal fin 1 spine, 9–11 rays; anal fin 1 spine, 9–11 rays; pectoral fins 13–16 rays; caudal fin 15 segmented rays. LSS 24–34; predorsal area scaly or naked; body with ctenoid scales; head, pectoral-fin bases, breast and belly with ctenoid or cycloid scales. Head and body compressed; mouth small. Gill opening to below rear margin of preopercle. Swims above the substrate and may form loose schools. Small-sized, occur mostly in freshwater, and most speciose in Australia. This group is in need of revision. Indo-Pacific; at least 10 species, 1 in WIO.

Hypseleotris cyprinoides (Valenciennes 1837)

Golden sleeper

PLATE 48

Eleotris cyprinoides Valenciennes in Cuv. & Val. 1837: 248

(Saint-Maurice River, Réunion, Mascarenes).

Asterropteryx cyprinoides: Bleeker 1875.

Eleotris tohizonae Steindachner 1880: 245, Pl. 2, Fig. 2 (Tohizona River, east coast of Madagascar); Fourmanoir 1955; Smith 1958; Arnoult 1959*.

Eleotris tohizonae: Jatzow & Lenz 1898.

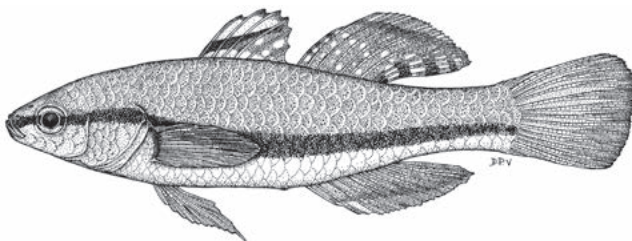
Hypseleotris dayi Smith 1950: 707, Fig. 2 (Lake St Lucia, South Africa); Smith 1958; Hoese & Winterbottom 1979; Maugé 1986; SSF No. 241.7*.

Hypseleotris cyprinoides: Smith 1958; Maugé 1986; Keith *et al.* 1999*; Fricke *et al.* 2009.

Hypseleotris tohizonae: Maugé 1986; Stiassny & Raminosoa 1994.

Second dorsal fin 1 spine, 7–9, usually 8 rays; anal fin 1 spine, 9–11 rays; pectoral fins 12–15 (usually 14) rays. LSS 24–28; TRB 8–10; opercle with ctenoid scales; cheek with cycloid scales, ctenoid scales near rear preopercular margin.

Most distinctive markings are narrow, vertical, blackish bar over pectoral-fin bases and distinct to diffuse black spot on lower caudal-fin rays, just below middle of fin; 2nd dorsal fin with characteristic rows of black and white ocellated spots, most pronounced posteroventrally on fin. Attains ~6.5 cm SL.



Hypseleotris cyprinoides, 4 cm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: South Africa (Kosi Bay and St Lucia to Mpambanyoni River estuary, KwaZulu-Natal), Madagascar, Comoros and possibly Réunion.

REMARKS Occurs in fresh to brackish waters, with a marine larval stage. Recorded from Réunion only as the type specimens of *Eleotris cyprinoides* and a single specimen collected in 2007 (by Philippe Keith and colleagues). There appears to be only one species in the region; however, further work may establish the validity of one or more of the species listed in the synonymy here.

GENUS *Ophiocara* Gill 1863

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 rays; pectoral fins 13–15 rays; caudal fin 17 segmented rays. LSS 33–39; head, cheek and opercle covered with scales. Complete oculoscapular canal on head; 5 preopercle pores; sensory papillae in transverse pattern. Long anterior nostril, which reaches over upper lip. Gill opening wide, reaching forward to below rear edge of eye. Large-sized, found in fresh to brackish water. Indo-Pacific; 12 nominal species, but work is required to determine how many of these apply to actual species.

Ophiocara porocephala (Valenciennes 1837)

Spangled sleeper

PLATE 48

Eleotris porocephala Valenciennes in Cuv. & Val. 1837: 237 (Seychelles; New Ireland, Bismarck Archipelago).

Eleotris madagascariensis Valenciennes in Cuv. & Val. 1837: 240 (Madagascar); Sauvage 1891*.

Eleotris ophicephalus: Bleeker 1875.

Eleotris ophicephalus: Sauvage 1891* [in part]; Arnoult 1959*.

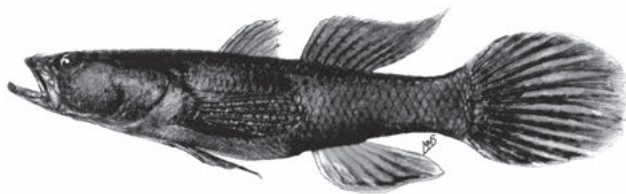
Eleotris limosus Smith 1936: 52, Pls. 4–5, Fig. B (Isipingo Lagoon, KwaZulu-Natal, South Africa); SFSA No. 941*.

Ophiocara aporos: SFSA No. 942; Smith 1961*.

Ophiocara porocephala: Smith 1958*; Smith & Smith 1963*; Hoese & Winterbottom 1979; Maugé 1986; SSF 241.8*; Stiassny & Raminosoa 1994; Terashima *et al.* 2001*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Second dorsal fin 1 spine, 8 or 9 rays; anal fin 1 spine, 7 rays; pectoral fins 13–15 rays. LSS 33–39; TRB 12–16; predorsal scales 15–26, entering interorbital space.

Head and body brown to greyish brown, with scattered dark brown spots on sides, live fish distinctively marked with whitish or golden spots scattered along sides of body; 2nd dorsal fin and caudal fin with rows of fine brown and whitish spots; 1st dorsal fin and anal fin unspotted; live young fish with triangular white saddles on back. Attains 25 cm SL.



Ophiocara porocephala, 32 cm TL (WIO). Source: Smith 1958

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (KwaZulu-Natal), Madagascar, Comoros, Seychelles, Réunion, Mauritius and Sri Lanka; elsewhere to Andaman Is., Thailand, Malaysia, Indonesia, Philippines, Taiwan, southern Japan, Micronesia, Solomon Is., Australia, New Caledonia and Fiji.

REMARKS Occurs in mangroves and shallow estuaries and enters freshwater.

GENUS *Ratsirakia* Maugé 1984

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 7–9 rays; anal fin 1 spine, 6–9 rays; pectoral fins 14–17 rays; caudal fin 15 segmented rays, usually all branched. LSS 28–36; predorsal scales 21–24; body scales ctenoid, with cycloid scales on predorsal area, opercle, small patch behind eyes on preopercle, pectoral-fin bases, pre-pelvic area and belly. No head pores; sensory papillae on head in mostly transverse pattern, characterised by short proliferated rows below eyes and long oculoscapular rows. Body compressed, relatively slender, becoming more robust with size; head cylindrical to slightly depressed; eyes large. Gill opening wide, reaching forward to preopercular margin. One species described, possibly 3 other species in WIO.

Ratsirakia legendrei (Pellegrin 1919)

Ratsirakia

PLATE 48

Eleotris legendrei Pellegrin 1919: 270 (Lac Alaotra, Antananarivo, Madagascar); Pellegrin 1932; Smith 1958; Arnould 1959*.

Ratsirakia legendrei: Maugé 1984, 1986; Stiassny & Raminosoa 1994; Reinthal & Stiassny 1997.

Diagnosis as for genus.

Head and body golden-brown, with indistinct dark brown barring and mottling on sides, but body and fins almost entirely black in large adults; cheeks and lower part of opercle paler than rest of head, with 2 brown short and narrow horizontal streaks from lower edge of eye and crossing cheek;

pectoral-fin bases with blackish triangular spot dorsally, and vertical dark yellow bar (white in preserved specimens) crossing bases of yellowish to pale brown pectoral-fin rays; bright yellow bar over bases of pectoral-fin rays remains distinct at all sizes; dorsal fins and caudal fin translucent to dusky (may be yellow basally), with irregular rows of yellowish and dark brown spots and irregular narrow bands; anal fin yellow at least on basal half. Attains 12 cm SL.

DISTRIBUTION Known only from freshwater lakes and rivers of Madagascar in WIO region.

GLOSSARY

hyaline – translucent.

FAMILY MICRODESMIDAE

Wormfishes and dartgobies

Helen K Larson

Small-sized (~3–11 cm TL) gobioids with elongate and often highly compressed body, 2 separate or continuous dorsal fins, and often very long-based dorsal and anal fins. Dorsal fins 6–28 spines, 9–66 rays; anal fin with or without spine, 9–61 rays; pectoral fins 10–26 rays; pelvic fins usually separate or nearly so, with 1 spine, 2–5 rays, and no pelvic frenum; caudal fin rounded, truncate or emarginate, with 15 or 17 segmented rays, some upper and lower rays undivided. Eyes large, laterally placed. Mouth small to moderate, often steeply oblique; chin prominent (especially pronounced in members of Microdesminae). Teeth caniniform, in several rows in both jaws, and may be present on vomer. Scales very small, usually cycloid, mostly embedded and usually not overlapping, but scales absent in some species; LSS 37–170. Lateral-line pores on head present or absent; sensory papillae may be reduced, in transverse pattern.

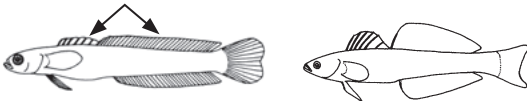
Two subfamilies are currently recognised: the Microdesminae (wormfishes, including the genera *Gunnellichthys* and *Paragunnellichthys*), most often found hovering over coral sand banks or seagrass beds on or near coral reefs, and the Ptereleotrinae (dartgobies, including the genera *Nemateleotris*, *Parioglossus* and *Ptereleotris*), typically found hovering near or on coral reefs. Other classifications exist. Occur in pairs, small groups, or sometimes in large schools. Twelve genera and at least 80 species worldwide; 5 genera and 22 species in WIO.

KEY TO GENERA

1a Dorsal fins appear as single fin (difficult to determine where 1st and 2nd dorsal fins begin or end), with 56–63 rays; body greatly elongate 2

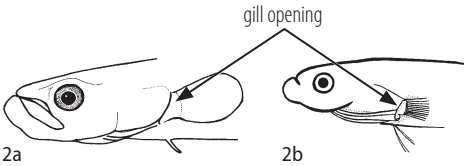


1b Dorsal fins usually separate, but if joined the two fins still distinguishable; 2nd dorsal fin 1 spine, 23–39 rays; body slender but not greatly elongate 3



2a Pelvic fins 4 rays; 2nd dorsal fin 36–42 rays; gill opening slit-like, not tubular, and just wider than pectoral-fin base *Gunnellichthys*

2b Pelvic fins 2 rays; 2nd dorsal fin 30–34 rays; gill opening inflated, tubular, and restricted to pectoral-fin base *Paragunnellichthys*



3a Pelvic fins 4 rays; usually no median fleshy ridge on nape 4

3b Pelvic fins 5 rays; low fleshy median ridge on nape, from between eyes to 1st dorsal-fin origin *Nemateleotris*

4a Gill opening restricted to pectoral-fin base or reaching forward to under opercle; 2nd dorsal fin 1 spine, 13–19 rays; low and skinny crest sometimes visible on nape, before 1st dorsal fin ... *Parioglossus*

4b Gill opening wide, reaching to below rear edge of preopercle; 2nd dorsal fin 1 spine, 22–39 rays; no median fleshy ridge on nape *Ptereleotris*

GENUS *Gunnellichthys* Bleeker 1858

Dorsal fins appear continuous, 20–22 spines, 36–42 rays; anal fin 36–41 rays; pectoral fins 11–16 rays; pelvic fins 1 spine, 4 rays; caudal fin 15 segmented rays. LSS ~200–250, cycloid, non-imbricate and difficult to count. Body very slender, compressed, eel-shaped. Chin especially prominent; snout fleshy and overhanging tip of upper lip. Gill opening slit-like, not tubular, extending forward to under opercle. Found on

shallow, protected coral reefs, typically hovering over sand, rubble or near seagrasses. At least 7 species, 5 in WIO.

KEY TO SPECIES

1a Black spot on opercle and/or caudal fin 2
1b No black spot on either opercle or caudal fin 3

2a Small black blotch at rear of opercle; no elongate black mark on caudal fin *G. monostigma*
2b Black blotch on upper rear corner of opercle, and elongate black spot at caudal-fin base, extending halfway onto fin *G. curiosus*

3a Purple stripe below eye, reaching rear margin of opercle; body whitish with no lateral stripe from eyes to caudal fin and no dorsomedian stripe from snout tip to dorsal fin *G. irideus*
3b Yellow to dark orange lateral stripe along body, from snout tip to caudal-fin margin; dark orange to brown dorsomedian stripe from snout tip to dorsal fin 4

4a Body yellowish; dark orange-brown stripe along midside of body, from snout tip to caudal-fin margin, stripe becoming more orange posteriorly; dorsomedian stripe on head dark brown *G. copleyi*
4b Body whitish to bluish white; yellow to dark orange lateral stripe along midsides of body, from snout tip to caudal-fin margin; dorsomedian stripe on head dark orange, extending onto dorsal fin *G. viridescens*

Gunnellichthys copleyi (Smith 1951)

Copley's wormfish

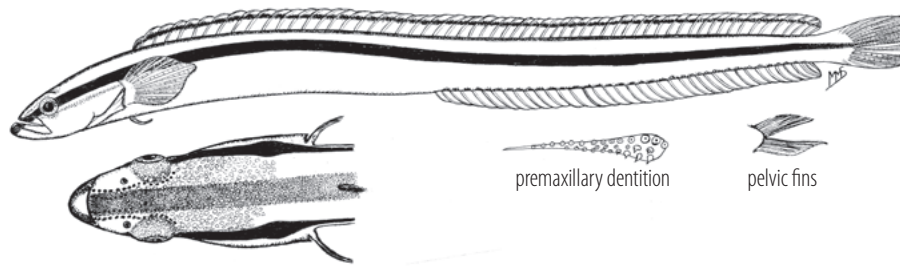
PLATE 49

Paragobioides copleyi Smith 1951: 521, Figs. 1–2 (Pinda, Mozambique; Mombasa, Kenya).

Gunnellichthys copleyi: Smith 1958*; Heemstra *et al.* 2004.

Dorsal fins 20 spines, 40–42 rays; anal fin 38–40 rays; pectoral fins 13–14 rays. Head covered with small cycloid scales; pectoral-fin bases, breast and belly with non-imbricate cycloid scales. Gill opening to just anterior to pectoral-fin base.

Head and body pale yellow, with dark brown dorsomedian stripe from snout tip to dorsal-fin origin narrowing and continuing along dorsal-fin base; dark orange-brown stripe along midsides of body, from snout tip to caudal-fin margin, stripe more orange on head and caudal fin, and midlateral stripe bordered with blue. Attains 120 mm TL.



Gunnellichthys copeleyi, 75 mm TL (East Africa). Source: Smith 1951



Gunnellichthys curiosus, 57 mm SL (Comoros). © R Winterbottom, ROM

DISTRIBUTION WIO: Kenya, Mozambique, Madagascar, Aldabra, Seychelles and Rodrigues.

REMARKS Very similar to *G. pleurotaenia* from the western Pacific, with which it may be conspecific.

Réunion (photographs only), Rodrigues and Maldives; elsewhere to Hawaii and New Caledonia.

REMARKS Found over sand and rubble in lagoons or on reef slopes, at 4–60 m.

Gunnellichthys curiosus Dawson 1968

Streakfin wormfish

PLATES 48 & 49

Gunnellichthys curiosus Dawson 1968: 54, Figs. 1–4 (Curieuse I., Seychelles); Allen & Steene 1987*; Randall & Anderson 1993; Randall & Goren 1993; Eichler & Lieske 1994*; Kuitert 1998*; Heemstra *et al.* 2004; Fricke *et al.* 2009.

Dorsal fins 20–21 spines, 40–42 rays; anal fin 38–40 rays; pectoral fins 14 or 15 rays. Predorsal scales extending forward to eyes; cycloid scales on upper part of opercle. Gill opening to just anterior to pectoral-fin base.

Head and body pale blue, brighter on head; broad orange lateral stripe from snout tip to caudal-fin base; black blotch on upper rear corner of opercle; dorsal fin reddish to orange; distinctive, elongate, bright-blue-edged black spot at caudal-fin base and extending halfway onto fin. Attains 76 mm SL.

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay and Aliwal Shoal), Madagascar, Comoros, Seychelles,

Gunnellichthys irideus Smith 1958

Plain wormfish

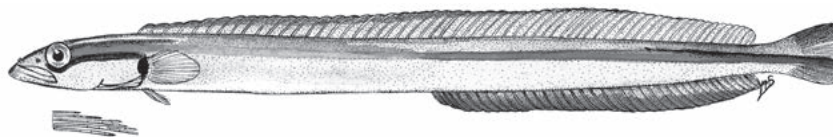
Gunnellichthys irideus Smith 1958: 128, Fig. 2f (Pinda, Mozambique).

Dorsal fins 20 spines, 38 rays; anal fin 36 rays; pectoral fins 12 rays. Sides of head covered with non-imbricate cycloid scales; breast and belly naked. Gill opening to under opercle.

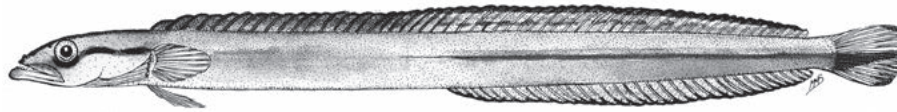
Head whitish, purplish dorsally, with irregular purple stripe below eye reaching back to end of opercle, preorbital area yellow, lower jaw reddish; body milky white, greenish dorsally, lower sides bluish, becoming pale orange posteriorly; caudal fin translucent ventrally, greenish dorsally, with red to orange stripes and bars. Preserved fish plain with no distinguishing stripes or spots. Attains 85 mm TL.

DISTRIBUTION WIO: Northern Mozambique.

REMARKS Known from few specimens, taken from sandy intertidal habitat.



Gunnellichthys irideus, 77 mm TL, holotype (N Mozambique). Source: Smith 1958



Gunnellichthys monostigma, 74 mm TL, holotype (N Mozambique). Source: Smith 1958

Gunnellichthys monostigma Smith 1958

Blackspot wormfish

PLATES 48 & 49

Gunnellichthys monostigma Smith 1958: 127, Fig. 2e (Pinda, Mozambique); Debelius 1993*; Randall & Anderson 1993; Randall & Goren 1993*; Winterbottom & Anderson 1997*; Kuitert 1998*.
Gunnellichthys viridescens: Kuitert 1998*.

Dorsal fins 21 spines, 36–40 rays; anal fin 36–41; pectoral fins 14 or 15 rays. Cheek and opercle with few scattered non-imbricate cycloid scales. Gill opening to just under opercle.

Head and body pearly white to bluish white, with small black blotch at rear of opercle, and blue-bordered pale orange irregular stripe on sides of head through eyes; indistinct blue stripe may be present on sides of body. Attains 97 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique to Chagos and Maldives; elsewhere to Japan, Micronesia, Australia, Society Is. and Marquesas Is.

REMARKS Found singly or in loose groups over sandy slopes in lagoon habitats, to ~42 m deep; dives head first into burrow or substrate when threatened.

Gunnellichthys viridescens Dawson 1968

Yellowstripe wormfish

PLATES 48 & 49

Gunnellichthys viridescens Dawson 1968: 61, Figs. 2–5 (Anonyme I., Seychelles); Randall & Anderson 1993; Randall & Goren 1993; Randall *et al.* 1994*; Randall 1995*.

Dorsal fins 20 or 21 spines, 38–41 rays; anal fin 36–40 rays; pectoral fins 12 or 13 rays. Predorsal area with few scattered scales; cheek and opercle with non-imbricate cycloid scales. Gill opening to pectoral-fin base.

Head and body whitish to bluish white, with dark orange dorsomedian stripe extending onto dorsal fin, yellow to dark orange lateral stripe along body from snout tip to caudal-fin margin. Attains 65 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Seychelles and Maldives; elsewhere to Indonesia, Japan, Marshall Is., Australia and French Polynesia.

REMARKS Found over sandy and rubble substrates, at 0.5–37 m.

GENUS *Nemateleotris* Fowler 1938

First dorsal fin tall, variably developed, with 6 spines; 2nd dorsal fin 1 spine, 27–32 rays; anal fin 1 spine, 27–32 rays; pectoral fins 19–21 rays; pelvic fins 1 spine, 5 rays, fins mostly separate and connected only at bases of 5th rays; caudal fin 17 segmented rays. Body scales cycloid anteriorly, ctenoid posteriorly; no predorsal scales, but sometimes with cycloid scales on sides of nape over opercle; LSS 110–160. Head and body compressed; eyes large, laterally placed. Median fleshy ridge on nape from interorbital region to 1st dorsal fin. Head pores present; sensory papillae small, in transverse pattern. Gill opening extends forward to below eye or at least rear edge of preopercle. Three species, 2 in WIO.

KEY TO SPECIES

- 1a Filamentous part of 1st dorsal-fin spine elongate, usually reaching to rear of 2nd dorsal fin; 2 oblique black lines on caudal fin, converging posteriorly *N. magnifica*
- 1b Filamentous part of 1st dorsal fin less elongate, usually not reaching beyond anterior third of 2nd dorsal fin; medial broad dark blue to blackish stripe on caudal fin *N. decora*

Nemateleotris decora Randall & Allen 1973

Elegant firegoby

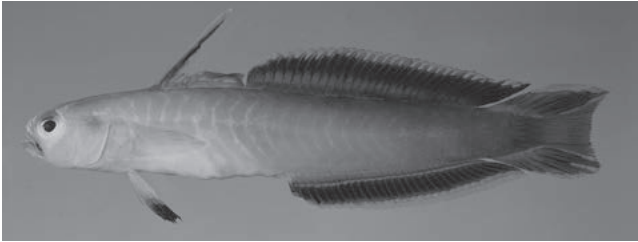
PLATE 49

Nemateleotris decora Randall & Allen 1973: 361, Figs. 3b, 6–7 (Augulupelu Reef, Palau Is.); Cornic 1987*; Debelius 1993*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Kuitert 1998*; Fricke *et al.* 2009.

Nemateleotris exquisita Randall & Connell 2013: 23–28, Figs. 9–11 (west coast off Wolmar, Mauritius, Mascarenes).

First dorsal fin pennant-like, first and second spines elongate; 2nd dorsal fin 1 spine, 27–32 rays; anal fin 1 spine, 28–31 rays; pectoral fins 20 or 21 rays; pelvic fins somewhat pointed; caudal fin emarginate. LSS 135–160.

Body yellowish fawn to buff, becoming deep blue to purple posteriorly, with blue to purple snout, lips and top of head; eyes and anterior part of head yellow; fins violet to red, with blue margins on dorsal fins and anal fin. Attains 60 mm SL.



Nemateleotris decora, 60 mm SL (Mauritius). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Red Sea, South Africa (Sodwana Bay), Mauritius, Réunion (photographs only) and Maldives; elsewhere to Ryukyu Is., Palau, New Caledonia and Samoa.

REMARKS Occurs in pairs or small groups, hovering just above substrate, on outer reef slopes and drop-offs, at 27–70 m. *Nemateleotris exquisita* is a synonym.

Nemateleotris magnifica Fowler 1938

Red firegoby

PLATES 49 & 50

Nemateleotris magnificus Fowler 1938: 131 (Buka Buka I., Sulawesi, Indonesia); Cornic 1987*.

Nemateleotris magnifica: SSF No. 240.64*; Winterbottom & Emery 1986*; Debelius 1993*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*; Branch *et al.* 1994*; Randall & Van Egmond 1994; King 1996*; Winterbottom & Anderson 1997; Kuitert 1998*; Terashima *et al.* 2001*; Fricke *et al.* 2009.

First dorsal fin with first spine filamentous and pointed, reaching back past middle of 2nd dorsal fin; 2nd dorsal fin 1 spine, 28–32 rays; anal fin 1 spine, 27–30 rays; pectoral fins 19 or 20 rays; pelvic fins slender and pointed; caudal fin rounded. LSS 110–130.

Body pearly whitish anteriorly, shading to orange-red or deep red posteriorly; front part of head yellow, spotted with violet, and predorsal ridge pale violet; 2 greenish black oblique lines on caudal fin, extending forward onto 2nd dorsal fin and anal fin. Attains ~60 mm SL.



Nemateleotris magnifica, 60 mm SL (South Africa). Source: RE Stobbs

DISTRIBUTION Indo-Pacific. WIO: Tanzania to South Africa (Aliwal Shoal), Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, Ryukyu Is., Australia, Marquesas Is. and Hawaii.

REMARKS Found at 6–61 m; typically occurs in pairs or small groups, hovering just above the substrate and gently flicking its 1st dorsal fin and pelvic fins. Displays monogamy. Feeds primarily on copepods and crustacean larvae. Frequently harvested for the aquarium trade.

GENUS *Paragunnellichthys* Dawson 1967

Dorsal fins low and continuous, fin origin directly above gill opening, 16–21 spines, 30–34 rays; anal fin 28–32 rays; pectoral fins 10 or 11 rays; pelvic fins 1 spine, 2 rays, fin insertions may be before pectoral fins, and fins separate or 5th rays joined by membrane; caudal fin 15 segmented rays, and fin not connected by membrane to dorsal fin or anal fin. Body scales small, non-imbricate and may be embedded. Body elongate, somewhat compressed. Snout and lower jaw rounded, chin prominent; mouth small. Gill opening inflated, tubiform, restricted to pectoral-fin base. Found in shallow sandy coral-reef lagoon habitats, to ~8 m deep. Three species, all in WIO.

KEY TO SPECIES

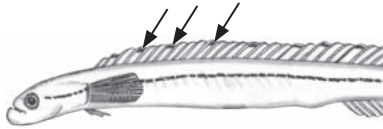
- 1a Pelvic fins united, inserted behind pectoral fins *P. fehlmanni*
 1b Pelvic fins separate, inserted in front of pectoral fins 2



Continued ...

KEY TO SPECIES

- 2a Edge of dorsal fin with row of black streaks on membrane, reaching to above anal-fin origin; narrow dark line along midside of body *P. springeri*



- 2b Edge of dorsal fins without series of black marks; midside of body plain *P. seychellensis*

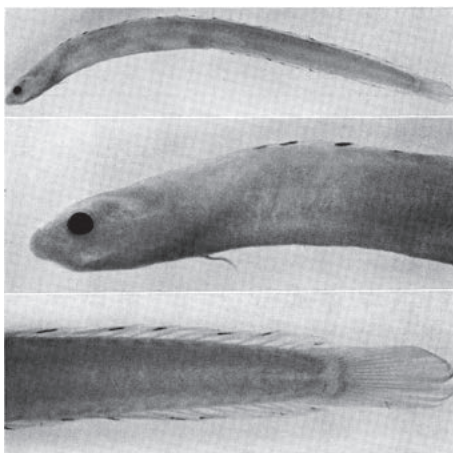
Paragunnellichthys fehlmanni Dawson 1969

Fehlmann's wormfish

Paragunnellichthys fehlmanni Dawson 1969: 373, Figs. 1–4 (Diego Garcia Atoll, Chagos Archipelago); Dawson 1973; Winterbottom & Emery 1986; Winterbottom & Anderson 1997.

Dorsal fins 19–21 spines, 31–33 rays; anal fin 29 or 30 rays; pectoral fins 10 rays; pelvic fins short, 5th rays joined by membrane.

Head and body yellow with few melanophores on predorsal area; dorsal fins and anal fin with distinct dark brown to black vertically elongate blotches on interradi al membrane, blotches more numerous on dorsal fins. Attains 34 mm SL.



Paragunnellichthys fehlmanni, 34 mm SL, holotype (Chagos). Source: Dawson 1969

DISTRIBUTION WIO: Chagos.

REMARKS Known only from the type specimens, collected from the Diego Garcia lagoon, to ~2.5 m deep.

Paragunnellichthys seychellensis Dawson 1967

Seychelles wormfish

PLATE 50

Paragunnellichthys seychellensis Dawson 1967: 75, Figs. 1–5 (Mahé, Seychelles); Dawson 1973.

Dorsal fins 16–18 spines, 30 or 31 rays; anal fin 28–30 rays; pectoral fins 11 rays; pelvic fins separate.

Preserved specimens plain pale yellow-green, with few diffuse melanophores along sides of body, but no distinct spots or blotches; fins plain, except anal fin may have few dusky blotches anteriorly. Attains at least 39 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Seychelles; elsewhere, Micronesia, New Guinea, Great Barrier Reef (Escape Reef) to French Polynesia.

REMARKS Known from few specimens; found in shallow sandy coral-reef lagoon habitat, to ~27 m deep.

Paragunnellichthys springeri Dawson 1970

Springer's wormfish

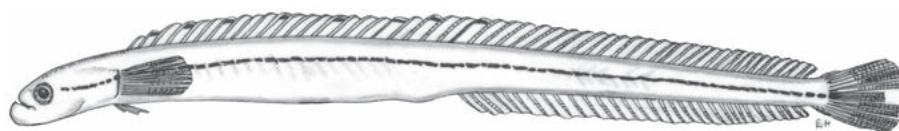
Paragunnellichthys springeri Dawson 1970: 268, Figs. 1–2 (Sharm el-Moya, Sinai, Egypt, Red Sea); Dawson 1973; Dor 1984.

Dorsal fins 20 spines, 34 rays; anal fin 32 rays; pectoral fins 10 rays; pelvic fins separate.

Preserved specimen pale brown, with narrow black stripe along midside of body extending onto caudal fin; dorsal fin anteriorly with series of short dark brown horizontally elongate blotches on interradi al membranes. Attains at least 22 mm SL.

DISTRIBUTION Known only from the holotype from the northern Red Sea.

REMARKS Collected over sand, at ~20–30 cm deep.



Paragunnellichthys springeri, 22 mm SL, holotype (Red Sea). Drawn from photograph

GENUS *Parioglossus* Regan 1912

First dorsal fin 5 or 6 spines; 2nd dorsal fin 1 spine, 13–19 rays; anal fin 1 spine, 12–19 rays; pectoral fins 15–20 rays; pelvic fins 1 spine, 3 or 4 rays, fins separate; caudal fin 15 or 16 segmented rays. Scales present or absent, cycloid if present, and may or may not be imbricate; nape midline naked (except scaly in 1 species) with sides naked or scaly; LSS 59–109. Head pores usually present, but rear part of oculoscapular canal absent (all pores absent in 2 species); sensory papillae in reduced transverse pattern; some species with thin fleshy nuchal crest. Eyes large, laterally placed. Mouth small, oblique and protrusible, and chin anteriormost; teeth in 1–3 rows in both jaws, no teeth on vomer or palatines; tongue tip blunt to rounded. Gill opening restricted, from pectoral-fin base to just under opercle. Twenty species, 4 in WIO (plus one or more may be undescribed).

KEY TO SPECIES

- | | | |
|----|--|-------------------------|
| 1a | Dark lateral stripe on body, extending to caudal-fin tip..... | 2 |
| 1b | No dark lateral stripe; horizontal, oblong to oval black spot on base of caudal-fin rays..... | <i>P. philippinus</i> |
| 2a | Blue or black spot (live or preserved fish, respectively) across bases of 5th or 6th dorsal-fin spines; no dark mid-dorsal stripe..... | <i>P. raoi</i> |
| 2b | No blue or black spot (live or preserved fish, respectively) on 1st dorsal fin; dark mid-dorsal stripe may be present from snout tip to upper edge of caudal-fin base..... | 3 |
| 3a | No preopercular pores; 2nd dorsal fin 1 spine, 16 or 17 rays; dark stripe across upper part of head and along sides of body to join vertical bar on upper caudal-fin base..... | <i>P. multiradiatus</i> |
| 3b | Preopercular pores present (in adults); 2nd dorsal fin 1 spine, 14–16 rays; dark stripe from eyes along lower half of body to caudal-fin margin..... | <i>P. taeniatus</i> |

Parioglossus multiradiatus

Keith, Bosc & Valade 2004

Seychelles dartgoby

PLATE 49

? *Parioglossus triquetrus*: Rennis & Hoese 1985.*Parioglossus multiradiatus* Keith, Bosc & Valade 2004: 341,

Fig. 1 (Bel Ombre River, Mahé, Seychelles).

First dorsal fin triangular, spines 4 and 6 elongate to filamentous (4th spine longest in adult males); 2nd dorsal fin 1 spine, 16 or 17 rays; anal fin 1 spine, 17 or 18 rays; pectoral fins 18 or 19 rays. LSS 98–109; nape naked. Nuchal crest low fold in males, barely visible in females.

Preserved specimens with greyish body, with brownish dorsomedian stripe; black stripe extending from eye across upper part of opercle and pectoral-fin base along sides of body, joining black vertical bar across bases of upper caudal-fin rays; males with dark ring around anus. Attains 35 mm SL.

DISTRIBUTION WIO: Mahé (Seychelles) in tidal portion of rivers, and South Africa (off Durban, KwaZulu-Natal).

REMARKS Rennis & Hoese (1985) observed a specimen from Seychelles that may be this species or *P. triquetrus*, which would then become the senior synonym.

Parioglossus philippinus (Herre 1945)

Philippine dartgoby

PLATE 49

Herreolus formosus [in part]: Herre 1940.*Herreolus philippinus* Herre 1945: 14 (Santa Maria, Zamboanga Province, Mindanao, Philippines).*Parioglossus philippinus*: Rennis & Hoese 1985*.

First dorsal fin low, 5th spine longest in adult males; 2nd dorsal fin 1 spine, 16–19 rays; anal fin 1 spine, 16–19 rays; pectoral fins 17–20 rays. LSS 61–81; nape naked. Nuchal crest prominent in adult males, and visible as low fold in females.

Preserved specimens with brownish body, with dusky to black dorsal midline; rounded to elongate black spot on lower base of caudal fin, may continue as stripe to rear margin of fin; males may have dark ring around anus. Attains 32 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Madagascar and India (off Mumbai); elsewhere to Philippines, Japan, Australia and New Caledonia.

REMARKS Occurs in sandy and coral-reef habitats, to ~10 m deep.

Parioglossus raoi (Herre 1939)

Rao's dartgoby

PLATE 49

Amblyeleotris (Andameleotris) raoi Herre 1939: 346 (west coast of Guitar I., Andaman Is.).*Parioglossus* sp.: Hayashi *et al.* 1981*.*Parioglossus raoi*: Rennis & Hoese 1985*; Randall *et al.* 1994*; Randall 1995*.

First dorsal fin relatively low, 3rd or 4th spine longest in males; 2nd dorsal fin 1 spine, 14–16 rays; anal fin 1 spine, 14–16 rays; pectoral fins 15–18 rays; caudal-fin margin notched in males,

emarginate in females. LSS 70–85; some scales on sides of nape. Nuchal crest usually prominent in males, low in females.

Body yellow to brownish; black stripe from eyes along lower part of body, may fade on peduncle or extend onto caudal fin; large bright blue spot at rear of 1st dorsal fin; upper and lower caudal-fin lobes dark in adults, but lower lobe may be paler than upper lobe. Attains 30 mm SL.

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf and Gulf of Oman; elsewhere to Andaman Is., Indonesia, Ryukyu Is. and Fiji.

REMARKS Common and sometimes locally abundant; found in shallow mangrove, estuarine and coastal habitats, usually over mud, sand or rocky substrates.

Parioglossus taeniatus Regan 1912

Thread-fin dartgoby

PLATE 50

Parioglossus taeniatus Regan 1912: 302 (Pacard Lagoon, Aldabra, Seychelles); Smith 1958; Rennis & Hoese 1985*.

First dorsal-fin spines 2–4 elongate to filamentous in males; 2nd dorsal fin 1 spine, 14–16 (usually 15) rays; anal fin 1 spine, 15 or 16 rays; pectoral fins 16–19 rays. LSS 76–86; sides of nape scaly. Nuchal crest usually prominent in males, low in females.

Preserved specimens yellowish brown, with dark brown stripe from eye along lower half of body to rear edge of caudal fin; 1st dorsal fin plain dusky; oblique dark bar across upper part of caudal fin. Attains 29 mm SL.

DISTRIBUTION Indo-Pacific (scattered). WIO: Aldabra (Seychelles) and southeastern Madagascar; elsewhere to Philippines, Palau, southern Great Barrier Reef and Fiji.

REMARKS Uncommon; occurs over sand, silt and rocks in shallow mangrove and estuarine habitats.

GENUS *Ptereleotris* Gill 1863

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 20–39 rays; anal fin 1 spine, 19–37 rays; pectoral fins 20–26 rays; pelvic fins 1 spine, 4 rays, fins separate or nearly so (may be remnant of membrane joining bases of 5th rays); caudal fin slightly emarginate to rounded, developing filaments in adults of some species; caudal fin 17 segmented rays. Scales tiny, mostly embedded and non-imbricate (and difficult to count), nearly all cycloid; head naked, predorsal scales present or absent;

LSS ~100–200; TRB ~35–40. Head pores present; sensory papillae in reduced transverse pattern. Jaws strongly oblique, lower jaw projecting; median fleshy chin fold or barbel may be present; vomerine teeth present or absent, no palatine teeth. Gill membranes broadly attached to isthmus, reaching forward to rear edge of preopercle or below mid-opercle. Preopercle rear margin not free. Skin with thick mucus coat. Twenty species, 8 in WIO.

KEY TO SPECIES

- | | | |
|----|---|-----------------------|
| 1a | Second dorsal fin 35–39 rays; anal fin 33–37 rays | 2 |
| 1b | Second dorsal fin 23–33 rays; anal fin 22–30 rays | 3 |
| 2a | Dorsal fins broadly joined by membrane, forming continuous fin; caudal fin emarginate, becoming filamentous in adults, and fin pale | <i>P. monoptera</i> |
| 2b | Dorsal fins separate; caudal fin rounded with large dark blotch | <i>P. lineopinnis</i> |
| 3a | Chin (in specimens >25 mm SL) with median fleshy barbel | 4 |
| 3b | Chin without barbel but with low fleshy knob with median fold posteriorly | 5 |
| 4a | Caudal fin truncate to slightly emarginate, with no filaments; adults with many narrow dark-edged pale bars along sides of body; dorsal fins with dark margins | <i>P. zebra</i> |
| 4b | Caudal fin of adults truncate to rounded, and with filaments; no narrow bars on pale body; dorsal fins without dark margins | <i>P. arabica</i> |
| 5a | Caudal fin with large elongate blackish blotch, from centre to rear margin; 2nd dorsal fin 29–33 rays | <i>P. heteroptera</i> |
| 5b | Caudal fin without large blackish blotch on centre, although blackish mark may be present at fin base; 2nd dorsal fin 23–29 rays | 6 |
| 6a | No predorsal scales; body with 2 narrow dark stripes | <i>P. melanota</i> |
| 6b | Predorsal scales present; no narrow stripes on body | 7 |
| 7a | Body and fins pale, and adults with narrow black line on pectoral-fin bases; gill opening reaching to below mid-opercle | <i>P. microlepis</i> |
| 7b | Head and anterior half of body pale, posterior half of body dark, and no dark bar on pectoral-fin bases; juveniles with large oval black spot on lower base of caudal fin; gill opening wide, reaching to below rear edge of preopercle | <i>P. evides</i> |

Ptereleotris arabica Randall & Hoese 1985

Lyre-tail dartgoby

PLATES 49 & 50

Ptereleotris arabica Randall & Hoese 1985: 8, Pl. 1a (Eilat, Israel, Gulf of Aqaba, Red Sea); Goren & Dor 1994; Randall 1995*.

?*Ptereleotris* sp.: Randall & Anderson 1993; Randall & Goren 1993*.

?*Ptereleotris hanae*: Anderson *et al.* 1998.

?*Ptereleotris hanae*: Kuitert 1998*.

First dorsal fin lower than 2nd dorsal fin, and 5th spine longest; 2nd dorsal fin 1 spine, 26–29 rays; anal fin 1 spine, 25–28 rays; pectoral fins 22 or 23 rays; pelvic fins short; caudal fin with upper and lower rays produced into long filaments, centre of fin convex. LSS ~170. Median, broad, rearward-pointing barbel on fold on chin.

Head, body and fins pale greyish blue, posteriorly with pale whitish streak along lower sides of body; pinkish bar across pectoral-fin bases. Attains 112 mm SL.

DISTRIBUTION WIO: Gulf of Aqaba (Red Sea) and Persian/Arabian Gulf; possibly Seychelles and Maldives (photographs only).

REMARKS Found at 1.5–15 m; observed in pairs, and may share burrows inhabited by an alpheid shrimp and burrowing species of gobies (*Amblyeleotris* and *Cryptocentrus*).

Ptereleotris evides (Jordan & Hubbs 1925)

Arrow dartgoby

PLATES 49 & 50

Encaeuira evides Jordan & Hubbs 1925: 303, Pl. 11, Fig. 2 (Wakanoura, Wakayama Prefecture, Japan, Inland Sea).

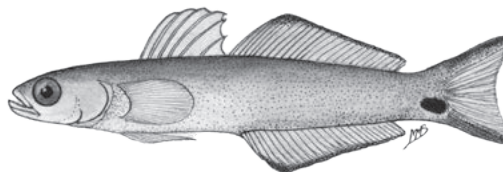
Ptereleotris tricolor Smith 1957: 817, Fig. 1 (Wamizi I., Mozambique); Smith 1958*; Smith & Smith 1963*.

Ptereleotris evides: Hoese & Winterbottom 1979; Randall & Hoese 1985*; Hoese 1986*; Winterbottom & Emery 1986*; Allen & Steene 1987*; Debelius 1993*, 1998*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Goren & Dor 1994; King 1996*; Winterbottom & Anderson 1997; Field & Field 1998*; Kuitert 1998*; Fricke *et al.* 2009.

First dorsal fin pointed; 2nd dorsal fin 1 spine, 23–26 rays; anal fin 1 spine, 23–26 rays; 2nd dorsal fin and anal fin higher anteriorly than posteriorly; pectoral fins 21–24 rays; pelvic fins short; caudal fin deeply emarginate. LSS ~135–148. No median chin barbel, but low fold present. Gill opening to rear edge of preopercle.

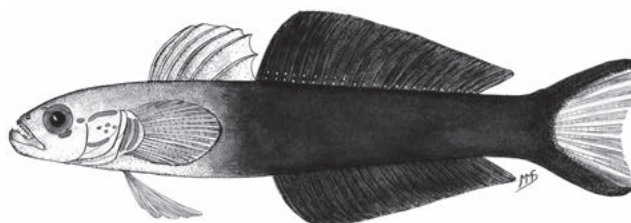
Body pale bluish grey anteriorly, shading to black or purplish black posteriorly; iridescent blue markings on operculum; distal edge of 1st dorsal fin orange to yellow; upper

and lower lobes of caudal fin reddish to blackish, centre of fin translucent to whitish. Juveniles paler, with large oval black spot on lower caudal-fin base. Attains 112 mm SL.



Ptereleotris evides, 50 mm TL, juvenile paratype of *P. tricolor* (Mozambique).

Source: Smith 1958



Ptereleotris evides, 118 mm TL, holotype of *P. tricolor* (Mozambique).

Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (Aliwal Shoal), Comoros, Aldabra, Seychelles, Mascarenes, Chagos and Maldives; elsewhere widespread to Japan (Wakanoura, Ryukyu and Ogasawara Is.), Australia, Lord Howe I., Line Is., Society Is., Rapa Iti and Pitcairn Is.

REMARKS Juveniles occur in small groups, and adults in pairs, often on exposed reef habitats, also in lagoons, at 2–15 m.

Ptereleotris heteroptera (Bleeker 1855)

Blacktail dartgoby

PLATES 49 & 50

Eleotris heteropterus Bleeker 1855: 422 (Bandjarmasin rivers, Borneo [Barito and Martapura river estuaries, Kalimantan, Indonesia]).

Ptereleotris heteroptera: Randall & Hoese 1985*; Hoese 1986*; Winterbottom & Emery 1986; Debelius 1993*, 1999*; Randall & Anderson 1993; Randall & Goren 1993*; Eichler & Lieske 1994*; Goren & Dor 1994; Randall 1995*; Winterbottom & Anderson 1997; Field & Field 1998*; Kuitert 1998*.

Ptereleotris heteropterus: Allen & Steene 1987*; Fricke *et al.* 2009.

First dorsal fin rounded, lower than 2nd; 2nd dorsal fin 1 spine, 29–33 rays; anal fin 1 spine, 27–30 rays; pectoral fins 21–24 rays; pelvic fins short, pointed; caudal fin emarginate. LSS ~150. No chin barbel, but very low and thin median fold may be present. Gill opening reaching to below mid-opercle.

Body pale blue to bluish grey, may be darker blue on lower half; some short iridescent blue streaks and spots may be visible on head; caudal fin translucent yellowish, with elongate black spot on centre. Attains 100 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman, South Africa (KwaZulu-Natal to Kei River, Eastern Cape), Seychelles, Mauritius, Réunion, Chagos and Maldives; elsewhere widespread to Indonesia, Ryukyu Is., Lord Howe I., Society Is. and Hawaii.

REMARKS Occurs in pairs or small groups over rubble and sand near coral reefs, at 7–46 m; observed feeding on zooplankton to ~3 m deep in water column. Juveniles may form especially large aggregations.

Ptereleotris lineopinnis (Fowler 1935)

Weeping dartgoby

PLATE 49

Laccoeleotris lineopinnis Fowler 1935: 403, Fig. 35 (off Umzumbe, KwaZulu-Natal, South Africa [fish stomach contents]); Smith 1949*, 1958*, 1961*; Smith & Smith 1963*.

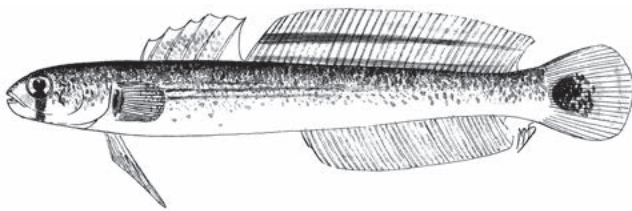
Ptereleotris lineopunctatus: Hoese & Winterbottom 1979.

Ptereleotris lineopinnis: Randall & Hoese 1985*; Hoese 1986*.

Ptereleotris sp. 1: Kuitert 1998*.

First dorsal fin with 5th spine longest; 2nd dorsal fin 1 spine, 36 or 37 rays; anal fin 1 spine, 33–35 rays; pectoral fins 24 rays; pelvic fins pointed, and tips may be filamentous; caudal fin convex. Chin with distinct median barbel, not followed by median fold. Gill opening nearly reaches rear edge of preopercle.

Preserved specimens pale, with black bar from eyes to rear corners of jaw, and large blackish blotch covering most of caudal fin. Attains 97 mm SL.



Ptereleotris lineopinnis, 115 mm TL, holotype (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: South Africa (off Umzumbe, KwaZulu-Natal) and Maldives; elsewhere, Mariana Is.

REMARKS Known only from the holotype and two partly digested specimens, all from fish stomach contents from the three known localities, with the fish collected at 91–100 m.

Ptereleotris melanota Randall & Lubbock 1982

Striped dartgoby

PLATES 49 & 51

Ptereleotris grammica melanota Randall & Lubbock 1982: 44,

Figs. 4–5 (Mauritius, Mascarenes); Cornic 1987*; Debelius 1993*; Eichler & Lieske 1994*.

Ptereleotris grammica: Randall & Hoese 1985*; Anderson *et al.* 1998*; Kuitert 1998*; Fricke *et al.* 2009.

Spines 3–5 of 1st dorsal fin elongate and filamentous in adults; 2nd dorsal fin 1 spine, 26 rays; anal fin 1 spine, 24 rays; pectoral fins 23 rays; pelvic fins long and slender; caudal fin emarginate to truncate. LSS 214–227. No chin barbel, but low median fold present. Gill opening nearly reaches rear edge of preopercle.

Head and body whitish, with dark brown lateral stripe on body, but stripe becoming blue-edged yellow on head; dorsal fins and anal fin yellow, with 2 blue lines; caudal fin white in centre, with dark brown to black blotch at rear margin, and upper and lower parts of fin yellow. Attains 64 mm SL.

DISTRIBUTION WIO: Mauritius, Réunion and Maldives.

REMARKS Found on outer reefs, over rubble or sand substrate near drop-offs, to ~50 m deep. A similar species, *P. grammica*, is known from the Philippines, southern Japan, Palau, New Guinea, Solomon Is. and Great Barrier Reef.

Ptereleotris microlepis (Bleeker 1856)

Pale dartgoby

PLATE 51

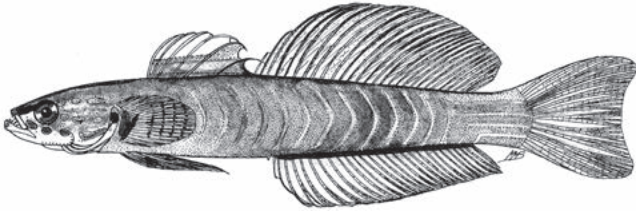
Eleotris microlepis Bleeker 1856: 102 (Banda I., Moluccas, Indonesia); Playfair 1867.

Ptereleotris playfairi Whitley 1933: 90 (Zanzibar, Tanzania).

Ptereleotris microlepis: Smith 1958*; Smith & Smith 1963*; Randall 1983*, 1995*; Randall & Hoese 1985*; Randall & Anderson 1993; Randall & Goren 1993; Goren & Dor 1994; Randall *et al.* 1994*; Winterbottom & Anderson 1997; Kuitert 1998*; Debelius 1999*.

First dorsal fin distinctly lower than 2nd; 2nd dorsal fin 1 spine, 25–29 rays; anal fin 24–27 rays; pectoral fins 21–24 rays; pelvic fins somewhat pointed; caudal fin slightly emarginate. LSS ~150. Chin with fleshy median ridge narrowing to thin fold. Gill opening to below mid-opercle.

Head and body pale bluish grey to pale greyish green, and sometimes with 2 faint orange to yellowish lines on body; pectoral-fin bases with thin blue-edged black oblique streak. Attains 110 mm SL.



Ptereleotris microlepis, 108 mm TL (WIO). Source: Smith 1958

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Tanzania (Zanzibar), South Africa, Comoros, Aldabra, Chagos (Diego Garcia Atoll) and Maldives; elsewhere widespread to French Polynesia.

REMARKS Found in pairs or small groups, usually in shallow sheltered habitat, over sand or sand-rubble, at 1–22 m; dives into burrow when pursued.

Ptereleotris monoptera Randall & Hoese 1985

Monofin dartgoby

PLATE 51

Ptereleotris monoptera Randall & Hoese 1985: 24, Pl. 3c–d, Fig. 8 (off Kuei-hou, Taiwan); Randall 1995*; Winterbottom & Anderson 1997.

Ptereleotris n. sp.: Winterbottom & Emery 1986*.

Dorsal fins low, continuous; 2nd dorsal fin 1 spine, 35–39 rays; anal fin 1 spine, 33–37 rays; pectoral fins 23–25 rays; pelvic fins pointed; caudal fin emarginate, upper and lower lobes pointed, elongated into filaments in adults. LSS ~105. Chin without barbel, but thin median fold present. Gill opening to below mid-opercle.

Body pale whitish to greyish blue, with broad blue area over abdomen; blackish bar from eyes to underneath chin; fins mostly yellowish, and anal fin with broad pink to orange-red band. Attains 107 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Oman, South Africa (Sodwana Bay), Seychelles and Chagos; elsewhere to Taiwan, Japan, Vanuatu, Australia and Society Is.

REMARKS May form loose schools; seeks refuge in burrow in sand or among coral rock, at 6–15 m.

Ptereleotris zebra (Fowler 1938)

Zebra dartgoby

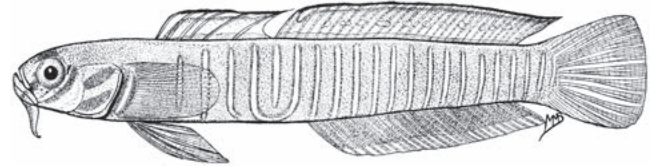
PLATE 51

Pogonocilius zebra Fowler 1938: 134 (Dasol Bay, Luzon, Philippines); Smith 1956*, 1958*; Smith & Smith 1963*; Cornic 1987*.

Ptereleotris zebra: Randall & Hoese 1985*; Debelius 1993*; Randall & Anderson 1993; Randall & Goren 1993; Eichler & Lieske 1994*; Goren & Dor 1994; Winterbottom & Anderson 1997; Kuitert 1998*.

Second dorsal fin 1 spine, 27–29 rays; anal fin 1 spine, 25–28 rays; pectoral fins 23–26 rays; pelvic fins moderately long; caudal fin slightly emarginate. LSS ~130. Chin with distinct median barbel. Gill opening to about mid-opercle.

Head and body yellowish to greenish, with ~20 pink to orange vertical bars on body, bars edged with blue to purplish; broad brownish to purplish band from eyes to chin; several bright blue oblique streaks on head. Attains 95 mm SL.



Ptereleotris zebra, 91 mm TL (Seychelles). Source: Smith 1958

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to South Africa (Sodwana Bay), Aldabra, Seychelles, Réunion, Mauritius, Chagos and Maldives; elsewhere to Philippines, Ryukyu Is., Mariana Is., Marshall Is., Great Barrier Reef, Line Is. and Marquesas Is.

REMARKS Occurs on shallow, exposed coral-reef slopes, at 1.5–25 m; found in large schools, and usually many fish share the same refuge hole.

GLOSSARY

imbricate – overlapping evenly.

nuchal crest – a fleshy crest on top of the middle of the head.

FAMILY XENISTHMIDAE

Wrigglers

Anthony C Gill

Tiny (15–35 mm SL), moderately elongate to very elongate gobioids, with rounded to slightly compressed body. Head usually slightly depressed; lower lip with uninterrupted free ventral margin; sensory pores on head present or absent; no pores on lower jaw; premaxillary ascending process greatly reduced; rostral cartilage ossified. Two separate dorsal fins: 1st dorsal fin with 2–6 spines; 2nd dorsal fin with or without spine, and 8–33 segmented rays; anal fin with or without spine, and 8–26 rays; caudal fin rounded to emarginate, with 15 (8 + 7) or 17 (9 + 8) segmented rays; pelvic fins separate, with or without spine, and 1–5 segmented rays. Head naked or with small cycloid scales on cheeks and/or upper part of opercle; body naked or inconspicuously covered with fine scales; no tubed lateral-line scales on sides of body. Branchiostegal rays 6; basibranchial 2 absent; hypobranchial 3 reduced to small cartilage nubbin or absent.

Cryptic inhabitants of coral reefs and rubble areas in tropical Indo-Pacific; very patchy in distribution, with many species known from a single or few specimens. Found from tidepools to at least ~30 m deep; species of *Xenisthmus* and *Paraxenisthmus* are 'sand divers,' living on sand patches adjacent to reefs or rubble. Most species appear to be predatory, feeding on small fishes and crustaceans. Six genera and 13 described species; 4 genera and probably at least 6 species in WIO. *Allomicrodesmus* is included here only in the key, based on a single unidentified larval specimen from the Seychelles (as reported by Leis *et al.* 1993).

KEY TO GENERA

- 1a First dorsal fin 2 spines; 2nd dorsal fin 29–33 rays; body very slender and elongate *Allomicrodesmus*
- 1b First dorsal fin 5 or 6 spines; 2nd dorsal fin 1 spine, 9–15 rays; body elongate but relatively robust 2

- 2a Segmented dorsal- and anal-fin rays unbranched; 1st dorsal fin 5 spines; 2nd dorsal fin 1 spine, 9 rays; pectoral-fin rays unbranched *Rotuma*
- 2b Segmented dorsal- and anal-fin rays branched; 1st dorsal fin 5 or 6 spines; 2nd dorsal fin 1 spine, 11–15 rays; at least some pectoral-fin rays branched 3

- 3a First dorsal fin 5 spines; no scales on head or body, and no sensory pores on head; pelvic-fin rays unbranched *Gymnoxenisthmus*
- 3b First dorsal fin 6 spines; scales present, and sensory pores present on head; 4 outer pelvic-fin rays branched *Xenisthmus*

GENUS *Gymnoxenisthmus*

Gill, Bogorodsky & Mal 2014

First dorsal fin 5 spines; pelvic fins 1 spine, 5 unbranched rays; at least some dorsal-, anal- and pectoral-fin rays branched. No scales and no head pores. Vertebrae 10 + 16. One species.

Gymnoxenisthmus tigrellus

Gill, Bogorodsky & Mal 2014

Tiger wriggler

PLATE 52

Gymnoxenisthmus tigrellus Gill, Bogorodsky & Mal 2014: 492, Fig. 1 (Farasan Archipelago, Saudi Arabia, southern Red Sea).

First dorsal fin 5 spines; 2nd dorsal fin 1 spine, 13 rays, all branched; anal fin 1 spine, 12 rays, all branched; pectoral fins 15 rays, and middle rays branched; pelvic fin with rudimentary spine, 5 rays, all rays unbranched and inner ray vestigial. No scales or head pores. Vertebrae 10 + 16.

Freshly dead specimen with translucent bluish grey head and body; body with 14 equally spaced, midlateral orange markings (spots, bars or chevrons): first a spot in front of pectoral-fin bases, and last a narrow, short bar along rear edge of hypurals; scattered melanophores on head and body, mostly confined to orange areas; head with orange stripe from mid-upper upper lip to upper half of eyes, then from behind eyes to above upper edge of preopercle, with large (almost pupil-sized) orange spot near edge of opercle; pectoral-fin bases orange anteriorly and dorsally, with 2 pale orange spots: one on mid-upper and the other on mid-lower part of fin base; dorsal fins and anal fin orange to translucent, with silvery white stripes and spots; caudal fin mostly translucent, with 2 large indistinct pale grey-orange spots on base (one dorsal and one ventral); pectoral fins and pelvic fins translucent. Attains at least 15 mm SL.

DISTRIBUTION Known only from the holotype from the Red Sea.

REMARKS Holotype, a gravid female, collected on sand at base of a coral, at ~8 m.

GENUS *Rotuma* Springer 1988

First dorsal fin 5 spines; 2nd dorsal fin 1 spine, 9 rays, all unbranched; anal fin 1 spine, 9 rays, all unbranched; pectoral fins 16 rays; pelvic fins with rudimentary spine, 5 rays, all rays unbranched and inner ray vestigial. No scales on head or body, and no sensory pores on head. Vertebrae 11 + 15. One species.

Rotuma lewisi Springer 1988

Lewis's wriggler

PLATE 52

Rotuma lewisi Springer 1988: 535, Figs. 1–8 (Rotuma I., Fiji).

Diagnosis as for genus.

Head, body and paired fins transparent; snout, lips and upper part of head yellow; iris yellowish grey, with pale yellow ring around pupil; abdomen yellow, with scattered melanophores; 6 yellow spots on midsides, underlain with melanophores, and posterior five spots with indistinct yellow to orange bars extending dorsally (to 1st dorsal fin, interdorsal space, 2nd dorsal-fin origin, end of 2nd dorsal fin, and mid-peduncle, respectively); 1st dorsal fin with orange distal margin and spot at origin; 2nd dorsal fin with orange to red distal margin and mid-row of orange to red spots; anal fin similar to 2nd dorsal fin, but fainter; caudal fin white, becoming transparent posteriorly, with narrow black bar on hypural margin, and this edged with broad red bar, and another less distinct red bar through rear third of fin. Attains 22 mm SL.



Rotuma lewisi, 18 mm SL, paratype (Fiji). Source: Springer 1988; © Proc. Biol. Soc. Wash., Allen Press Publ. Services

DISTRIBUTION Indo-Pacific. WIO: Comoros; elsewhere, Fiji (Rotuma I.) in central Pacific.

REMARKS Recorded from WIO on the basis of 2 specimens.

GENUS *Xenisthmus* Snyder 1908

First dorsal fin 6 spines; 2nd dorsal fin 1 spine, 11–15 rays, all rays branched in adults; anal fin 1 spine, 10–14 rays, all rays branched in adults; pectoral fins 15–18 rays, most rays branched in adults; pelvic fins 1 spine, 5 rays, anterior 4 rays branched in adults. Some developed gill rakers present. Body with small scales; head pores present. Vertebrae 10 + 16 or 17. Indo-Pacific genus with 8 described species, plus additional undescribed species; 3 species in WIO.

KEY TO SPECIES

- 1a Tongue tip rounded; 2nd dorsal fin 1 spine, 11 or (rarely) 12 rays; anal fin 1 spine, 10 or (rarely) 11 rays; 13 broad dark bars on upper half to two-thirds of body: first bar at pectoral-fin bases, last bar near end of peduncle *X. polyzonatus*
- 1b Tongue tip indented; 2nd dorsal fin 1 spine, 12 or 13 rays; anal fin 1 spine, 11 or 12 rays; colouration not as above 2
- 2a Second dorsal fin 1 spine, 12 rays; pectoral fins 16 rays; rear nostrils with well-developed flap; ctenoid scales on rear part of body; cycloid scales on sides of head; head pale, with narrow dark stripe from lower lip to pectoral-fin bases, and then becoming broader on body (sometimes covering much of body) and extending to lower part of peduncle. *X. africanus*
- 2b Second dorsal fin 1 spine, 13 rays; pectoral fins 16 or (usually) 17 rays; posterior nostrils with raised rim, but no well-developed flap; scales mostly cycloid, but sides of head without scales; head and body pale, with dark reticulate mottling dorsally *X. balius*

Xenisthmus africanus Smith 1958

Flathead wriggler

PLATE 52

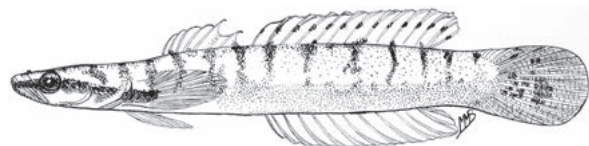
Platycephalops polyzonatus (non *Eleotris polyzonatus* Klunzinger 1871): Smith 1957*.

Xenisthmus africanus Smith 1958: 153, Fig. 10 (Pinda, Mozambique); SSF No. 241.10*; Winterbottom & Emery 1986; Winterbottom & Anderson 1997.

Xenisthmus africana: Hoese & Winterbottom 1979.

Second dorsal fin 1 spine, 12 rays; anal fin 1 spine, 11 rays; pectoral fins 16 rays. LSS 57–66; TRB 20–23; scales on sides of head cycloid; scales on body cycloid anteriorly, ctenoid posteriorly (behind mid-2nd dorsal fin). Tongue tip indented. Posterior nostril with well-developed membranous flap.

Head pale, with narrow dark stripe from lower lip to pectoral-fin bases, becoming broader on body (sometimes covering much of body) and extending to lower part of caudal peduncle. Attains 33 mm SL.



Xenisthmus africanus, 25 mm TL, juvenile (Mozambique). Source: Smith 1957

DISTRIBUTION Indian Ocean. WIO: Tanzania (Zanzibar), Mozambique (Bazaruto; Pemba and Pinda), Aldabra and Chagos; elsewhere to Cocos (Keeling) Is.

Xenisthmus balius Gill & Randall 1994

Dappled wriggler

PLATES 52 & 53

Xenisthmus balius Gill & Randall 1994: 446, Fig. 1 (Jana I., Saudi Arabia, Persian/Arabian Gulf); Randall 1995*.

Second dorsal fin 1 spine, 13 rays; anal fin 1 spine, 12 or 13 rays; pectoral fins 16 or (usually) 17 rays. LSS 60–70; TRB 19–22; no scales on sides of head; body covered with small cycloid scales (except a few irregularly distributed ctenoid scales on peduncle in some specimens). Tongue tip weakly indented. Posterior nostril with raised rim, but without membranous flap anteriorly.

Head and body pale, with reticulate dark mottling dorsally; 1 or 2 small black spots near middle of caudal-fin base. Attains 31 mm SL.

DISTRIBUTION WIO: Persian/Arabian Gulf and Red Sea.

REMARKS Found on sand and rubble patches adjacent to reefs, at 1.5–17 m.

Xenisthmus polyzonatus (Klunzinger 1871)

Bullseye wriggler

PLATE 53

Eleotris polyzonatus Klunzinger 1871: 482 (Al-Qusayr, Egypt, Red Sea). *Xenisthmus polyzonatus*: Winterbottom & Emery 1986; Randall & Goren 1993*; Winterbottom & Anderson 1997.

Second dorsal fin 1 spine, 11 or 12 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 16–18 (rarely 16) rays, all branched but for upper 1 or 2 rays and lower 0–2 rays. LSS 52–66; TRB 20–16; scales on sides of head cycloid; scales on body cycloid anteriorly, ctenoid posteriorly (behind 2nd dorsal-fin origin). Tongue tip rounded. Posterior nostril with well-developed membranous flap.

Body with 13 broad dark bars on upper half to two-thirds: first through pectoral-fin bases and last near end of peduncle; dark bar below eyes; caudal fin with large black spot, bordered narrowly with white, and then with orange. Juveniles with less pronounced bars on body, and with dark stripe from behind eyes, nearly reaching dark spot at caudal-fin base. Attains ~30 mm SL.



Xenisthmus polyzonatus, 26 mm SL (Maldives). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Comoros to Maldives and Rodrigues; elsewhere to Philippines, Ryukyu Is., Mariana Is., Australia, New Caledonia and Samoa.

REMARKS Benthic, inshore, on sand and fine coral grit adjacent to reefs, from low tide mark to at least 12 m deep.

GLOSSARY

- basibranchial** – median ventral cartilage or bony element in a branchial arch, behind the tongue.
- hypobranchials** – paired bones on either side of the basibranchials on the lower part of the gill arch.
- ossified** – become bone.
- rostral cartilage** – the cartilage on the snout.

FAMILY KRAEMERIIDAE

Sand-darts

Helen K Larson

Small-sized gobioids with elongate body; eyes small, close-set and dorsally placed. Dorsal fins continuous, with 4–6 spines, 13–17 rays; anal fin 1 spine, 11–14 rays; pectoral fins 3–9 rays; pelvic fins 1 spine, 5 rays, usually separate; caudal fin with 11 segmented rays. Last rays of dorsal fin and anal fin split to base, all other rays simple. Mouth with thick and sometimes scalloped or papillose lips, lower lip more or less continuous across fleshy, pointed, distinctly protruding chin, with lobes and flaps tucked behind lip margin; underside of head, preopercle lower margin, and sometimes opercle lower margin with scalloping or flaps; tongue tip deeply bilobed. Teeth small, sharp; no teeth on vomer or palatines. No scales. Branchiostegal rays 5. Vertebrae 10–14 + 16 or 17.

Cryptic and burrowing in fine coral to muddy sand, in shallow marine to estuarine areas, thus rarely observed. Two genera and 11 nominal species, in Indo-Pacific; both genera and at least 2 species in WIO.

KEY TO GENERA

- 1a Pelvic fins with 5th rays fully joined, forming disc *Gobitrichinotus*
- 1b Pelvic fins separate or nearly so *Kraemeria*

GENUS *Gobitrichinotus* Fowler 1943

Dorsal fins continuous, 4–6 spines, 18–21 rays, with notch before segmented rays; anal fin 1 spine, 13 or 14 rays; pectoral fins 8–10 rays, branched; anal-fin origin below 6th or 7th dorsal-fin ray; pelvic fins with 5th rays straight and fused together their entire length. HL 13–20% SL. No scales. Gill rakers rudimentary to absent. Vertebrae 14 + 16 or 17. Occur in fresh to brackish waters. Two poorly known species, 1 in WIO.

Gobitrichinotus arnoulti Kiener 1963

Freshwater sand-dart

Gobitrichinotus arnoulti Kiener 1963: 330, Fig. 2

(Andevoranto, Kalomalala, Madagascar).

Gobitrichinotus arnoulti: Stiassny & Raminosoa 1994.

Dorsal fins continuous but with distinct indentation before 1st segmented ray. Dorsal fin 5 spines, 20 or 21 rays; anal fin 1 spine, 13 or 14 rays; pectoral fins 8 or 9 rays. Opercle margin smooth, not scalloped; small flat lobes or scallops along lower edge of preopercle and below lower lip.

Body pale golden to whitish, and head and body covered with fine irregular black speckles forming indistinct reticulate or mottled pattern. Attains 35 mm SL.

DISTRIBUTION WIO: endemic to Madagascar.

REMARKS Hides in sand at river mouths; resembles *G. radiocularis* from the Pacific (from Philippines to Polynesia).

GENUS *Kraemeria* Steindachner 1906

Dorsal fin continuous, 5 or 6 spines, 13 or 14 rays; anal fin 1 spine, 12–14 rays; pectoral fins 3–8 rays, branched or unbranched; pelvic fins 1 spine, 5 rays, and fins mostly

separate but may be partly joined at base by membrane; anal-fin origin under 2nd or 3rd dorsal-fin ray. HL <25% SL; eyes minute and close-set; characteristic protruding and pointed chin; jaws with fleshy to papillose lips; thin flaps or scalloping usually present underneath head, along preopercle margin and sometimes on opercle lower margin; tongue tip deeply bilobed. No scales. Gill rakers short, may be partly embedded. Vertebrae 10–14 + 16 or 17. Body whitish, with almost no pigmentation but for some pale speckling. Cryptic and sand-dwelling, burrow shallowly with eyes barely protruding. This genus is in need of review. About 7 poorly known species in tropical Indo-Pacific, 1 in WIO.

Kraemeria nuda (Regan 1908)

Fringed sand-dart

Psammichthys nudus Regan 1908: 246, Pl. 31, Fig. 1 (sand-siftings from Praslin Reef, Seychelles) [in part].

Kraemeria nudum: Rofen 1958*; Goren 1987*.

Kraemeria samoensis: Smith 1959*; Smith & Smith 1963*;

Winterbottom 1976; Hoese 1986*; Maugé 1986; SSF No. 242.1*;

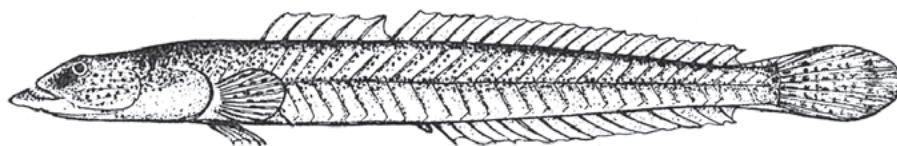
Winterbottom & Emery 1986*.

Dorsal fin 5 spines, 14 rays; anal fin 1 spine, 13 rays; pectoral fins 7–8 rays, some rays branched. Rear edge of opercle smooth, lower edge with small thin pointed flaps with no scalloping and no scalloping present along preopercular margin. Tongue tip bilobed.

Body transparent to translucent pale yellowish, with fine speckled pattern of melanophores dorsally. Attains 32 mm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique, Seychelles, Mauritius and Chagos; elsewhere to French Polynesia.

REMARKS Found along sandy beaches with strong wave action, often near entry of freshwater streams.



Gobitrichinotus arnoulti, 4 cm TL, holotype (Madagascar). Source: Kiener 1963

FAMILY SCHINDLERIIDAE

Schindler's fishes

Helen K Larson

Tiny gobioids (to ~20 mm SL) resembling fish larvae, with slender transparent body (internal pigment sometimes present), no scales, and single dorsal fin. Dorsal fin 15–22 rays; anal fin 10–18 rays; pectoral fins rounded, with 11–18 rays; no pelvic fins; caudal fin truncate, with 13 segmented rays (10 branched); all rays except for caudal-fin rays unsegmented and unbranched. Eyes large and lateral. Mouth small, oblique; teeth very small. Branchiostegal rays 5. Urogenital papilla elongate in males, blunt and bilobed in females. Skeleton poorly ossified; unique elongate urostyle; vertebrae 12–24 + 13–21.

Exhibit extreme paedomorphism, and are among the world's smallest fishes and are the most lightweight vertebrates. Planktonic, pelagic or benthopelagic; occur offshore (possibly to ~130 m deep) and also in estuaries, lagoons and near coral reefs.

Much work remains to be done on this family. One genus, *Schindleria* Giltay 1934, with 5 species recognised although more are known to exist (as yet undescribed); 4 species from WIO known (2 species recently described from the Red Sea not included).

KEY TO SPECIES

- 1a Gut length $\sim\frac{2}{3}$ SL; anal-fin origin well posterior to dorsal-fin origin *S. praematura*
- 1b Gut length only slightly $>\frac{1}{2}$ SL; anal-fin origin opposite dorsal-fin origin *S. pietschmanni*

Schindleria pietschmanni (Schindler 1931)

Pietschmann's Schindler's fish

Hemiramphus pietschmanni Schindler 1931: 79 (Leeward Is., Hawaii); Schindler 1932*.

Schindleria pietschmanni: Sardou 1974*; Johnson & Brothers 1993; Harris & Cyrus 1996; Leu *et al.* 1999, 2008.

Dorsal fin 15–22 rays; anal fin 10–18 rays, fin origin opposite dorsal-fin origin; pectoral fins 11–18 rays. Gut length only slightly $>\frac{1}{2}$ SL.

Transparent when live, with melanophores on swimbladder. Attains 12.5 mm SL.

DISTRIBUTION Indo-Pacific. WIO: South Africa (Kosi Bay) and Madagascar; elsewhere, records from Taiwan and Hawaii.

Schindleria praematura (Schindler 1930)

Premature Schindler's fish

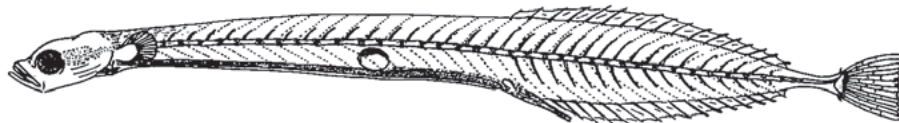
Hemiramphus praematurus Schindler 1930: 79 (Pearl and Hermes Reef, Hawaiian Is.); Schindler 1932*.

Schindleria praematura: Sardou 1974*; Johnson & Brothers 1993; Harris & Cyrus 1996; Leu *et al.* 1999; Viljoen & Cyrus 2002.

Dorsal fin 15–22 rays; anal fin 10–18 rays, fin origin well behind dorsal-fin origin; pectoral fins 11–18 rays. Gut length $\sim\frac{2}{3}$ SL.

Transparent when live, with melanophores on swimbladder. Attains 17.5 mm SL.

DISTRIBUTION Indo-Pacific to eastern Pacific. WIO: South Africa (Kosi Bay), Madagascar and Lakshadweep; widespread elsewhere, from China to Easter I.



Schindleria pietschmanni, 9 mm TL, male (Madagascar). Source: Sardou 1974

SUBORDER ACANTHUROIDEI

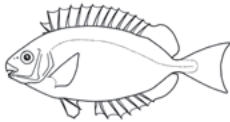
Wouter Holleman

The suborder Acanthuroidei comprises 6 families of widely distributed, important tropical and subtropical reef fishes. They include the surgeonfishes, scats, rabbitfishes, luvar, platax, spadefishes and Moorish idol. Most species are herbivorous and many help to keep fast-growing algae in check, thus keeping coral reefs from becoming overgrown. Surgeonfishes also graze on turtles and other animals that have algae growing on them, and juvenile rabbitfishes regularly clean seagrasses, ensuring healthy stands of seagrass.

Members of the suborder generally have a deep, compressed body; gill membranes broadly united across isthmus, restricting the gill openings ventrally; mouth small, and premaxillae not protrusible or only slightly so.

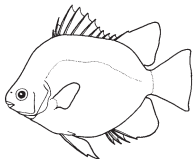
KEY TO FAMILIES

- 1a Pelvic fins with 2 strong spines and 3 rays between the spines **SIGANIDAE**



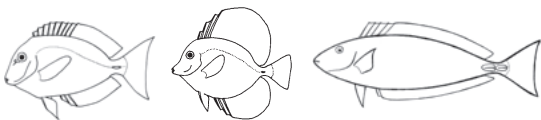
- 1b Pelvic fins with single spine at front 2

- 2a Dorsal fin 11 or 12 spines **SCATOPHAGIDAE**



- 2b Dorsal fin 4–10 spines 3

- 3a Caudal peduncle with 1 or 2 scalpel-like spines on each side (moveable and folding into a groove), or 1 to several sharply keeled fixed plates **ACANTHURIDAE**



- 3b Peduncle without scalpel-like spines or keeled plates 4

Continued ...

KEY TO FAMILIES

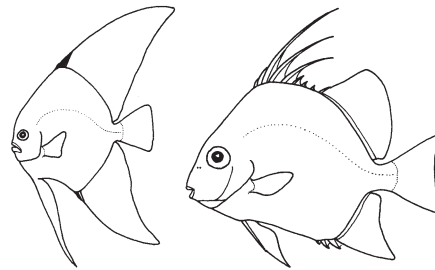
- 4a Dorsal and anal fins without spines (except 2 spines in dorsal fin of juveniles) **LUVARIDAE**



- 4b Dorsal fin 4–7 spines; anal fin ≥ 1 spines 5

- 5a Snout produced; 3rd spine of dorsal fin long and filamentous; adults with protuberance in front of eyes **ZANCLIDAE**

- 5b Snout not produced; no filament on dorsal fin (except *Tripteron* with first 3 dorsal-fin spines elongated); no protuberance in front of eyes **EPHIPPIDAE**



FAMILY EPHIPPIDAE

Spadefishes, orbfishes and platax

Phillip C Heemstra

Body deep disc-like and strongly compressed; head profile steep, merging with anterior dorsal fin. Head short, its length less than half body depth; interorbital space and front of head naked or head covered with scales. Eyes large, placed just above horizontal axis through mouth. Mouth small, maxilla not reaching past front edge of eye; upper jaw not protrusible; jaws with bands of slender setiform (bristly) or compressed teeth; no teeth on palatines; vomer with or without teeth. Preopercle smooth or serrate; opercle without spines. Dorsal fin single but may be deeply notched before soft-rayed part, with 5–10 spines, 19–39 rays; anal fin 3 spines, 15–29 rays; pelvic fins 1 spine, 5 rays, and well-developed scaly axillary process (dorsal, anal and pelvic fins greatly elongated in juveniles of some species); pectoral fins small, rounded, shorter than head; caudal fin truncate, slightly convex or double emarginate. Scales relatively large and smooth (*Ephippus*) or small and ctenoid (*Platax*). Lateral line complete, from head to base of caudal fin. Branchiostegal membranes broadly joined to isthmus; gill opening not extending much below pectoral-fin base; no pseudobranch. Branchial skeleton distinctive, with basihyal

(tongue) bone and interarcual cartilage absent or reduced, and series of short fleshy gill rakers loosely attached to upper limb of 1st gill arch; first (outermost) gill opening restricted, the front half of lower limb connected by skin to gill cover. Swimbladder bifurcate at first anal-fin pterygiophore, the two branches extending posteriorly to middle of anal-fin base. Vertebrae 9 or 10 + 14; dorsal and anal fins with hidden, antrorse, procumbent spine fused to first pterygiophore of these fins.

Found in estuaries, harbours, over soft bottoms and on coral reefs; some species also associate with flotsam and *Sargassum* weed in the open ocean. A motley assemblage of disparate fishes, with 6 or 7 genera assigned to the family; 3 genera and 5 species in WIO.

KEY TO GENERA

- 1a Dorsal, anal and pelvic fins greatly elongated in juveniles; dorsal-fin spines inconspicuous, mostly hidden by scales and skin, and rear spines longest; dorsal fin 28–39 rays *Platax*
- 1b Dorsal, anal and pelvic fins not much elongated in juveniles; dorsal-fin spines distinct, anterior spines longest; dorsal fin 19 or 20 rays 2
- 2a Head profile bluntly rounded; snout length shorter than or subequal to eye diameter *Ehippus*
- 2b Head profile angular; snout length about twice eye diameter *Tripterodon*

GENUS *Ehippus* Cuvier 1816

Body orbicular, strongly compressed; head profile very steep; snout length shorter than or subequal to eye diameter. Dorsal fin with 9 or 10 spines, spines 2–5 elongate, the interspinous membranes deeply incised; fin deeply indented before soft-rayed part. Scales smooth, with irregular membranous edges, extending on top of head to front of interorbital space and covering most of dorsal fin and anal fin. Jaws with bands of slender incisors with single lanceolate cusp; no teeth on vomer or palatines. Preopercle distinctly serrate, with broad naked margin; no spines on opercle. One species.

Ehippus orbis (Bloch 1787)

Orbfish

PLATE 54

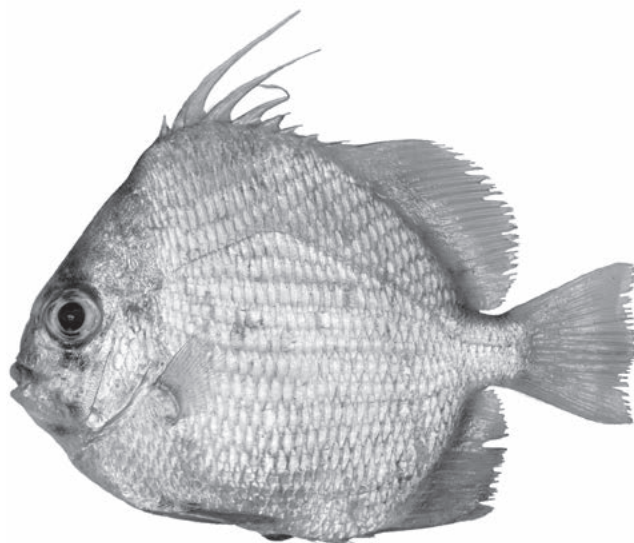
Chaetodon orbis Bloch 1787: 81, Pl. 202, Fig. 2 (Tharangambadi, India).

Ehippus orbis: Gloerfelt-Tarp & Kailola 1984*; Randall 1995*;

Heemstra 2001*.

Diagnosis as for genus. Dorsal fin 9 or 10 spines, 19 or 20 rays; anal fin 3 spines, 14–16 rays; pectoral fins 18 or 19 rays. Body depth 1.3–1.5 in SL; HL 3.4–3.7 in SL. LL scales 39–43; GR 9/9.

Body silvery blue-green, uniform or with ~5 faint narrow bars on dorsal half of body. Attains 20 cm TL.



Ehippus orbis, 11 cm TL (Myanmar). © Alveim © IMR

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, India and Sri Lanka; elsewhere to Indonesia, Philippines, China and Taiwan.

REMARKS Found in estuaries and over mud and sand bottoms, to ~30 m deep. Of minor importance to fisheries, usually caught in trawls or lift nets.

GENUS *Platax* Cuvier 1816

Body disc-like, strongly compressed; head profile steep. Dorsal fin 5–7 hidden spines, 1st spine short, the rest increasing in length posteriorly, 29–39 rays; anal fin 3 hidden spines, 21–30 rays; pectoral fins small, 16–19 rays. Scales extending on top of head to interorbital space and covering most of median fins. Jaws with bands of slender, tricuspid incisors; no teeth on vomer (except some specimens with a few villiform teeth on vomer) or palatines. Anterior nostril tubular; posterior nostril oval with well-developed inner flap on rear edge. Preopercle smooth; no spines on opercle. Five species in Indo-Pacific, 3 in WIO.

KEY TO SPECIES

- 1a Dorsal fin 5 spines, 34–39 rays; anal fin 3 spines, 25–30 rays; middle tooth cusp about twice length of lateral cusps; interorbital width 35–42% HL; juveniles (<10 cm SL) tan or reddish brown, with irregular black spots and blotches and small white ocelli on body; in adults, dark bar behind head fainter, and vertical bar through eyes a series of dark vermiculations, not solid *P. orbicularis*
- 1b Dorsal fin 5 spines, 28–34 rays; anal fin 3 spines, 21–28 rays; middle tooth cusp not much longer than lateral cusps; interorbital width 39–52% HL 2
- 2a Large adults with prominent hump on nape, and head profile almost vertical; LL scales 56–66; broad dark or dusky bar from dorsal-fin origin across rear edge of operculum and pectoral-fin base to belly, where it usually encloses black blotch, and another smaller black vertical streak often present at anal-fin origin *P. teira*
- 2b Adults with head profile slightly curved, and no prominent bulge at nape; LL scales 44–52; no black blotch on sides of belly or black streak at anal-fin origin; in juveniles, front margin of black area at rear part of body closely preceded by faint narrow dark bar; adults yellowish silver, usually with small scattered black spots *P. boersii*

Platax boersii Bleeker 1853

Boer's platax

PLATE 54

Platax boersii Bleeker 1853: 758 (Makassar, Sulawesi, Indonesia); Kishimoto *et al.* 1988*; Kuitert & Debelius 2001*.

Body depth more than twice HL, and 0.9–1.3 in SL; HL 3.1–3.4 in SL; LL scales 44–52. Head profile of juveniles evenly curved, and adults with bony swelling between eyes. Jaws with bands of slender, flattened, tricuspid teeth, middle cusp barely longer than lateral cusps; no teeth on palatines or vomer; lower jaw with 5 pores on each side. Dorsal fin 5 spines, 31–34 rays; anal fin 3 spines, 24–28 rays; pectoral fins 16 or 17 rays; pelvic-fin tips when depressed reaching to or past rear of anal-fin base; caudal fin of adults double emarginate, shorter than head length. Juveniles with pelvic fins and anterior rays of dorsal fin and anal fin elongated, and dorsal-fin height greater than anal-fin height and subequal to body depth.

Adults (>18 cm TL) yellowish silvery, usually with small scattered black spots on body; dark bar through eyes and another just behind head; median fins yellowish green; pelvic fins black; margins of pectoral fins, anal fin and caudal fin black; adults in spawning aggregations primarily yellow. Juveniles yellowish brown or silvery, with 2 black bars (as in

adults), and rear third of body blackish, continuing onto dorsal fin and anal fin, but front of blackish zone often preceded by narrow faint dark bar; pectoral fins hyaline; caudal fin pale greenish or yellow, with black base and rear margin. Attains 40 cm TL.

DISTRIBUTION Range uncertain because of confusion with other species: probably tropical waters of Indo-Pacific, unconfirmed reports in WIO from Kenya and eastwards to Seychelles; elsewhere to Indonesia, Philippines and New Guinea in western Pacific.

REMARKS Adults solitary in coastal waters or in large schools on or near reefs, in 10–60 m; juveniles often on deep slopes among coral formations. Caught with hook and line, trawls or hand nets. Probably does well in aquaria, and the striking juveniles are valuable in the aquarium trade.

Platax orbicularis (Forsskål 1775)

Round platax

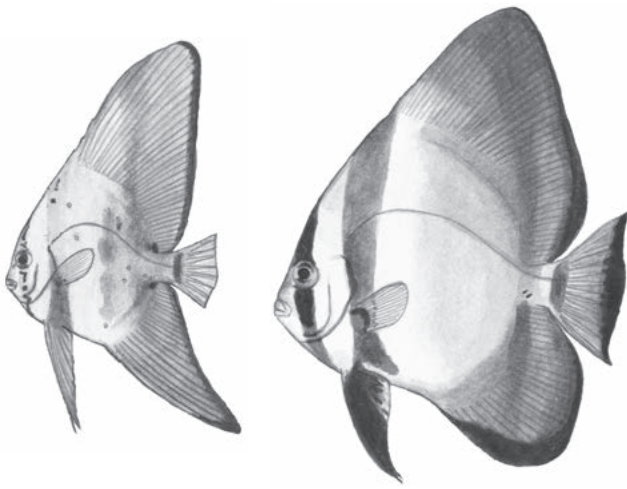
PLATE 54

Chaetodon orbicularis Forsskål in Niebuhr 1775: 59, xii (Jeddah, Saudi Arabia, Red Sea).

Platax orbicularis: SSF No. 192.1*; Randall 1995*; Kuitert & Debelius 2001*; Heemstra & Heemstra 2004; Fricke *et al.* 2009.

Body depth more than twice HL, and 0.9–1.4 in SL; HL 3.4–3.8 in SL; LL scales 44–52. Large adults (>40 cm TL) with bony swelling between eyes. Jaws with bands of slender, flattened, tricuspid teeth, middle cusp about twice length of lateral cusps; no teeth on palatines or vomer; lower jaw with 5 pores on each side. Dorsal fin 5 spines, 34–39 rays; anal fin 3 spines, 25–29 rays; pectoral fins 16 or 17 rays; pelvic-fin tips when depressed reach middle of anal-fin base; caudal fin truncate in juveniles, double emarginate in adults. Juveniles with pelvic fins and anterior rays of dorsal fin and anal fin elongated, and dorsal-fin height subequal to body depth.

Adults (>20 cm TL) silvery grey or dusky, occasionally with few small scattered black spots on body; dark vertical vermiculated bar through eyes and another just behind head; median fins yellowish or silvery, with black margins; pelvic fins yellow with black tip; males with larger white area on rear margin of anal fin. Small juveniles reddish brown or coppery, with irregular black spots and blotches, and small white, black-edged ocelli on body; solid dark vertical bar through eyes; pair of small black spots at bases of last 3 dorsal- and anal-fin rays; caudal fin transparent, with reddish brown base. Attains 50 cm TL.



Platax orbicularis, 7 cm SL, juvenile (Australia); 10 cm SL, subadult (Japan).

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (Knysna), Oman to India, Madagascar, Comoros, Seychelles, Mauritius, Réunion, Chagos and Maldives; elsewhere to Indonesia, Philippines, Japan, New Guinea, Australia and Tuamotu Is.

REMARKS Juveniles occur inshore and are common in mangrove swamps, where they often float on their side at the surface and mimic floating leaves. Adults solitary, in pairs, small groups or large schools, on or near reefs, in 10–60 m. Eggs pelagic. Reportedly omnivorous, feeding on algae, small fishes, zooplankton and benthic invertebrates. Caught with hook and line, palisade traps, spear, trawls and hand nets. Known to breed in captivity; the attractive juveniles are valuable in the aquarium trade.

Platax teira (Fabricius 1775)

Spotbelly platax

PLATES 54 & 55

Chaetodon teira Fabricius in Niebuhr (ex Forsskål) 1775: 60, xii (Al-Luhayya, Yemen, Red Sea).

Platax teira: SSF No. 192.3*; Randall 1995*; Heemstra & Heemstra 2004*; Fricke *et al.* 2009.

Body depth more than twice HL, and 0.9–1.2 in SL; HL 2.7–3.5 in SL; LL scales 50–66; GR 9/9. Large adults (>35 cm SL) with bony hump (hyperostosis of supraoccipital and frontal bones) from top of head to interorbital region, and head profile almost vertical. Jaws with bands of slender, flattened, tricuspid teeth, middle cusp slightly longer than lateral cusps; vomer with few teeth; no teeth on palatines; lower jaw with 5 pores on

each side. Dorsal fin 5 or 6 spines, 28–34 rays; anal fin 3 spines, 21–26 rays; pectoral fins 16–18 rays; pelvic-fin tips when depressed not reaching much past rear of anal-fin base; caudal fin double emarginate. Juveniles with pelvic fins and anterior rays of dorsal fin and anal fin greatly elongated, and dorsal-fin height much greater than body depth.

Body yellowish silvery or dusky, with black or dusky bar through eyes and another dark bar from dorsal-fin origin across edge of operculum and pectoral-fin base to belly, where it usually encloses black blotch, and another smaller black vertical streak often at anal-fin origin; median fins dusky yellow, with black margins; pelvic fins yellow, dusky yellow or blackish. Attains 65 cm TL.



Platax teira (South Africa). © DA Polack

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (Knysna), Oman to India, Madagascar, Comoros, Réunion, Mauritius and Maldives; elsewhere to Indonesia, Taiwan, Philippines, northern Japan (Hokkaido), Melanesia, New Guinea and northern Australia.

REMARKS Juveniles and adults found inshore, on protected reefs, in mangrove areas and also on wrecks and deep reefs, to ~70 m; occur as solitary, in pairs or large schools. Feeds on algae, zooplankton and benthic invertebrates. Found inshore and also drifting with *Sargassum* weed and flotsam far from land. Caught with hook and line, palisade traps, spear, trawls and hand nets; like most *Platax*, this species is unafraid of divers; flesh can be excellent, or rank, with a weedy flavour. The long-finned juveniles are valuable in the aquarium trade.

GENUS *Tripterodon* Playfair 1867

Body deep and compressed, disc-like; head profile steep. Dorsal fin with 9 spines, first spine short, spines 3–5 elongate, spines 3–8 swollen near base, and 19–21 rays, interspinous membranes deeply incised; anal fin with 2 or 3 spines, 15–17 rays; pectoral fins shorter than head, with 17–19 rays; caudal fin emarginate. Scales moderate, ctenoid, on cheeks and operculum, extending on top of head to interorbital space and covering proximal half of median fins. Preopercle serrate in juveniles, smooth in adults; no spines on opercle. Jaws with bands of slender, moveable, tricuspid incisors; palate and tongue edentate. Swimbladder large, not connected to head, bifurcate posteriorly, the two horns extending to 3rd or 4th caudal vertebra. One species.

Tripterodon orbis Playfair 1867

African spadefish

PLATE 55

Tripterodon orbis Playfair in Playfair & Günther 1867: 42, Pl. 7, Fig. 1 (Zanzibar, Tanzania); Smith 1936*; SSF No. 192.4*; Kuitert & Debelius 2001*; Heemstra & Heemstra 2004*.

Diagnosis as for genus. Body depth more than twice HL, and 1.1–1.5 in SL; HL 3–3.2 in SL; LL scales 43–45. Ascending process of premaxillae equal in length to lateral ramus; lips thick. Nostrils far apart; anterior nostril a round pore, posterior nostril long and oval. Juveniles with pelvic fins and dorsal-fin spines greatly elongated (twice HL); outermost pelvic-fin ray reaches past base of 2nd ray of anal fin; pectoral fins 17–19 rays; caudal fin emarginate.

Adults greenish silver, with series of white spots along scale rows (one spot per scale); dorsal-fin spines yellowish, and soft portion of dorsal fin dusky yellow; anal fin iridescent bluish green; median fins blackish distally; pelvic fins blackish. Juveniles silvery, with 5 main dark bars: first bar from forehead across eyes to chest, second from nape across opercle to pectoral-fin bases, third from middle spines of dorsal fin to belly, fourth from dorsal-fin to anteriormost anal-fin rays, and fifth at caudal-fin base; 1 or 2 faint narrow dark bars dorsally between main bars; snout and front of head dusky. Attains 75 cm TL.



Tripterodon orbis, 43 cm TL (Mozambique). © Alvheim © IMR

DISTRIBUTION WIO: Pakistan, Somalia to South Africa (Durban, KwaZulu-Natal; juveniles to Algoa Bay, Eastern Cape) and Madagascar.

REMARKS Found on coral reefs and in inshore protected waters, to 45 m deep. Schools of ~30–100 fish often seen above the reefs at Sodwana Bay, South Africa. Feeds on benthic invertebrates and zooplankton. Flesh excellent to eat.

GLOSSARY

antrorse – pointing or curving anteriorly, specifically spines or fin elements.

ascending process – a vertical extension of the anterior of the premaxilla.

bifurcate swimbladder – swimbladder with two lobes.

hyperostosis – excessive growth of bone.

interarcual cartilage – a cartilage in the pharyngeal arch.

lanceolate cusp – broad at the base and tapering to a point; arrow-like.

procumbent – lying down and pointing forwards.

Sargassum – a genus of brown seaweed (macroalgae) common in temperate and tropical seas.

setiform – bristle-like.

FAMILY SCATOPHAGIDAE

Scats

Phillip C Heemstra

Medium-sized with deep and strongly compressed body, covered with minute adherent ctenoid scales; lateral line complete. Head length about half body depth; interorbital area scaly; no spines or serrae on head bones of adults and juveniles, but head of post-larvae with fused bony shields, blunt spines and projecting ridges bearing swollen granulated pads, as well as large spine above pectoral-fin bases (all disappearing with growth). Mouth small, horizontal; jaws not protrusile; maxilla covered by preorbital bone. Teeth minute, slender, tricuspid, moveable, in bands in both jaws; no teeth on vomer or palatines. Dorsal fin deeply notched: spinous portion with 10–12 strong heteracanth spines, and rayed portion with 15–17 rays, preceded by strong spine firmly attached to first unbranched ray (contrary to the literature, the small 1st dorsal-fin spine is not a procumbent spine, as it projects dorsally at 45° angle to horizontal line at its base and is moveable or hinged); anal fin 4 spines, 13–16 rays; pectoral fins ~ $\frac{2}{3}$ HL; pelvic fins 1 spine, 5 branched rays, and small scaly axillary process; caudal fin truncate, with 14 branched rays. Lateral line ~94–130 scales. Branchiostegal rays 6; gill slits 4, a slit behind

last; gill rakers short and soft; pseudobranch well-developed. Swimbladder simple. Total vertebrae 23; supraneurals 2; first neural spine autogenous.

Occur in shallow marine waters, estuaries and freshwater. The fins have strong grooved spines that can produce a painful wound; however, the venom glands of juveniles disappear with growth. Omnivorous, feeding on algae, detritus, small crustaceans and worms. Two genera and 4 species in Indo-Pacific; 1 genus and 2 species in WIO.

GENUS *Scatophagus* Cuvier 1831

Dorsal fin 11 spines, 16–18 rays; anal fin 4 spines, 14 or 15 rays; pectoral fins 15 or 16 rays. Middle rays of dorsal fin and anal fin longest. Branchiostegal membranes united, forming free fold across isthmus. Two or 3 species (Kottelat 2001), 2 in WIO.

KEY TO SPECIES

- 1a Head profile of adults concave above eyes and convex at nape; body of large adults (>20 cm SL) brownish silver, with various-sized round dark spots; small juveniles coppery brown, with 5 or 6 irregular black bands breaking up into round spots; dorsal part of body and head reddish orange; spinous part of dorsal fin black, with reddish orange spines; dorsal-, caudal- and anal-fin rays white; pectoral fins 16–18 rays *S. argus*
- 1b Head profile more or less straight; head and body with 6 wide dark bars; pectoral fins 15 or 16 rays *S. tetracanthus*

Scatophagus argus (Linnaeus 1766)

Spotted scat

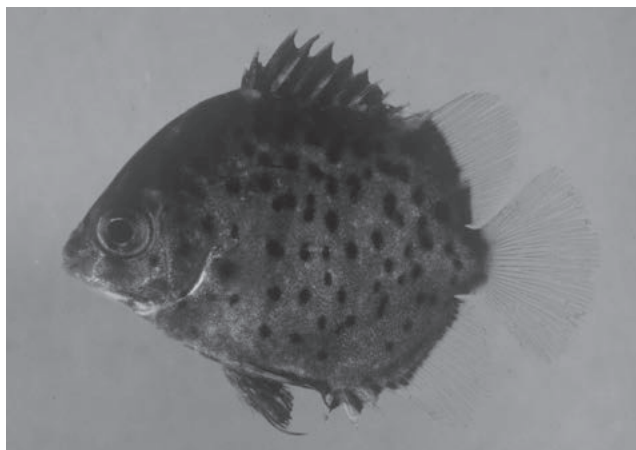
PLATE 55

Chaetodon argus Linnaeus (ex Brünnich) 1766: 464 (India).

Scatophagus argus: Pethiyagoda 1991*; Randall 1995*; Kottelat 2001*.

Dorsal fin 10–12 spines, 16–18 rays, and fin deeply notched before last spine; anal fin 4 spines, 13–15 rays; pectoral fins distinctly shorter than pelvic fins, with 16–18 rays; caudal fin rounded in juveniles, truncate in adults, with 14 branched rays. Body depth 1.5–1.8 in SL; HL 3.2 in SL; eye diameter ~4.5 in HL; GR 6/16. Preopercle weakly serrate.

Adults brownish silvery, with large, round, dark brown or blackish spots. Juveniles (15–20 mm SL) reddish orange dorsally, with 5 or 6 dark brown bars that break up into irregular dark blotches (at ~3 cm SL) and then into eye-sized dark spots. Attains 38 cm TL.



Scatophagus argus, 3 cm SL, juvenile (New Caledonia).

© R Winterbottom, ROM

DISTRIBUTION Indo-Pacific (widespread). WIO: Persian/Arabian Gulf to India and Sri Lanka; elsewhere to Indonesia, Japan, Micronesia, New Guinea, Australia, New Caledonia and Tahiti.

REMARKS Found in estuaries, harbours, mangrove areas and the lower reaches of freshwater streams; usually occurs in small schools, tiny juveniles float in surface film. Harvested as food, medicine and for aquarium trade, and used as a marine aquaculture species in Asia.

Scatophagus tetracanthus (Lacepède 1802)

Barred scat

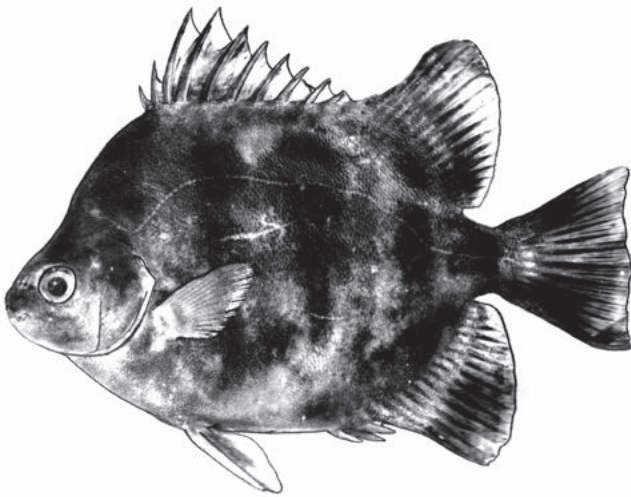
PLATE 55

Chaetodon tetracanthus Lacepède 1802: 726, 727 [no locality given].

Scatophagus tetracanthus: SFS No. 582*; Arnoult 1986; SSF No. 191.1*; Eccles 1992*.

Dorsal fin 12 spines, 15–18 rays; anal fin 4 spines, 14 or 15 rays; pectoral fins 15 or 16 rays. Body depth 1.4–1.6 in SL; HL 3.1–3.3 in SL; eye diameter 1.9–2.1 in HL, and 1.9–2.1 in interorbital width; GR 4/9–11. Preopercle finely serrate.

Adults with 6 broad dark bars on head and body, space between bars white on front half of body, and yellowish on rear half of body; median fins yellowish; pectoral fins hyaline-yellow; pelvic fins dark with yellow spine. Juveniles also with 6 dark bars on head and body, and space between silvery white; first 3 dorsal-fin membranes reddish, median fins otherwise hyaline with dark bases; pelvic fins dark with yellow spine. Attains 30 cm TL.



Scatophagus tetracanthus, 15 cm TL (Mozambique). Source: SSF

DISTRIBUTION WIO: Somalia to South Africa (adults to KwaZulu-Natal, juveniles to Eastern Cape), Mozambique (common in Maputo Bay), and Madagascar. Reports from Australia and New Guinea in western Pacific need confirmation.

REMARKS Shoaling; common in harbours and estuaries. Feeds on algae, detritus and sewage. Adults and juveniles are excellent aquarium fish.

GLOSSARY

autogenous – independently generated.

heteracanth spines – asymmetrical dorsal-fin spines with either the right or left side thickened.

pseudobranch – a small, gill-like organ on the inner surface of the operculum.

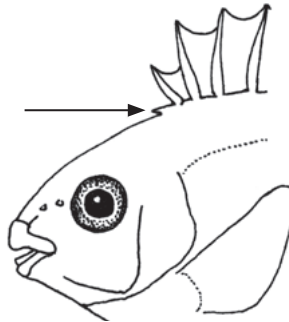
FAMILY SIGANIDAE

Rabbitfishes or spinefoots

David J Woodland

Moderate-sized with deep or slender, laterally compressed, elliptical body; distinguished by 2 spines (inner and outer) in each pelvic fin, separated by 3 rays, the innermost spine connected to belly by membrane. Snout rounded; mouth small, terminal; jaws with serrated 'beak' of incisiform, bicuspid,

imbricated teeth, and jaws not protrusible, but upper jaw hinged, permitting it to be flexed up and down when feeding. Dorsal fin 13 spines, 10 rays, and fin preceded by short forward-projecting (antrorse) spine sometimes partly hidden in groove; anal fin 7 spines, 9 rays; caudal fin emarginate or truncate throughout life, or progressing from emarginate to forked with increasing size. Scales very small, cycloid. Vertebrae 10 + 13.



Position of short forward-projecting (antrorse) dorsal spine.

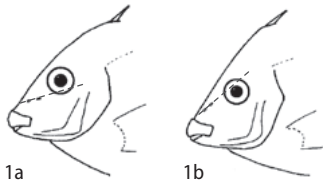
Anatomically a very uniform group in body proportions and counts, varying mainly in general colour of the body and fins, yet this is changeable with a fish's mood and substrate and can even be obliterated by similar irregular brown blotching when threatened or caught. Several species live typically in pairs among hard corals, but the majority in WIO are schooling, frequenting coral reefs, estuaries and coastal lagoons. Feed primarily on seaweeds, very occasionally on seagrasses, but more often on the micro-organisms that coat the blades; their diet and the nibbling action of their jaws explains the common name rabbitfish. Although primarily herbivorous, they can be caught using light gear and a small bait of animal flesh. Captured fish should be handled with care as the spines are armed with venom glands and stings are very painful. Important as food fishes throughout the tropics, where, depending on habitat, they are captured with hook and line, trawls, seine nets, set nets, traps and by spearing. Flesh palatable to excellent, though species living on coral reefs are occasionally responsible for ciguatera poisoning.

Common in shallow coastal waters throughout Indo-Pacific; most species are confined to the tropics, a few range into subtropical waters, and two have entered the eastern Mediterranean Sea through the Suez Canal. Presently, 1 genus (*Siganus*), divided into 2 subgenera: *Siganus*, with at least 25 species (14 in WIO), and *Lo* with 5 species (characterised by a tubular snout, and not found in the region). A revision would lead to the recognition of at least 3 genera.

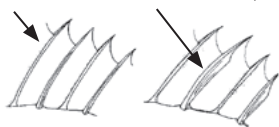
Diagnosis as for family. The WIO species were reviewed by Woodland (1984), and the family was revised by Woodland (1990); Kuitert & Debelius (2001) provide many excellent colour photographs of WIO species (although the taxonomy given occasionally differs from that recognised here). At least 14 species in WIO.

KEY TO SPECIES

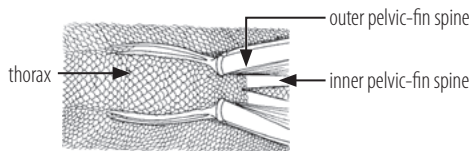
- 1a Line projected through anterior and posterior nostrils passes through lower third of rear edge of eye; sides of body yellow, usually completely covered with tiny blue ocelli, but these may be missing from lower body and/or posterior flanks, and occasionally ocelli totally absent, especially in very small juveniles where blue bars may precede ocelli development *S. corallinus*
- 1b Line projected through anterior and posterior nostrils passes above midpoint of rear edge of eye; colouration not as above 2



- 2a No scales along midline of thorax (in front of pelvic fins); dorsal- and anal-fin spines may be slender or stout 3
slender and stout dorsal- and anal-fin spines



- 2b Midline of thorax in front of pelvic fins scaled; dorsal- and anal-fin spines stout 8



- 3a Dorsal- and anal-fin rays long, 3rd dorsal-fin ray longer than distance from anterior nostril to posterior edge of eye; anal- and at least posterior dorsal-fin spines stout; caudal fin truncate or barely emarginate; vermiculations or labyrinthine pattern on sides of body 4
- 3b Dorsal- and anal-fin rays short, the 3rd dorsal-fin ray shorter than distance from anterior nostril to posterior edge of eye; dorsal- and anal-fin spines slender; caudal fin usually forked (emarginate in young of some species, to ~10 cm SL); head or body with spots and/or long wavy lines (but no labyrinthine pattern) (markings may disappear after preservation) 5

Continued...

KEY TO SPECIES

- 4a Head and body boldly marked with pearly blue to cream labyrinthine lines on pale brown to grey background; peduncle distinctly barred dark brown and whitish, and caudal-fin base with prominent whitish narrow bar (markings usually remain distinct after preservation) *S. spinus*
- 4b Head and body either olive or pale brown above and silvery below to entirely very dark brown, and with fine pale (often indistinct) vermiculations or wavy lines on sides (head and sides of preserved specimens usually plain brown, without traces of original pattern, but occasionally boldly marbled in pale and dark shades, with dark band under chin as in fright pattern); no irregular pale bars on peduncle or at caudal-fin base *S. luridus*
- 5a Caudal fin deeply forked, longest ray at least twice length of mid-rays (up to 3 times as long in adults); mid-caudal-fin rays shorter than outer spine of pelvic fins; last anal-fin spine very short, <1/2 length of longest anal-fin spine; prejuveniles without scales *S. argenteus*
- 5b Caudal fin emarginate in young to forked in adults, longest ray at most twice length of mid-rays (only in very large specimens, >25 cm SL), usually much less than twice length; mid-caudal-fin rays longer than outer spine of pelvic fins; last anal-fin spine short, but not <1/2 length of longest anal-fin spine 6
- 6a Body slender, depth 2.6–3.4 in SL; 18–21 scale rows between lateral line and bases of dorsal-fin spines 2–4; 6–19 wavy or horizontal golden-bronze lines running length of body below lateral line (usually lost after preservation) *S. rivulatus*
- 6b Body slender, depth 2.2–2.9 in SL; 15–32 scale rows between lateral line and bases of dorsal-fin spines 2–4; sides of body with cream or pearly blue spots (often lost after preservation) 7
- 7a Each side of body with ~30–70 evenly spaced large round spots, pearly blue or cream with blue centres (largest spot subequal to pupil), and a few scattered spots between lateral line and dorsal-fin base. Fish displaying fright pattern with sides irregularly dappled with small pale brown spots (smaller, more numerous and less distinct than spots described above) and large spots still discernible (although lost after preservation); 5 or 6 diagonal zones flecked with dark brown across sides *S. sutor*
- 7b Each side of head and body with ~100–250 pearly spots (number increasing with size of fish), tiny on nape, becoming ovoid or rod-shaped and progressively larger posteriorly (but largest much smaller than pupil). Fish displaying fright pattern with 5 or 6 diagonal zones flecked with dark brown across sides; sometimes dappled all over with small pale round spots (both slightly larger and smaller than pearly spots). All spots frequently lost after preservation, but small pearly spots on nape usually persist as dark dots *S. canaliculatus*

Continued...

KEY TO SPECIES

- 8a Body slender, its depth 2.3–2.6 in SL; 9–12 prominent evenly dispersed black spots above eyes, within dark diagonal band from chin to nape (spots persist after preservation) *S. puelloides*
- 8b Body deep, 1.8–2.3 in SL; no prominent black spots above eyes; if dark diagonal band from chin to nape present, wavy lines within this band 9
- 9a Shortest distance between bony orbit and upper lip $\leq \frac{1}{2}$ diameter of bony orbit; >29 scale rows between lateral line and bases of dorsal-fin spines 2–4 *S. javus*
- 9b Shortest distance between bony orbit and upper lip $> \frac{1}{2}$ diameter of bony orbit; <29 scale rows between lateral line and bases of dorsal-fin spines 2–4 10
- 10a No dark bands on head and anterior body 11
- 10b Oblique dark band from chin to nape, and another band of similar width parallel to it from pelvic-fin bases to dorsal-fin base (bands may fade after preservation, but rear band indicated by pair of dark lines that mark its border); sides of body behind rear band with many blue spots, sometimes anterodorsally only (spots dark brown on paler background after preservation) *S. virgatus*
- 11a Head and body completely covered with dark spots; caudal fin of large specimens (>15 cm SL) deeply forked, middle rays shorter than outer spine of pelvic fins (caudal fin of smaller specimens emarginate to deeply forked, middle rays shorter than or subequal to outer spine of pelvic fins) 13
- 11b Head and body not completely covered with spots; caudal fin emarginate to only moderately forked, middle rays longer than outer spine of pelvic fins 12
- 12a Large round yellow spot (size of eye) below bases of rear dorsal-fin rays (may persist as grey patch after preservation); golden stripes along sides of body, breaking into spots near anal-fin base *S. insomnis*
- 12b No large yellow spot below bases of rear dorsal-fin rays; entire head and body covered with regular pattern of pale blue to silver vermiculations on brown background *S. vermiculatus*
- 13a Dark spots on nape similar in size to those on head and adjacent areas, and no greenish patch in nape area *S. laqueus*
- 13b Dark spots on nape much smaller than those on adjacent areas, and greenish patch on nape area *S. stellatus*

Siganus argenteus (Quoy & Gaimard 1825)

Streamlined rabbitfish

PLATE 56

Amphacanthus argenteus Quoy & Gaimard 1825: 368, Pl. 62,
Fig. 3 (Guam, Mariana Is.).

Amphacanthus rostratus Valenciennes in Cuv. & Val. 1835: 158
(Massawa, Eritrea, Red Sea).

Siganus argenteus: Fowler 1932*; Kearney *et al.* 1972;
Kami & Ikehara 1976; Tobias 1976; Popper *et al.* 1979; Woodland 1984*,
1990*, 2001*; Burgess *et al.* 1988*; Randall 1995*; Winterbottom &
Anderson 1997; Laboute & Grandperrin 2000*; Kuitert & Debelius 2001*;
Anderson 2005*.

Siganus rostratus: Tsuda & Bryan 1973; Taylor 1983*.

Body of juveniles and adults compressed, fusiform and slender, body depth 2.4–3 in SL. Head small with pointed snout; long flap on anterior nostril extending past posterior nostril. Caudal fin deeply forked, median rays 0.3–0.5 length of longest ray. Last dorsal-fin spine short, 2.6–3.5 in longest dorsal-fin spine. No scales along midline of thorax; fine scales on cheek. Prejuveniles plumper, cigar-shaped, body depth ~4 in SL, and without scales (except for single row along lateral line at onset of metamorphosis); anterior nostril flap reaching only halfway to rear nostril; caudal fin not deeply forked.

Head and body deep sea-blue above to pale blue or silvery below, covered with small yellow spots, bars and comma-shaped marks, frequently joined to form horizontal wavy lines (particularly on lower sides though sometimes over whole of sides); prejuveniles yellow-brown or possibly sea-blue above and silver below. In frightened fish, colours obscured by irregular diagonal zones mottled dark and pale brown, and prominent white saddle on peduncle. After death, colours fade rapidly so head and body may become solid brown. Attains 46 cm TL.



Siganus argenteus, 20 cm SL (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Red Sea, Gulf of Aden, Tanzania, Mozambique, Madagascar, Aldabra, Seychelles, Mascarenes, Chagos, Laccadives, Maldives and Sri Lanka; elsewhere to Japan, Marshall Is., Australia, New Caledonia, Rapa Iti and Pitcairn Is.

REMARKS Unique among siganids in having distinct prejuvenile stage that metamorphoses into juvenile form at ~65 mm SL. Schooling; juveniles and adults found around coral reefs, and prejuveniles pelagic, found up to several kilometres offshore.

Siganus canaliculatus (Park 1797)

Whitespotted rabbitfish

PLATE 56

Chaetodon canaliculatus Park 1797: 33 (Sumatra, Indonesia).

?*Amphacanthus guttatus* var. *oramin* Schneider in Bloch & Schneider 1801: 207, Pl. 48 (Tharangambadi, India).

Teuthis oramin: Day 1875*.

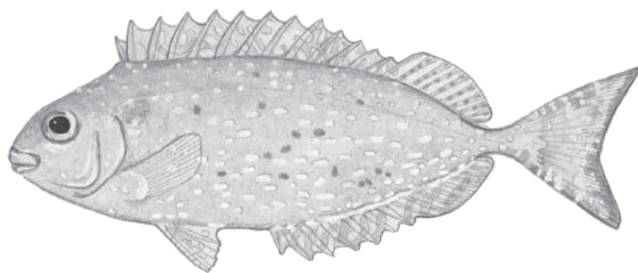
Siganus oramin: Misra 1962*; Kuronuma & Abe 1972*.

Siganus canaliculatus: Soh 1976*; Woodland 1984*, 1990*, 2001*;

Allen & Swainston 1988*; Randall 1995*.

Body slender, its depth 2.3–2.8 in SL. Anterior nostril with long flap in juveniles, its tip reaching at most to posterior nostril; flap progressively shorter with age, reduced to flange around nostril by ~20 cm SL. Last dorsal-fin spine shortest, but not <½ length of longest spine. Caudal fin emarginate in small juveniles to forked in adults, mid-rays up to half length of longest rays in large fish. Scale rows 16–27 between lateral line and bases of dorsal-fin spines 2–4; no scales along midline of thorax.

Colour pattern in life variable, influenced by habitat, age and mood of fish. Head and body silvery grey above, with trace of green on nape, and silver below; ~100–250 pearly round, ovoid and rod-shaped spots evenly dispersed over each side of body, tiny on nape and larger elsewhere, arranged in more or less regular rows, 2–4 rows of spots above lateral line. Frightened fish entirely mottled with shades of pale and dark brown, but mainly 5 or 6 darker diagonal zones alternating with paler zones across sides, obscuring regular pattern of spots. Attains 25 cm TL.



Siganus canaliculatus, 17 cm SL (Persian/Arabian Gulf).

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Pakistan, India and Sri Lanka; elsewhere to east coast of India, Indonesia, South China Sea and northern Australia.

REMARKS Found in schools over coral-reef flats, in bays and estuaries, as well as in deeper water, to ~50 m deep.

Siganus corallinus (Valenciennes 1835)

Spotted rabbitfish

PLATE 56

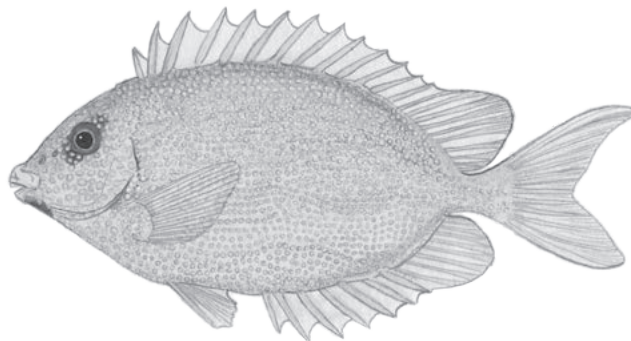
Amphacanthus corallinus Valenciennes in Cuv. & Val. 1835: 139 (Seychelles; Java, Indonesia).

Siganus corallinus: Woodland 1984*, 1990*, 2001*;

Kuiter & Debelius 2001*; Anderson 2005.

Body deep, 1.7–2.4 in SL; head profile strongly concave before eyes and behind chin so that snout protrudes prominently. Caudal fin emarginate in juveniles (to ~5 cm SL), becoming deeply forked with sharply pointed lobes in adults. Midline of thorax scaled.

Head, body and fins orange-yellow, and entire sides of body usually with pale blue and dark-blue-rimmed ocelli (sometimes no ocelli on large areas posteroventrally, especially in small juveniles); no ocelli on caudal fin; brown smudge across eyes (live fish), no spots on iris. WIO specimens with small brown patch under chin, not extending to upper lip (no patch in specimens from western Pacific, which Kuiter & Debelius [2001] regard as separate species *S. studeri*). Very small juveniles (<5 cm SL) plain yellow; next life stage with vertical blue bars or lines on sides, subsequently dividing into ocelli. Attains 30 cm TL.



Siganus corallinus, 23 cm SL (Seychelles).

DISTRIBUTION Indo-Pacific. WIO: Aldabra, Seychelles and Maldives; elsewhere to Andaman Is., Indonesia, Palau, Japan, northern Australia and New Caledonia.

REMARKS Juveniles school in seagrasses; adults live in pairs on coral reefs, in some areas migrating inshore on rising tide in large numbers to feed.

Siganus insomnis Woodland & Anderson 2014

Bronze-lined rabbitfish

PLATE 56

Siganus insomnis Woodland & Anderson 2014: 130, Figs. 3–7
(Addu Atoll, Feydhoo I., Maldives).

Siganus javus (non Linnaeus 1759): Jones & Kumaran 1980*.

Siganus guttatus (non Bloch 1787): Allen & Steene 1987*.

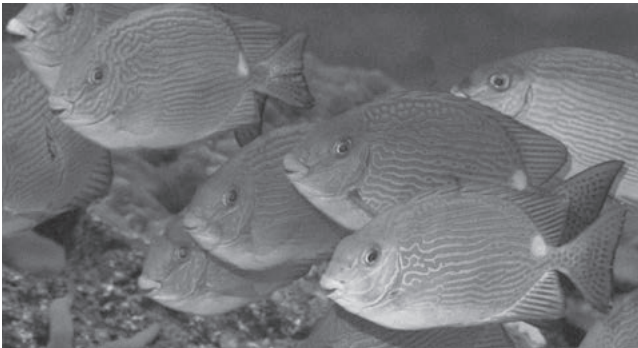
Siganus lineatus (non Valenciennes in Cuv. & Val. 1835): Woodland 1984*
[in part], 1990* [in part], 2001* [in part]; Chitravadivelu & Sivapalan
1984*; Kurup & Samuel 1985*; De Bruin *et al.* 1995* [in part];
Randall & Anderson 1993.

Siganus cf. *lineatus*: Kuitert & Debelius 2001*.

Siganus ?*lineatus*: Anderson 2005*.

Body deep, 2–2.1 in SL. Dorsal-fin spines 5–7 longest; dorsal- and anal-fin rays high, longest rays 1.2–1.5 length of longest spines in respective fins. Caudal fin emarginate, more so in juveniles. Midline of thorax scaled.

Head and body blue above to silver below; sides with golden-bronze bands, sometimes broken but mostly running full length of body, and breaking into spots at bases of dorsal, anal and caudal fins; bright yellow spot (about size of eye) at bases of last few dorsal-fin rays (often fading to grey spot in dead fish); caudal fin blue with bronze spots. Differs from sibling species *S. lineatus* (from eastern Indo-Pacific) mainly in pattern of bands on sides, which meander and break into spots anterodorsally on head. Attains at least 35 cm SL.



Siganus insomnis (Sri Lanka). © SG Anderson

DISTRIBUTION WIO: Maldives, Laccadives, southern India and Sri Lanka.

REMARKS Young found in schools in estuarine areas, such as seagrass flats and mangroves, and adults in schools on coral-reef flats and lagoons.

Siganus javus (Linnaeus 1766)

Java rabbitfish

PLATE 56

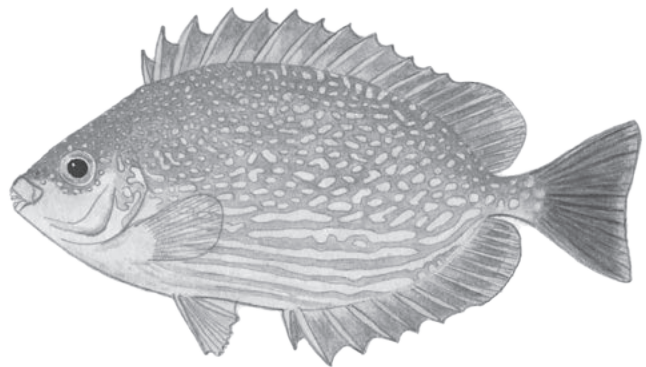
Teuthis javus Linnaeus 1766: 507 (Java, Indonesia).

Siganus javus: Whitehouse 1923; Misra 1962; Randall *et al.* 1978*;

Talwar & Kacker 1984*; Woodland 1984*, 1990*, 2001*; Randall 1995*.

Body deep, 2–2.3 in SL; head profile ascending steeply from above eyes to first spines of dorsal fin. Dorsal-fin spines 4–6 longest, but only slightly longer (1.2–1.6 times) than last spine; dorsal- and anal-fin rays of moderate length, longest rays subequal to longest spines in their respective fins. Caudal fin emarginate. Midline of thorax scaled.

Body dark bronze, with numerous gunmetal blue spots on upper sides coalescing into silvery blue lines on lower sides; lips and cheeks yellow; dorsal- and anal-fin spines and rays yellow; caudal fin dusky with large central black area (live fish). Attains 55 cm TL.



Siganus javus, 14 cm SL (Persian/Arabian Gulf).

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Pakistan, India and Sri Lanka; elsewhere to Indonesia, South China Sea and northern Australia.

REMARKS Found in small schools in shallow coastal waters on coral reefs, in rocky areas and brackish lagoons, mainly in murkier waters.

Siganus laqueus Von Bonde 1934

Brown-spotted rabbitfish

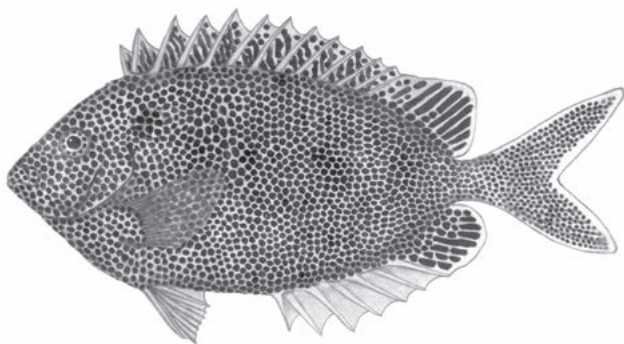
PLATE 56

Siganus laqueus Von Bonde 1934: 451, Pl. 23, Fig. 4 (Zanzibar, Tanzania);
Kuitert & Debelius 2001*.

Siganus stellatus: Smith 1961*; Blaber 1978; Woodland 1984* [in part],
1990* [in part], 2001*; Allen & Steene 1987*; Randall & Anderson 1993;
Anderson 2005*.

Body deep, 1.8–2.3 in SL; head profile virtually straight dorsally, and concave behind chin. Caudal fin emarginate in young to deeply forked in adults, lobes usually broadly rounded, but upper lobe sometimes sharply pointed. Midline of thorax scaled.

Head and body greyish green, covered with dark brown spots extending onto all fins except pectoral fins; spots relatively larger and more irregular in outline in juveniles (in sibling species *S. stellatus* from Red Sea, spots diminish in size towards dorsal-fin origin where distinctive green patch occurs); iris silver, with 10–13 brown spots; dark brown patch size of eye near origin of lateral line (prominent and permanent in juveniles, subdued and evanescent in older fish); in large fish, caudal-fin margin and trailing edges of soft dorsal fin and anal fin with narrow yellow or cream margin. Freshly dead fish become brown with darker brown spots. Attains 40 cm TL.



Siganus laqueus, 25 cm SL (Maldives).

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa, Comoros, Aldabra, Seychelles, Maldives, India and Sri Lanka; elsewhere, Andaman Sea (Thailand and Malaysia) and southwestern coasts of Sumatra and Java.

REMARKS Found around coral reefs; juveniles and subadults schooling, and adults in pairs; in East Africa, juveniles occur in coastal lagoons and around mangroves at mouths of creeks.

Siganus luridus (Rüppell 1829)

Dusky rabbitfish

PLATE 57

Amphacanthus luridus Rüppell (ex Ehrenberg) 1829: 45 (Red Sea).

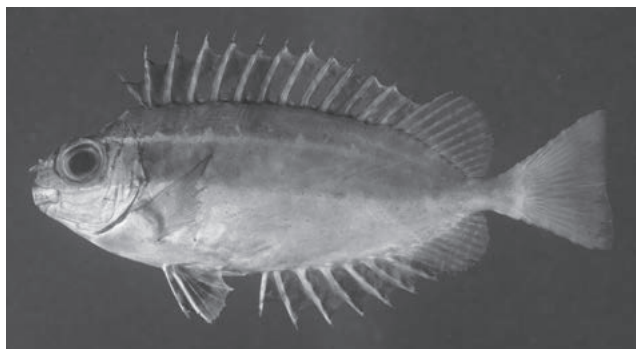
Amphacanthus abhortani Valenciennes in Cuv. & Val. 1835: 143 (Mauritius, Mascarenes) [in part].

Siganus luridus: Ben-Tuvia 1964*; George 1972*; Popper & Gunderman 1975; Lundberg & Lipkin 1979; Popper *et al.* 1979; Randall 1983*; Woodland 1984*, 1990*; Stergiou 1988; Kuitert & Debelius 2001*.

Body moderately slender, its depth 2.2–2.8 in SL. Anterior nostril with long broad flap reaching to or past posterior nostril. Anterior spines of dorsal fin and anal fin slender,

posterior spines stout; longest dorsal-fin spine 1.3–1.7 length of last spine. Caudal fin truncate, may be slightly rounded in large adults. No scales along midline of thorax.

Colour pattern shows regional variation and can be influenced by colour of substrate. Head and body either olive-green or pale brown above and becoming silvery below, or uniformly dark brown (live fish); sides of body and median fins covered with fine off-white vermiculations or wavy lines, sometimes tending to a horizontal pattern on lower sides of head and body (pattern only visible after death in darkest individuals); no barring on peduncle or caudal-fin base. Attains 30 cm TL.



Siganus luridus, 10 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Red Sea, Gulf of Aden, Persian/Arabian Gulf, Gulf of Oman, Kenya to South Africa (Aliwal Shoal), Aldabra and Mascarenes; Lessepsian migrant to Mediterranean Sea.

REMARKS Has spread into eastern Mediterranean via Suez Canal. Adults found in small schools in shallow inshore waters, over hard bottoms of rocky or coral reefs; juveniles found in immense schools, in bays or on inner coral-reef flats.

Siganus puelloides Woodland & Randall 1979

Black-eyed rabbitfish

PLATE 57

Siganus puelloides Woodland & Randall 1979: 391, Fig. 1 (Villingili I., Malé Atoll, Maldives); Woodland 1984*, 1990*; Debelius 1993*; Randall & Anderson 1993; Kuitert & Debelius 2001*.

Body depth 2.2–2.4 in SL; head profile wedge-shaped, not markedly concave before eyes or behind chin. Caudal fin forked in adults, probably emarginate in small juveniles. Midline of thorax scaled.

Head and body pale bluish above to silvery blue below, and covered with densely packed yellow spots, often anastomosing above lateral line to create labyrinthine pattern, and colour pattern extending onto caudal-fin base; diffuse dark brown oblique patch through eyes, with 3–5 small black spots above

each eye and fewer below; chocolate brown band under chin terminating at edge of upper lip; dorsal fin and anal fin with plain yellow spines and rays. Attains 32 cm TL.

DISTRIBUTION Indian Ocean. WIO: Seychelles and Maldives; eastwards to Andaman Sea (Thailand).

REMARKS Adults found in pairs on coral reefs. Feeds on sessile colonial tunicates and monaxonid sponges as well as benthic algae.

Siganus rivulatus Forsskål & Niebuhr 1775

Marbled rabbitfish

PLATE 57

Siganus rivulatus Forsskål & Niebuhr in Niebuhr 1775: 25, x (Al-Luhayya, Yemen, Red Sea); Ben-Tuvia 1964*; George 1972*; Popper & Gundersman 1975; Popper *et al.* 1979; Woodland 1984*, 1990*; Debelius 1993*; Kuitert & Debelius 2001*.

Body slender, its depth 2.7–3.4 in SL. Anterior nostril with triangular flap reaching halfway to posterior nostril. Last anal-fin spine shortest, though only slightly shorter than 1st spine. Caudal fin emarginate, more so in older fish, longest ray 1.4–1.7 length of middle rays. No scales along midline of thorax.

Body grey or olive-green above to silvery below; 6–12 horizontal wavy bronze or golden lines on lower half of body (below lateral line) in adults, but these lines orange, rivulose, and over most of sides in juveniles (<10 cm SL) (lines lost after preservation). In frightened or sleeping fish, this pattern obscured by pale and dark brown mottling, creating 6 dark irregular diagonal zones alternating with paler zones. Attains 42 cm TL.

DISTRIBUTION WIO: Red Sea and Gulf of Aden; Lessepsian migrant to Mediterranean Sea.

REMARKS Has spread via the Suez Canal into eastern Mediterranean Sea where it is of commercial significance. Large schools found in shallow inshore waters, over sand, rock or hard coral, to ~20 m deep; tolerates polluted waters (common around sewer outfalls).

Siganus spinus (Linnaeus 1758)

Little rabbitfish

PLATE 57

Sparus spinus Linnaeus 1758: 281 (Java, Indonesia).

Teuthis marmorata: Day 1875*.

Siganus spinus: Munro 1955*; Tsuda & Bryan 1973; Bryan 1975;

Kami & Ikehara 1976; Tobias 1976; Woodland 1984*, 1990*, 2001*;

Kuitert & Debelius 2001*.

Body slender, depth 2.3–2.8 in SL. Snout convex, short and blunt; anterior nostril with broad strap-like flap extending past posterior nostril. Dorsal- and anal-fin spines stout; longest dorsal-fin spine 1.6–2 length of last spine. Caudal fin emarginate in juveniles, truncate in adults. No scales along midline of thorax.

Head and body boldly marked with pearly blue, silvery or cream labyrinthine lines on pale brown to greyish background; upper part of pattern vermiculate, and lower part consisting of horizontal wavy lines; peduncle barred dark brown and whitish, and caudal-fin base with prominent narrow whitish bar (markings usually remain after preservation). Attains 23 cm TL.

DISTRIBUTION Indo-Pacific. WIO: India and Sri Lanka; records from Persian/Arabian Gulf and Gulf of Oman not substantiated; elsewhere to Andaman Sea, Indonesia, Japan, Micronesia, Australia and Society Is.

REMARKS Earliest life stage is pelagic in open sea; thereafter (at ~4–5 cm TL) migrates in immense numbers to inner coral-reef flats, and adults found in small groups on outer reef flats.

Siganus stellatus (Forsskål 1775)

Yellow-tailed spotted rabbitfish

PLATES 57 & 58

Scarus stellatus Forsskål in Niebuhr 1775: 26, x (Jeddah, Saudi Arabia, Red Sea).

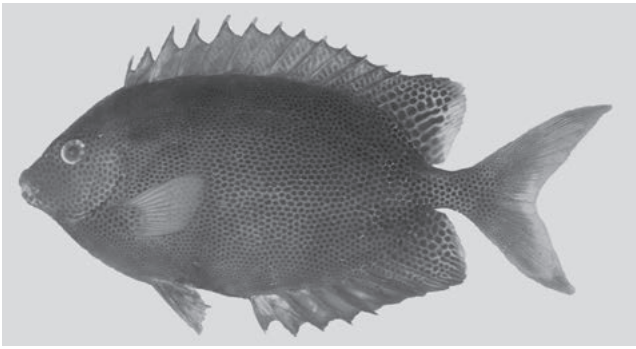
Amphacanthus punctatus Rüppell 1829: 46, Pl. 11, Fig. 2 (Red Sea).

Amphacanthus nuchalis Valenciennes in Cuv. & Val. 1835: 140 (Red Sea).

Siganus stellatus: Randall 1983*; Woodland 1984* [in part], 1990* [in part]; SSF No. 245.1*; Kuitert & Debelius 2001.

Body deep, 1.8–2.2 in SL; head profile virtually straight dorsally, concave behind chin. Caudal fin emarginate in young, becoming deeply forked and lobes acutely pointed in adults (caudal-fin lobes paddle-shaped in the sibling species *S. laqueus*). Midline of thorax scaled.

Head and body silvery to pale blue, covered with chocolate brown spots, diminishing markedly in size towards nape where there is distinct greenish patch (no patch in *S. laqueus*), and spots extending onto all fins except pectoral fins; trailing edges of anal fin and soft dorsal fin yellow, and colour continuous with yellow saddle on peduncle; upper and lower margins of caudal fin white, trailing edge yellow, but most of fin yellow in large adults; iris silver, with 9–12 brown spots. Freshly dead fish become brown with darker brown spots. Attains 40 cm TL.



Siganus stellatus, 21 cm SL (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Red Sea and Gulf of Aden (Djibouti).

REMARKS Found around coral reefs; juveniles schooling, adults in pairs.

Siganus sutor (Valenciennes 1835)

Shoemaker rabbitfish

PLATE 58

Amphacanthus sutor Valenciennes in Cuv. & Val. 1835: 148 (Seychelles).

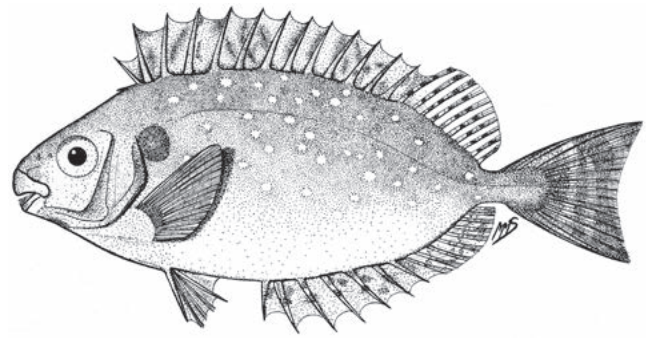
Amphacanthus abhortani Valenciennes in Cuv. & Val. 1835: 143 (Mauritius, Mascarenes) [in part].

?*Amphacanthus olivaceus* Valenciennes in Cuv. & Val. 1835: 163 (Mauritius, Mascarenes).

Siganus sutor: Woodland 1984*; SSF No. 245.2*; Cornic 1987*; Ntiba & Jaccarini 1988; Woodland 1990*; Van der Elst 1993*; Opic *et al.* 1994*.

Body slender, its depth 2.2–2.6 in SL. Anterior nostril with long flap in juveniles, its tip reaching at most to posterior nostril; flap progressively shorter with age, eventually reaching only quarter way to posterior nostril. Last dorsal-fin spine the shortest, but not $< \frac{1}{2}$ length of longest spine. Caudal fin emarginate in small juveniles, becoming forked in adults, with mid-rays $< \frac{1}{2}$ length of longest rays in large adults. Scale rows 24–32 between lateral line and bases of dorsal-fin spines 2–4; no scales along midline of thorax.

Colour pattern in life highly variable, influenced by habitat, age and mood of fish: head and body either greenish or sandy brown above to pale silvery below. Juveniles with up to ~70 round pearly blue spots evenly dispersed over sides of body, arranged in more or less regular rows, most prominent row on lateral line, and a few small scattered spots above lateral line. In adults, spots larger (up to pupil size) and fewer (~30–50) (spots lost after preservation); spots on midsides most prominent, blushing from blue to cream in life, while acquiring deep blue or grey centre. Frightened fish entirely mottled with shades of pale and dark brown, creating mainly 5 or 6 darker diagonal zones alternating with paler zones across sides, obscuring regular pattern of spots. Attains 50 cm TL.



Siganus sutor, 16 cm TL (South Africa). Source: SSF

DISTRIBUTION WIO: Yemen (Gulf of Aden), southern Oman, Kenya to South Africa (Knysna, Western Cape), Madagascar, Comoros, Aldabra, Seychelles and Mascarenes.

REMARKS Found in large schools in estuaries, on rock reefs, and inner pavement areas and lagoons of coral-reef flats.

Siganus vermiculatus (Valenciennes 1835)

Vermiculated rabbitfish

PLATE 58

Amphacanthus vermiculatus Valenciennes in Cuv. & Val. 1835: 126 (New Guinea).

?*Amphacanthus russelii* Valenciennes in Cuv. & Val. 1835: 123 (Vizagapatam, India).

Siganus vermiculatus: Gunderman *et al.* 1983; Woodland 1984*, 1990*, 2001*; De la Paz & Aragonés 1986; Kuitert & Debelius 2001*.

Body deep, 1.9–2.2 in SL. Anterior nostril with small flange, broadened slightly posteriorly. Spines of dorsal fin and anal fin stout; posteriormost anal-fin spine longest. Caudal fin emarginate. Midline of thorax scaled.

Head and body covered with pale blue (dorsally) to silvery vermiculate pattern on brown background; dark spots on soft parts of dorsal fin and anal fin, arranged in rows, basal row prominent; caudal fin spotted. Attains 45 cm TL.

DISTRIBUTION Indo-Pacific. WIO: India and Sri Lanka; elsewhere to Andaman Is., Micronesia and Fiji.

REMARKS Found in schools in estuaries and coastal lagoons.

Siganus virgatus (Valenciennes 1835)

Double-barred rabbitfish

PLATE 58

Amphacanthus virgatus Valenciennes in Cuv. & Val. 1835: 133 (Java, Indonesia).

Teuthis canaliculata (*non* Park): Bleeker 1862 [publ. 1863]*.

Teuthis virgata: Herre 1959; Bleeker 1862 [publ. 1863]*.
Siganus virgatus: Munro 1955*; Woodland 1984*, 1990*, 2001*;
 Kuiter & Debelius 2001* [excluding Fig. C].

Body deep, 1.8–2.3 in SL. Caudal fin emarginate. Midline of thorax scaled.

Head and body yellowish above, silvery below; 2 dark brown bands: one band through eyes from chin to nape and darkest below eyes, another band parallel to it, from pectoral-fin bases to before dorsal-fin origin; margins of both bands delineated by blue line (bands fade but lines persist after preservation); dark blue spots and lines included within band through eyes; rear band with single dark blue line through its long axis in very small juveniles, but older fish with several short blue lines which break up into spots with increasing size; area between dark bands highly reflective (flashing silvery in life), and with pale blue spots in adults, and short blue lines and spots in young; pale yellowish reflective area also immediately behind rear band; sides of body variously marked with pale blue spots, either distributed over most of sides or confined anterodorsally; dorsal fin and caudal fin yellowish. Attains 33 cm TL.

DISTRIBUTION Indo-Pacific. WIO: southern India and Sri Lanka; elsewhere to Andaman Is., Indonesia, Philippines, Taiwan, Japan and northern Australia.

REMARKS Occurs on coral reefs and rocky reefs; young recorded from freshwater streams; small juveniles schooling, older fish in pairs.

FAMILY LUVARIDAE

Luvar

Phillip C Heemstra

Head profile blunt and body robust and oblong, compressed, streamlined and tapering to narrow peduncle, with distinct fleshy midlateral keel and 2 small accessory keels (above and below main keel) in adults, and lunate caudal fin. Mouth very small, maxilla broad, covered by preorbital bone when mouth closed; teeth very small or absent in adults, present on tongue and palatines in some juveniles; nostrils single, small, circular. Dorsal fin low and long, with 11–13 unbranched rays and no spines in adults; fin higher, with 2 long spines and 22 or 23 rays in juveniles (<30 cm SL). Anal fin low and long, with 13 or 14 unbranched rays and no spines in adults;

fin higher, with ~18 rays and no spines in juveniles. Pectoral fins well-developed, with 15–20 rays, and subequal to head length. Pelvic fins rudimentary, near anus and below pectoral-fin bases; fins elongate in postlarvae (~8 cm SL) but shrink with growth and lose their soft rays, the elements becoming fused to form single small bony plate over anus in adults. Caudal fin with 16 principal rays, 7 + 7 branched rays that bifurcate proximally and overlap most of hypural plate in juveniles and adults. Head, body and fins covered with peculiar minute scales comprising two irregular oval discs: the proximal disc embedded in skin and joined by short column to the distal disc; some enlarged scales along bases of dorsal fin and anal fin. Lateral line from slightly above mid-eye to end of caudal fin. Branchiostegal rays 5, and membranes broadly united to isthmus; gill rakers well-developed. Swimbladder large. Dorsal- and anal-fin pterygiophores expanded distally and join to form series of interdigitating bony bases for the fins. Vertebrae 9 + 13.

Epipelagic, from surface to ~200 m; worldwide in subtropical and temperate waters. The single species is closely related to the Acanthuridae and Siganidae.

Luvarus imperialis Rafinesque 1810

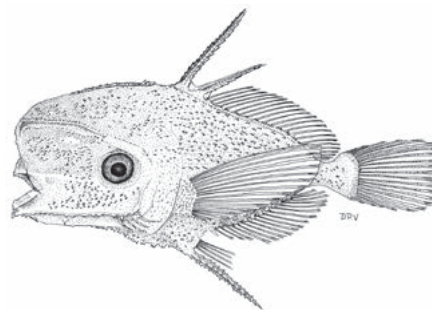
Luvar

PLATE 59

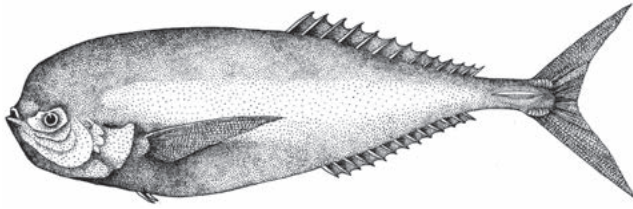
Luvarus imperialis Rafinesque 1810: 22 (Sicily, Italy, Mediterranean Sea);
 Topp & Girardin 1971; Abe & Kobata 1974*; SSF No. 250.1*;
 Tyler *et al.* 1989*.

Diagnosis as for family. Body depth 2.9–3.2 in SL; HL 3.5–3.8 in SL; GR 4–6/11–14.

Body and head bluish dorsally, silvery pink ventrally; dorsal fin and anal fin black; pectoral fins yellow-orange or pink; caudal fin reddish orange with round blackish spot at base; juveniles with large dark spots over body and fins. Attains 200 cm TL and ~150 kg.



Luvarus imperialis, 1 cm SL, transforming larva (South Africa). Source: SSF



Luvarus imperialis, 115 cm FL.

Source: SSF (composite, mainly drawn from Day 1881)

DISTRIBUTION Circumglobal, but antitropical, in all subtropical to temperate seas, including Mediterranean Sea, but few records from Indian Ocean (e.g., off Cape Point, South Africa); not known from polar seas or near the equator.

REMARKS An oceanic and epipelagic fish of the high seas, from near surface to deep water (~200 m); apparently solitary. Feeds on jellyfishes, ctenophores and other planktonic animals. A 125-kg mature female stranded on a beach in Florida (USA) had ovaries weighing 2.7 kg and containing an estimated 785 000 eggs; a 117-kg specimen was caught in the southeastern Atlantic, ~32 km west of Cape Point, South Africa.

FAMILY ZANCLIDAE

Moorish idol

Wouter Holleman

Body strongly compressed and disc-like; dorsal-fin spines 3–7 elongated to create slender pennant-like fin; pectoral fins relatively small, but pelvic fins relatively well-developed; anal fin prominent, triangular; caudal fin lunate. Snout long and tubular; mouth small, terminal; teeth long and bristle-like, mostly covered by wide lips. Eyes high-set; short spine develops in front of each eye of adults. Scales minute and rough. Distinct, strongly contrasting colouration of bands of black, white and yellow.

Monotypic; possibly related to the surgeonfishes (family Acanthuridae), but without scalpel-like spine on peduncle. Common throughout subtropical to tropical Indo-Pacific.

Zanclus cornutus (Linnaeus 1758)

Moorish idol

PLATE 59

Chaetodon canescens Linnaeus 1758: 272 (East Indies).

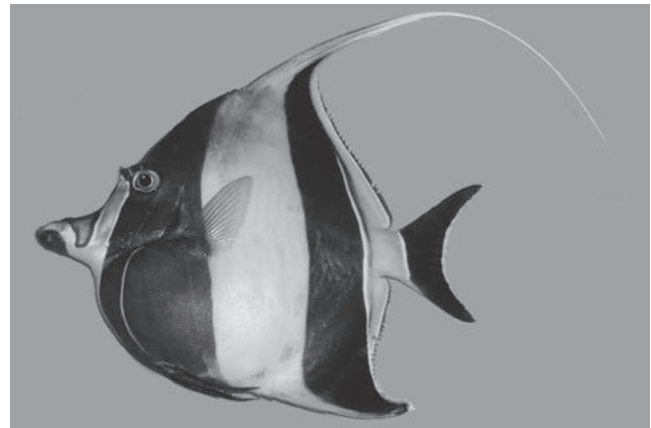
Chaetodon cornutus Linnaeus 1758: 273 (Indian seas).

Zanclus centrognathus Valenciennes in Cuv. & Val. 1831: 528 (Vanikoro I., Santa Cruz Group, Solomon Is.).

Zanclus cornutus: SFSA No. 618*; SSF No. 244.1*; Randall 1995*; Heemstra & Heemstra 2004*.

Diagnosis as for family. Dorsal fin 6 or 7 spines, 39–43 rays, and spines 3–7 extended into long filament (usually longer than SL); anal fin 3 spines, 31–37 rays; pectoral fins 18 or 19 rays; pelvic fins 1 spine, 5 rays. GR 1/10. Body depth 1–1.4 in SL.

Body with 2 broad vertical black bars (one bar from dorsal fin origin, across head, through eye and covering anterior body and pectoral and pelvic fins; another bar on rear of body, in front of peduncle, extending from mid-base of dorsal fin and widening onto anal fin), and the broad area between bars white and shading to yellow posteriorly; snout with distinct yellow-orange saddle bordered with black; peduncle yellowish; caudal fin black with white margin. Attains 22 cm SL.



Zanclus cornutus, 14 cm SL (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific to eastern Pacific (widespread). WIO: Gulf of Oman to South Africa (juveniles to Mossel Bay, Western Cape); not known from Red Sea; elsewhere to southern Japan, Solomon Is., Lord Howe I., Rapa Iti, Hawaii and Panama.

REMARKS Common on coral and rocky reefs and in lagoons, from shallow water to at least 180 m; also enters rocky estuaries. Pelagic spawner; its wide distribution is probably due to an unusually long planktonic larval/post-larval stage, which has been calculated (from otoliths) at 49–69 days; the post-larva can reach 7 cm TL. *Chaetodon canescens* is a synonym described from the larval stage. Observed singly, in pairs or in small groups of 4–6, but juveniles sometimes in larger schools. Omnivorous, feeding mostly on benthic invertebrates, including sponges. Iconic coral-reef species and notoriously difficult to keep in aquaria, but may live for several years under suitable conditions.

FAMILY ACANTHURIDAE

Surgeonfishes

John E Randall

Body oblong to oval and disc-like, and compressed; dorsal fin continuous; sides of peduncle with distinctive scalpel-like spine that folds into groove or with one to several sharply keeled bony plates; scales minute, ctenoid. Eyes high on head; mouth small, terminal. Teeth in single row on jaws: teeth of *Acanthurus*, *Paracanthurus* and *Zebrasoma* close-set and spatulate with denticulate edges (ideal for grazing or browsing on filamentous or soft algae); teeth of *Ctenochaetus* numerous, slender with incurved denticulate tips, and flexible in jaws (feed by whisking the surface with their teeth as they apply suction, taking in fragments of filamentous algae, diatoms, foraminifera, bacteria, detritus and fine sand); teeth of *Naso* less closely spaced, varying from very small, pointed and finely serrate (in zooplankton-feeders, such as *N. hexacanthus*) to nearly truncate and smooth-edged (e.g., *N. lituratus*). (The form and number of teeth in the jaws has some value for species identification, but only when related to a specimen's

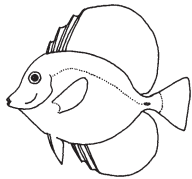
size because the number of teeth increases with growth.)

Among the dominant fishes found on coral reefs, both in numbers of individuals and biomass, although some species inhabit rocky reefs, mangroves, seagrasses or algal beds. Show varying degrees of habitat preference, feeding either on leafy algae (such as *Sargassum*) or zooplankton, or both. Together with other herbivores, they are vital to coral-reef ecosystems by preventing the overgrowth of algae on corals and other benthic invertebrates. Generally active by day and hidden at night beneath ledges or in crevices. Normal swimming is accomplished by sculling with the pectoral fins, with the caudal fin used only when speed is required (similar to wrasses and parrotfishes of families Labridae and Scaridae, respectively). The sexes are separate. Keris larvae of species of the genus *Naso* are the late post-larval stage that come inshore from the open ocean to metamorphose into juveniles.

Occur in all tropical seas, with some species ranging into subtropical or warm-temperate waters. Important in subsistence fisheries; caught mainly by gillnets, drive nets, traps and spears. Some colourful species are of considerable value in the aquarium trade. Six genera and 80 species; 5 genera and 41 species in WIO.

KEY TO GENERA

- 1a Dorsal fin 4 or 5 spines; snout strongly produced; dorsal and anal fins elevated *Zebrasoma*



- 1b Dorsal fin 6–9 spines; snout not strongly produced; dorsal and anal fins not especially elevated 2

- 2a Pelvic fins 1 spine, 3 rays 3

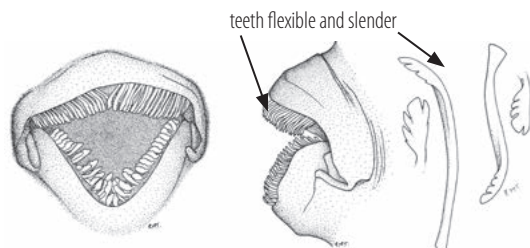
- 2b Pelvic fins 1 spine, 5 rays 4

- 3a Dorsal fin 9 spines, 19 or 20 rays; body bright blue and black, but peduncle and caudal fin yellow with broad black upper and lower margins merging with black on body *Paracanthurus*

- 3b Dorsal fin 4–7 spines, 24–31 rays; colour not as above *Naso*

- 4a Teeth in jaws fixed, spatulate, with denticulate edges, 8–28 in each jaw; dorsal fin usually 9 spines (two species with 8 spines) *Acanthurus*

- 4b Teeth in jaws flexible, slender, with compressed incurved tips, denticulate on lateral edge, adults with >30 teeth in each jaw; dorsal fin 8 spines *Ctenochaetus*



GENUS *Acanthurus* Forsskål 1775

Body oval and compressed; peduncle compressed, bearing single, sharp, forward-projecting, hinged and embedded spine. Dorsal fin 8 or 9 spines; anal fin 3 spines; pelvic fins

1 spine, 5 rays. Teeth in jaws fixed, incurved, thin and wide, with denticulate edges. Widespread and generally associated with coral or rocky reefs. Occur in Atlantic and Indo-Pacific; 37 species, 20 in WIO.

KEY TO SPECIES

- | | |
|--|---|
| <p>1a Body pale, with vertical black bars; caudal fin truncate or slightly emarginate (caudal concavity [difference between lengths of longest and shortest caudal-fin rays] >15 in SL); peduncle spine very small 2</p> <p>1b Body not pale and without black bars; caudal fin emarginate to lunate (caudal concavity <15 in SL, except ~14–17 in <i>A. guttatus</i>); peduncle spine not very small 3</p> <p>2a Head and body with 5 or 6 vertical black bars; anal fin 19–22 rays <i>A. triostegus</i></p> <p>2b Head and body with 9 vertical black bars, bars much broader dorsally; anal fin 21–23 rays <i>A. polyzona</i></p> <p>3a Snout length 6.6–8.2 in SL; adults with 22–28 teeth in lower jaw 4</p> <p>3b Snout length 3.9–5.3 in SL; adults with ≤22 teeth in lower jaw 5</p> <p>4a Snout length 6.6–7.1 in SL; peduncle depth 2.7–3 in HL; head and body with longitudinal blue lines; maximum size ~40 cm TL <i>A. mata</i></p> <p>4b Snout length 7.9–8.2 in SL; peduncle depth 2.2–2.5 in HL; no blue lines on head or body; maximum size ~27 cm TL <i>A. thompsoni</i></p> <p>5a Dorsal fin 8 spines; snout somewhat produced <i>A. tristis</i></p> <p>5b Dorsal fin 9 spines (1st spine short, may be embedded); snout not produced 6</p> <p>6a Body depth 1.5–1.6 in SL; caudal fin slightly emarginate; 2 or 3 vertical white bars on head and body; body, dorsal fin and anal fin posterior to 2nd white bar dark grey with numerous small white spots <i>A. guttatus</i></p> <p>6b Body depth 1.7–2.5 in SL; caudal fin of adults emarginate to lunate; colour not as above 7</p> <p>7a Upper body with prominent dark stripes; peduncle spine large (and venomous), its length 1.8–2.1 in HL 8</p> <p>7b No dark stripes on upper body; peduncle spine not large, its length 2.1–8 in HL 9</p> | <p>8a Body with narrow pale blue stripes, broadly edged in black, and alternating with yellow stripes; peduncle spine and socket not orange; pectoral fins 16 rays <i>A. lineatus</i></p> <p>8b Body with numerous black stripes, progressively broader ventrally, and separated by pale blue lines; peduncle spine and socket bright orange; pectoral fins 17 rays <i>A. sohal</i></p> <p>9a Dorsal fin 28–30 rays; body depth 1.7–1.9 in SL; caudal fin emarginate; body blue, except chest crossed by broad white band; dorsal fin and peduncle yellow; caudal fin black, with white central crescent and rear margin <i>A. leucosternon</i></p> <p>9b Dorsal fin 23–28 rays; body depth 1.8–2.3 in SL; caudal fin of adults lunate; colour not as above 10</p> <p>10a Black spot at end of dorsal-fin base, and smaller black spot at end of anal-fin base; head and chest with numerous small orange spots; body depth 2–2.3 in SL; maximum size ~21 cm TL <i>A. nigrofuscus</i></p> <p>10b No black spot at ends of dorsal- or anal-fin bases; no small orange spots on head and chest; body depth 1.8–2.3 in SL 11</p> <p>11a Two short black bands (length ~1.5–2 times eye diameter) above upper end of gill opening (and joining semicircle mark in juveniles <10 cm SL); broad white bar at centre of caudal-fin margin, and caudal-fin lobes edged white <i>A. tennentii</i></p> <p>11b Colour not as above 12</p> <p>12a Throat and chest black, with transverse whitish band; no yellow or black marks behind eyes or at gill opening <i>A. leucocheilus</i></p> <p>12b Colour not as above 13</p> <p>13a Horizontal black band on body, extending posteriorly from upper end of gill opening, its length 4.5–9 in SL; stomach not gizzard-like 14</p> <p>13b Colour not as above; stomach gizzard-like 15</p> <p>14a Narrowing horizontal black streak extending well forward from peduncle spine; longest dorsal-fin spine ~2 in HL <i>A. nigricauda</i></p> |
|--|---|

Continued ...

KEY TO SPECIES

- 14b No dark streak extending forward from peduncle spine, but rather white band surrounding caudal-fin base; longest dorsal-fin spine ~1.5 in HL *A. gahhm*
- 15a Bluish black spot directly behind eyes (subequal to eye diameter), followed by orange-yellow bar behind gill opening, and lips white *A. bariene*
- 15b Colour not as above 16
- 16a Head and nape with numerous small pale blue spots; yellow blotch at upper end of gill opening, followed by short bluish black band; body with numerous fine pale yellow lengthwise lines *A. maculiceps*
- 16b Colour not as above 17
- 17a Upper end of gill opening with orangish to dark brown, bilobed, tilted spot; narrow black band at dorsal-fin base; peduncle spine rimmed with orange *A. auranticavus*
- 17b Colour not as above 18
- 18a Caudal fin blue with numerous small black spots; peduncle spine white; yellow band joining eyes; body with numerous, slightly wavy, pale bluish longitudinal lines; dorsal and anal fins mainly yellow, without dark lines *A. dussumieri*
- 18b No black spots on caudal fin; peduncle spine brown; no yellow band joining eyes (yellowish area may extend in front of eyes, but not as distinct band); no pale bluish longitudinal lines on body; dorsal and anal fins with alternating blue and brownish yellow longitudinal lines 19
- 19a Pectoral fins dark brown basally, outer third yellowish (fish >12 cm SL); dorsal fin with 4 longitudinal blue lines alternating with brownish yellow areas; peduncle spine 4.5–5.5 in HL; GR 16–22 *A. xanthopterus*
- 19b Pectoral fins uniformly brown; dorsal fin with 8 blue lines alternating with brownish yellow lines; peduncle spine 3–4.4 in HL; GR 20–25 *A. blochii*

Acanthurus auranticavus Randall 1956

Violet-fin surgeonfish

PLATE 59

Hepatus nigrofuscus (non Forsskål 1775): Fowler & Bean 1929 [in part].
Acanthurus auranticavus Randall 1956: 210, Figs. 2u, 19 (Atulayan I., Luzon I., Philippines); Randall 2002.

Dorsal fin 9 spines, 25 or 26 rays; anal fin 3 spines, 23 or 24 rays; pectoral fins 16 or 17 rays; adults with 18 or 19 upper

teeth, 18–20 lower teeth. Body depth 2.1–2.2 in SL; peduncle spine large, 2.2–4.4 in HL; caudal fin deeply emarginate to lunate, caudal concavity 4.2–6.8 in SL.

Body with fine, irregular, pale purplish blue longitudinal lines, alternating with dark brown; head uniformly dark brown, except short, tilted, dark orange-brown band (often paler in centre) from upper end of gill opening to pectoral-fin base; pale yellowish ‘wash’ often seen dorsally on head, anterior body, and extending onto dorsal fin; narrow dark brown band along dorsal-fin base; caudal-fin base with narrow white bar (front edge of bar straight and rear edge slightly crescentic, but edges often irregular), caudal-fin margin often broadly whitish, but narrower at lobe tips; rear edge of peduncle-spine socket usually orange. Often appears nearly black underwater, except for narrow white bar at caudal-fin base. Attains ~30 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Seychelles and Maldives; elsewhere to Christmas I., Indonesia, Philippines and Great Barrier Reef.

REMARKS Found over hard substrates on shallow reef flats, inner lagoon reefs and outer reef crests, to ~2 m deep. Often encountered in feeding aggregations (sometimes >30 individuals), which may overwhelm territorial damselfishes.

Acanthurus bariene Lesson 1831

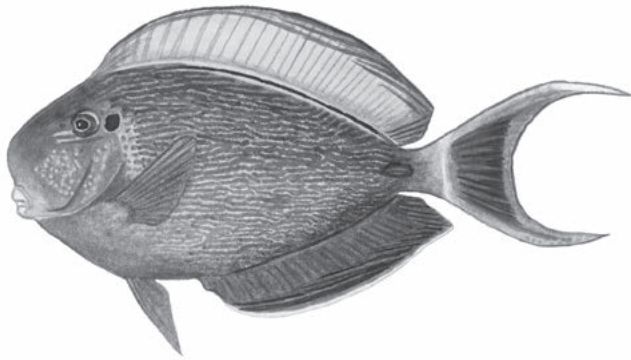
White-lipped surgeonfish

PLATE 59

Acanthurus bariene Lesson 1831: 150 (Offack Bay, Waigeo I., Indonesia); Randall 1956, 2002*; Fricke *et al.* 2013.
Acanthurus nummifer Valenciennes in Cuv. & Val. 1835: 234 (Waigeo I., Indonesia).

Dorsal fin 9 spines, 26–28 rays; anal fin 3 spines, 25 or 26 rays; pectoral fins 17 rays; adults with 18–21 upper teeth, 20–22 lower teeth. Body moderately deep, 1.9–2 in SL; large adults with strongly convex forehead; peduncle spine large, ~2 in HL; caudal fin of adults lunate, caudal concavity of large adults up to ~3.5 in SL. Stomach gizzard-like.

Body with alternating, irregular longitudinal lines of orange-brown and pale blue; head yellowish brown, with small orange-yellow spots, and irregular markings on cheeks, and blue-edged black spot nearly as large as eye just behind eye, followed by diffuse orange-yellow vertical bar; mouth white; dorsal fin mainly yellow, with bright blue line at base and margin; peduncle-spine socket edged in black; caudal-fin lobes orange-yellow shading outwardly to pale blue, central part of fin dark brown. Attains at least 42 cm TL.



Acanthurus bariene, 30 cm SL (Maldives).

DISTRIBUTION Indo-Pacific. WIO: Mozambique Channel, Seychelles, Maldives and Sri Lanka; elsewhere to Indonesia, Ryukyu Is., Great Barrier Reef and Solomon Is.

REMARKS Generally found in >10 m and to at least 50 m deep, on outer reef slopes and drop-offs. Adults usually seen as solitary individuals grazing on reefs or compact sand surfaces; relatively easy to approach underwater.

Acanthurus blochii Valenciennes 1835

Ringtail surgeonfish

PLATE 59

Acanthurus annularis Valenciennes in Cuv. & Val. 1835: 209 (Mauritius, Mascarenes).

Acanthurus blochii Valenciennes in Cuv. & Val. 1835: 209 (Mauritius, Mascarenes; Seychelles); Bennett 1836; SSF No. 243.1*; Winterbottom & Anderson 1997, 1999; Fricke 1999; Randall 2002*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Acanthurus matoides (blochii): Günther 1879.

Acanthurus sp.: Allan & Steene 1987*.

Acanthurus mata (non Cuvier 1829): Winterbottom *et al.* 1989*.

Dorsal fin 9 spines, 25–27 rays; anal fin 3 spines, 24 or 25 rays; pectoral fins 17 rays; adults with up to 20 teeth in each jaw. Body depth 1.9–2.1 in SL; snout length 4.3–4.5 in SL; peduncle spine 3–4.4 in HL; caudal concavity ~6.2–10 in SL, becoming shallower with growth. Stomach gizzard-like.

Body bluish grey, with numerous tiny brownish yellow spots; head with alternating lines of same colours; irregular yellow spot nearly as large as eye just behind eyes; opercle membrane black; dorsal fin yellow, with narrow blue wavy bands (horizontal distally, oblique below); peduncle-spine socket edged blue or black; caudal-fin base usually encircled by white bar. Can quickly change to much darker colour, obscuring yellow markings. Attains at least 42 cm TL.



Acanthurus blochii, 7 cm SL, juvenile (Mauritius). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Kenya to Mozambique, Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives and Sri Lanka; elsewhere to Christmas I., Philippines, southern Japan, New Guinea, Great Barrier Reef, New Caledonia, Society Is. and Hawaii.

REMARKS Occurs on shallow coral reefs and will graze on algal film on nearby compact sand. Johannes (1981) reported large spawning aggregations on the reef flat in Palau, in May, around full moon and new moon.

Acanthurus dussumieri Valenciennes 1835

Pencilled surgeonfish

PLATES 59 & 60

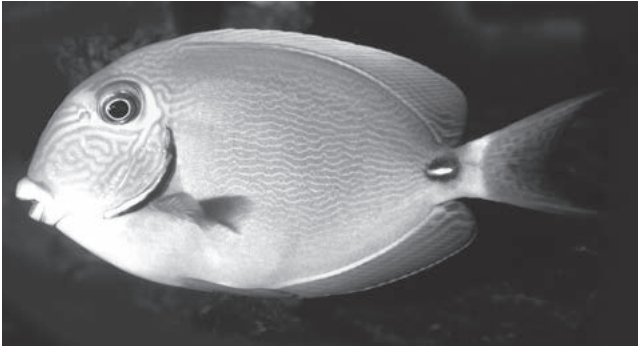
Acanthurus dussumieri Valenciennes in Cuv. & Val. 1835: 201

(Mauritius, Mascarenes); Günther 1861; Playfair & Günther 1867; Peters 1877, 1883; Sauvage 1891; Baissac 1976; Randall 1984*, 1995*, 2002*; SSF No. 243.2*; Cornic 1987*; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Acanthurus bariene (non Lesson 1931): Baissac 1953, 1990.

Dorsal fin 9 spines, 25–27 rays; anal fin 3 spines, 24–26 rays; pectoral fins 16 or 17 rays; adults with 20–22 teeth in total. Body depth 1.9–2.1 in SL; large adults with strongly convex forehead; peduncle spine 3–5 in HL; caudal fin lunate, caudal concavity <5 in SL (for specimens >30 cm SL). Stomach gizzard-like.

Body yellowish brown, with irregular longitudinal blue lines on head and body; broad yellow band across front of interorbital region and continuing behind eyes as large irregular spot; opercular membrane black; peduncle spine white, socket edged in black; dorsal and anal fins of adults mostly yellow, with bright blue line at base and blue margin (fins of juveniles fully striped with blue); caudal fin deep blue, with numerous small blackish spots, basal part of lobes orange-yellow. Can quickly change to much darker colour, thus obscuring yellow markings. Attains at least 54 cm TL.



Acanthurus dussumieri, juvenile (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Oman to South Africa (Algoa Bay, Eastern Cape), Madagascar, Seychelles, Réunion, Mauritius, Saya de Malha Bank, Chagos and Maldives; elsewhere to southern Japan, Great Barrier Reef, Lord Howe I., Line Is. and Hawaii.

REMARKS Generally found on seaward reefs, to ~61 m deep. Usually seen as solitary but may also occur in small groups; reportedly a pair spawner. Tends to graze on algal film on compact sand, but also from hard reef substrates.

Acanthurus gahhm (Gmelin 1789)

Red Sea surgeonfish

PLATE 60

Chaetodon gahm var. Gmelin 1789: 1268 (Red Sea).

Acanthurus nigricans (non Linnaeus 1758): Randall 1983.

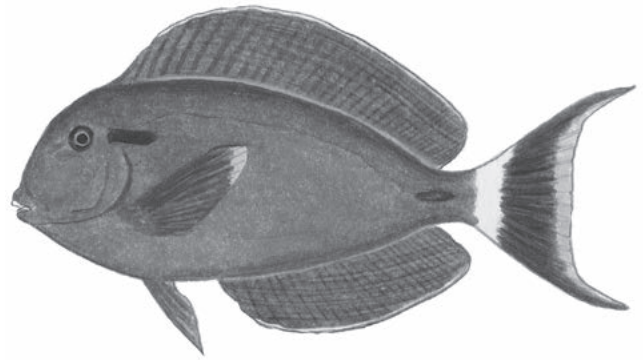
Acanthurus gahhm: Randall 1988, 2002; Kuiter & Debelius 2001*;

Manilo & Bogorodsky 2003; Lieske & Myers 2004;

Golani & Bogorodsky 2010.

Dorsal fin 9 spines, 25 or 26 rays; anal fin 3 spines, 23–25 rays; pectoral fins 16 or 17 rays; adults with up to 20 upper teeth and 22 lower teeth. Body depth 1.7–2.3 in SL; head profile of adults convex; peduncle spine moderately large; caudal fin emarginate in juveniles, lunate in adults, and caudal concavity <5 in SL in large adults. Stomach gizzard-like.

Body dark brown, and some adult colour forms with nearly horizontal purplish black band with rounded ends just above upper end of gill opening (band length ~2.5 times eye diameter; ~ $\frac{3}{4}$ its length behind gill opening) (band absent in juveniles); upper third of pectoral fins with broad yellow margin; dorsal and anal fins with faint narrow bluish stripes; caudal fin dark brown, with wide white band at base, and pale blue margin broadest centrally. Attains at least 40 cm TL.



Acanthurus gahhm, 28 cm SL (Red Sea).

DISTRIBUTION WIO: Red Sea and Gulf of Aden.

REMARKS Inhabits open sand and rubble bottoms, from lagoons to the base of seaward reefs, at 5–55 m. May be locally abundant. Records from other areas may be misidentifications of *A. nigricauda*.

Acanthurus guttatus Forster 1801

White-spotted surgeonfish

PLATE 60

Acanthurus guttatus Forster in Bloch & Schneider 1801: 215

(Tahiti, Society Is.); Valenciennes in Cuv. & Val. 1835; Günther 1861;

Guichenot 1863; Playfair & Günther 1867; Gudger 1929; Baissac 1953,

1990; Harmelin-Vivien 1976*; Cornic 1987; Chabanet 1994; Lieske &

Myers 1994; Winterbottom & Anderson 1997, 1999; Fricke 1999;

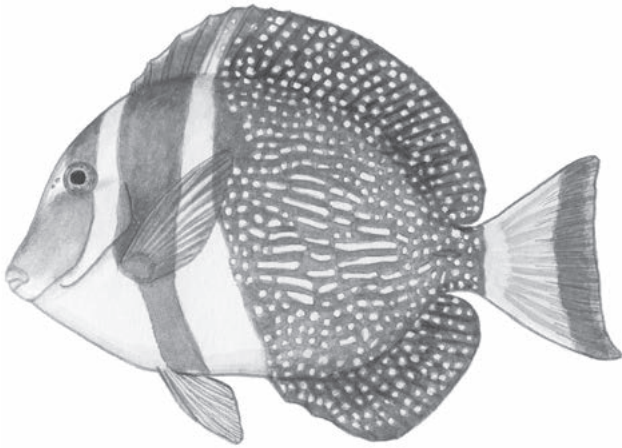
Kuiter & Debelius 2001; Randall 2002*; Heemstra *et al.* 2004;

Fricke *et al.* 2009.

Rhombotides guttatus: Bleeker 1874.

Dorsal fin 9 spines, 27–30 rays; anal fin 3 spines, 23–26 rays; pectoral fins 15–17 rays; adults with 12 upper teeth and 14 lower teeth. Body depth 1.5–1.6 in SL; peduncle spine small; caudal fin slightly emarginate, caudal concavity 14–17 in SL.

Body grey-brown, with 2 or 3 distinct vertical white bars on anterior half of body: one from nape across operculum, another on front of body, and sometimes a third at middle of body; numerous distinct white spots on rear half of body and on adjacent parts of dorsal and anal fins; pelvic fins bright yellow; caudal-fin base with broad pale yellowish zone. Attains 28 cm TL.



Acanthurus guttatus, 17 cm SL (Rodrigues).

DISTRIBUTION Indo-Pacific. WIO: Seychelles, Mascarenes, Chagos and Maldives; unconfirmed reports from South Africa (Sodwana Bay); elsewhere to Indonesia, Ryukyu Is., Great Barrier Reef, New Caledonia and Tahiti.

REMARKS Inhabits the surge zone of exposed reefs or rocky shores, usually in small schools, and forms spawning aggregations. White spots on the body may help to conceal the fish as it swims in the swirling white bubbles produced by surf. Browses mainly on filamentous algae, but also calcareous algae such as *Jania*.

Acanthurus leucocheilus Herre 1927

Pale-lipped surgeonfish

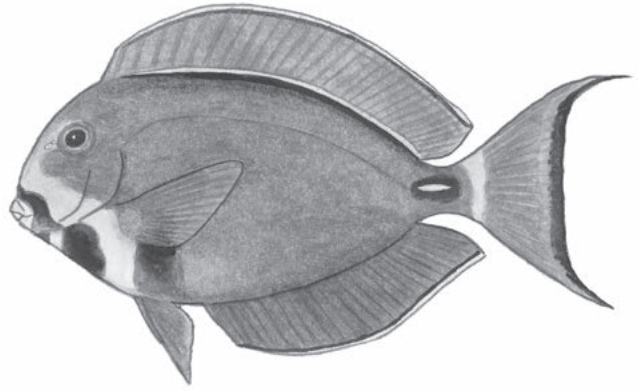
PLATE 60

Acanthurus leucocheilus Herre 1927: 419, Pl. 12, Fig. 3 (Bantayan, Cebu and Agutaya islands, Philippines); Randall 1956, 2002*; Winterbottom & Anderson 1997*; Kemp 2000; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003.
Acanthurus melanosternon Smith 1956: 693, Pl. 18b (Aldabra, Seychelles).

Dorsal fin 9 spines, 24–26 rays; anal fin 3 spines, 23–25 rays; pectoral fins 17 rays; adults with 18–20 upper teeth and 20–22 lower teeth. Body depth 2–2.3 in SL; head profile of adults strongly convex; peduncle-spine length ~3 in HL; caudal fin of adults deeply lunate with long lobes, caudal concavity of large adults <4 in SL.

Body medium to dark brown, without fine longitudinal lines; front of upper lip orange, rest of mouth and narrow zone around it white, with broad blackish zone on front of snout extending onto chin; pale brown band on throat behind dark zone on chin, followed by broad blackish band across chest; large black spot above pectoral-fin axils; peduncle spine white, socket rimmed black; dorsal fin brown, with black line at base,

bright blue margin, black submarginal line, and orange line below this that joins to broad orange distal part of last 6 rays; caudal fin brown, base encircled by white, and margin broadly blue. Juveniles with bright yellow caudal fin with black margin. Attains possibly 48 cm TL.



Acanthurus leucocheilus, 30 cm SL (Seychelles).

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to Tanzania (Zanzibar), northern Mozambique (Pemba), Seychelles, Maldives and Sri Lanka; elsewhere to Andaman Is., Christmas I., Indonesia, Philippines and Line Is.

REMARKS Occurs singly or in small groups, generally on outer reef areas, at ~5–30 m.

Acanthurus leucosternon Bennett 1833

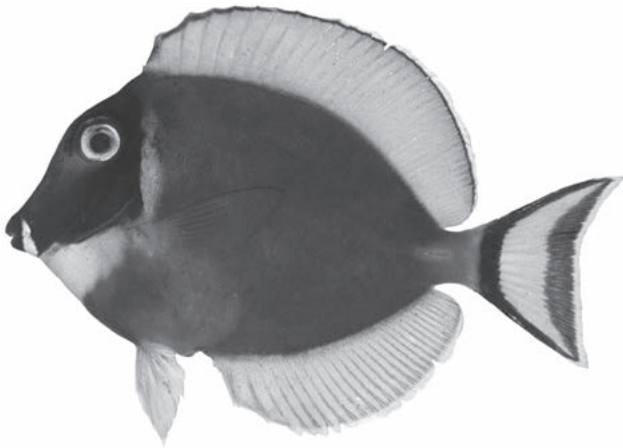
Powder-blue surgeonfish

PLATE 60

Acanthurus delisianus: Guérin-Mèneville 1829*.
Acanthurus leucosternon Bennett 1833: 183 (Sri Lanka); Günther 1861; Playfair & Günther 1867; Gudger 1929*; Baissac 1953, 1976, 1990; Fourmanoir & Guézé 1962; Harmelin-Vivien 1976; Randall *in* Fischer & Bianchi 1984*; SSF No. 243.3*; Cornic 1987; Winterbottom *et al.* 1989*; Randall & Anderson 1993; Randall 1995*, 2002*; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.
Acanthurus delisiani Valenciennes *in* Cuv. & Val. 1835: 193 (Mauritius, Mascarenes).
Rhombotides leucosternon: Bleeker 1874, 1879.

Dorsal fin 9 spines, 28–30 rays; anal fin 3 spines, 26–28 rays; pectoral fins 15 or 16 rays; adults with 10 upper teeth and 12 lower teeth. Body depth 1.7–1.9 in SL; peduncle spine moderately long, 2.5–3 in HL; caudal fin emarginate, caudal concavity of adults 10–13.5 in SL.

Head black; broad white band on anterior half of chest, with short, narrow section extending forward onto chin and behind upper lip; body blue, shading to yellow at peduncle and caudal-fin base; peduncle spine bright yellow; dorsal fin yellow, with thin white margin and thin submarginal black line; central area of caudal fin white, surrounded by broad black margin, except narrow white margin. May attain 23 cm TL.



Acanthurus leucosternon, 8 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indian Ocean. WIO: Oman (and possibly Gulf of Oman) to South Africa (Sodwana Bay), Comoros, Seychelles, Réunion, Mauritius, Maldives and Sri Lanka; not known from Red Sea; elsewhere to Andaman Is., Cocos (Keeling) Is., Christmas I., and southern Indonesia (Sunda Is. and at least to Bali).

REMARKS Found inshore, on coral-reef flats and upper reef slopes, at 5–25 m (usually in <15 m); well known for occurring in large feeding aggregations. Hybridises with *A. nigricans*.

Acanthurus lineatus (Linnaeus 1758)

Lined surgeonfish

PLATE 60

Chaetodon lineatus Linnaeus 1758: 274 ('Indies').

Acanthurus vittatus Bennett 1828: Pl. 2 (Sri Lanka).

Acanthurus lineatus: Gudger 1929*; Baissac 1976, 1990;

Harmelin-Vivien 1976; Randall 1984*, 2002*; SSF No. 243.4*;

Cornic 1987*; Winterbottom *et al.* 1989*; Randall & Anderson 1993;

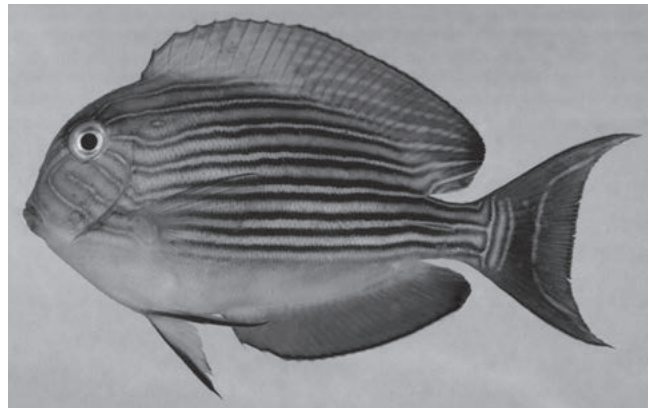
Winterbottom & Anderson 1997, 1999; Fricke 1999;

Kuiter & Debelius 2001*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Acanthurus lineolatus: Baissac 1952.

Dorsal fin 9 spines, 27–30 rays; anal fin 3 spines, 25–28 rays; pectoral fins 16 rays; large adults with up to 14 upper teeth and 16 lower teeth. Body oblong, depth in adults ~2.2 in SL; peduncle spine long, 1.9–2 in HL; caudal fin strongly lunate, caudal concavity 3.3–4.5 in SL.

Upper three-quarters of body bright yellow, with narrow, black-edged, bright blue stripes, continuing obliquely and narrowly onto head, and posteriorly onto dorsal fin; lower quarter of body lavender to bluish white; caudal fin yellow basally, with 2 dark-edged blue vertical lines, rest of fin dark purplish grey (mainly yellow in juveniles), with narrow bright blue margin, and curved blue line in middle of fin that continues as inner margin on lobes. Attains 38 cm TL (~30–45 years).



Acanthurus lineatus, 7 cm SL (Comoros). © R Winterbottom, ROM

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos, Maldives, Lakshadweep and Sri Lanka; apparently absent from seas around Arabian Peninsula (where it is replaced by the related *A. sohal*); elsewhere to Indonesia, Philippines, southern Japan, Great Barrier Reef, New Caledonia, Samoa, Society Is., Tuamotu Is. and Marquesas Is.

REMARKS Common and abundant, inshore to ~10 m deep (commonly in 1–3 m). Territorial and aggressive, at which time it takes on darker head colouration. Has a long pelagic larval stage, and adults live sedentary lives on reefs. Grazes on algal turf and filamentous algae. The peduncle spine is unusually large (being nearly free of sheath material) and is venomous.

Acanthurus maculiceps (Ahl 1923)

Spottyface surgeonfish

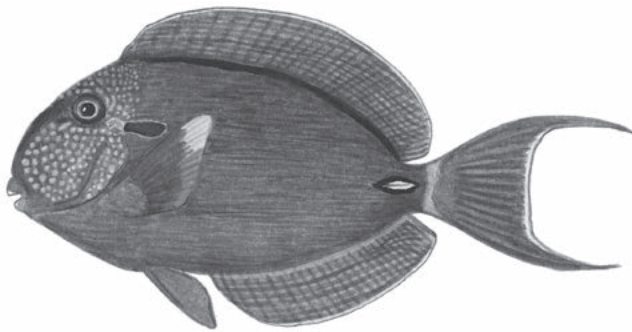
PLATE 60

Hepatus maculiceps Ahl 1923: 36, Fig. 4 ([Kikiwiei] New Britain, Papua New Guinea).

Acanthurus maculiceps: Kuitert & Debelius 2001*; Randall 2002*.

Dorsal fin 9 spines, 24 or 25 rays; anal fin 3 spines, 23 or 24 rays; pectoral fins 16 rays; adults with up to 18 upper teeth and 20 lower teeth. Body depth 2–2.2 in SL; snout convex in large adults; peduncle spine 2.5–3.2 in HL; caudal fin of adults lunate, caudal concavity up to 3.3 in SL.

Body brown to grey-brown, with numerous fine pale yellow longitudinal lines, except on abdomen and chest; upper end of gill opening with short horizontal black band, narrowly rimmed yellow, its anterior part sometimes yellow; head and nape with numerous small, round to oblong, pale yellow or blue spots, some interconnected; dorsal fin with thin black line at base and oblique narrow yellow bands distally; pectoral fins with large yellow blotch distally; peduncle spine white, socket edged black; caudal fin with irregular narrow yellowish white bar at base and thin white margin. Attains 40 cm TL.



Acanthurus maculiceps, 22 cm SL (Maldives).

DISTRIBUTION Indo-Pacific. WIO: Maldives; elsewhere to New Guinea, Samoa and Line Is.

REMARKS Generally found in outer reef areas, at 1–30+ m, either solitary or in small groups; rare in most parts of its range.

Acanthurus mata (Cuvier 1829)

Elongate surgeonfish

PLATE 60

Chaetodon mata Cuvier 1829: 224 [Coromandel coast, India].

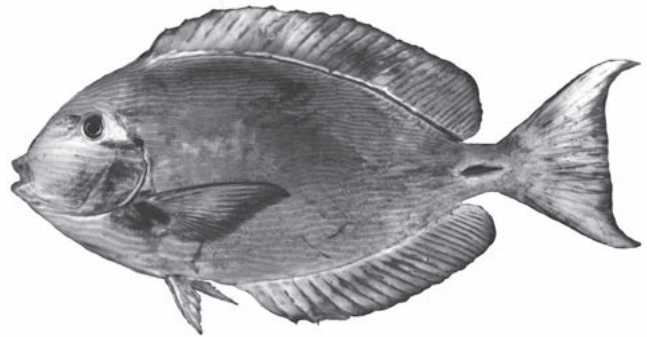
Acanthurus mata: Valenciennes in Cuv. & Val. 1835*; Randall 1956, 1995*, 2002*; Harmelin-Vivien 1976 [as *mataa*]; Winterbottom *et al.* 1989*; Baissac 1990; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*;

Lieske & Myers 2004; Fricke *et al.* 2009; Golani & Bogorodsky 2010.

Acanthurus bleekeri Günther 1861: 335 ('East Indies'); Randall 1983, 1984*; Winterbottom *et al.* 1989*.

Dorsal fin 9 spines, 24–26 rays; anal fin 3 spines, 23 or 24 rays; pectoral fins 16 or 17 rays. Adults with up to 24 upper teeth and 26 lower teeth. Body depth ~2.1–2.5 in SL (subadults to large adults); snout short, 6.6–6.9 in SL; peduncle narrow, least depth 10–12 in SL, and peduncle spine small; caudal fin deeply emarginate, caudal concavity of adults 5.5–8 in SL. Stomach not round and gizzard-like.

Body grey to brown, with longitudinal blue-grey lines; upper end of gill opening with small blackish spot, preceded by yellow band that continues as double band in front of eye. Attains 50 cm TL.



Acanthurus mata, 35 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea, Gulf of Oman to South Africa (Eastern Cape), Madagascar, Seychelles, Réunion, Mauritius, Maldives and Sri Lanka; elsewhere to east coast of India, southern Japan, Australia and New Caledonia; not known from French Polynesia and Pitcairn Is. to Hawaii.

REMARKS Found to at least 18 m deep. More inclined than other species of the genus to enter turbid seas. Generally feeds on zooplankton above the bottom, often in small aggregations; has been observed to feed on the faecal matter of diurnal aggregations of the nocturnally active carangid *Caranx sexfasciatus*.

Acanthurus nigricauda Duncker & Mohr 1929

Epaulette surgeonfish

PLATE 61

Acanthurus gahm (non Gmelin 1789) Valenciennes in Cuv. & Val. 1835; Günther 1861; Playfair & Günther 1867; Sauvage 1891; Fourmanoir & Guézé 1962; Cornic 1987.

Acanthurus lunulatus Liénard in Guichenot 1863 [*nomen nudum*].
Rhombotides gahm (non Gmelin 1789): Bleeker 1874, 1875.

Acanthurus gahm var. *nigricauda* Duncker & Mohr 1929: 75 (Massau I., Bismarck Archipelago).

Acanthurus gahm: Baissac 1976; Harmelin-Vivien 1976.

Acanthurus nigricauda: SSF No. 243.6*; Baissac 1990; Debelius 1993*; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Fricke 1999; Randall 2002*; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Acanthurus nigricaudus: Winterbottom *et al.* 1989*; Letourneur 1998; Kuitert & Debelius 2001*.

Dorsal fin 9 spines, 25–28 rays; anal fin 3 spines, 23–26 rays; pectoral fins 17 rays; adults with ~19 upper teeth and ~22 lower teeth. Body depth of adults 2–2.2 in SL; peduncle spine of adults 2.8–4.5 in HL; caudal fin increasingly lunate with growth, caudal concavity up to 3.6 in SL. Stomach gizzard-like.

Body grey-brown to dark brown, without undulating lines on body or spots on head, and capable of rapidly changing its ground colour to pale greyish blue; slightly tilted black band from near upper end of gill opening (the ends of band usually rounded); dorsal and anal fins with blue margin; dorsal-fin base with dark reddish or purple-bluish line, joining area of pale blue tinge medially on nape; pectoral fins yellow distally; peduncle spine edged in black, extending forward as long black streak with pointed end; caudal fin blackish grey, with white bar at base and narrow bright lavender-blue to white margin. Attains 40 cm TL.



Acanthurus nigricauda, 22 cm SL (Australia). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (widespread). WIO: Tanzania (Zanzibar) to southern Mozambique (but juveniles to KwaZulu-Natal, South Africa), Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives and Sri Lanka; elsewhere to Philippines, southern Japan, New Guinea, Great Barrier Reef, New Caledonia, Society Is. and Tuamotu Is.; not known from Red Sea, northern Arabian Sea and Hawaii.

REMARKS Usually seen over sand near coral reefs, or on rocky bottom, where it grazes on surface algae by ingesting sand.

Acanthurus nigrofuscus (Forsskål 1775)

Brown surgeonfish

PLATE 61

Chaetodon nigrofuscus Forsskål in Niebuhr 1775: 64, xiii (Jeddah, Saudi Arabia, Red Sea).

Chaetodon elongatus Lacepède 1802: 454, Pl. 6, Fig. 2 (Indo-Pacific).

Acanthurus nigrofuscus: Valenciennes in Cuv. & Val. 1835; Guichenot 1862; Playfair & Günther 1867; Sauvage 1891; Baissac 1953, 1990; Randall 1955, 2002*; SSF No. 243.7*; Chabanet 1994; Letourneur & Chabanet 1994; Winterbottom *et al.* 1989*; Debelius 1993*; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Lieske & Myers 2004; Fricke *et al.* 2009; Golani & Bogorodsky 2010; Fricke *et al.* 2013.

Acanthurus orbicularis (non Quoy & Gaimard 1835): Guichenot 1863.

Aconurus orbicularis (non Quoy & Gaimard 1835): Playfair & Günther 1867; Bleeker 1874.

Rhombotides nigrofuscus: Bleeker 1874.

Teuthis elongates: Barnard 1927.

Acanthurus nigros (non Günther 1861): Gudger 1929.

Acanthurus rubropunctatus: Gudger 1929*.

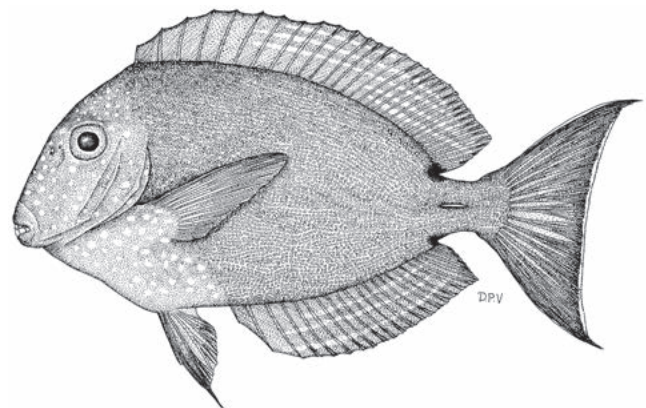
Acanthurus lineolatus: Baissac 1953, 1968; Fourmanoir & Guézé 1962.

Acanthurus nigroris (non Valenciennes 1835): Baissac 1976.

Acanthurus elongatus: Harmelin-Vivien 1976; Baissac 1953.

Dorsal fin 9 spines, 24–27 rays; anal fin 3 spines, 22–24 rays; pectoral fins 16 or 17 rays; large adults with 14 upper teeth and 16 lower teeth. Body depth 2–2.3 in SL; peduncle spine ~3 in HL; caudal fin lunate, caudal concavity of adults 4.5–6 in SL.

Body brown to pale lavender-brown, with or without fine longitudinal pale bluish undulating lines or rows of dots; head, nape and chest with small pale orange spots; lips blackish; black spot (larger than pupil) at end of dorsal-fin base, and smaller black spot at end of anal-fin base; edge of peduncle-spine socket narrowly blackish; caudal fin with narrow bright margin. Attains 21 cm TL.



Acanthurus nigrofuscus, 7 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea, Oman to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Mascarenes and Chagos; elsewhere to Philippines, Ogasawara Is., Lord Howe I., Tuamotu Is., Rapa Iti, Pitcairn Is. and Hawaii.

REMARKS Relatively abundant; found on shallow coral reefs and rocky bottom, at 2–25 m. Myrberg *et al.* (1988) observed large spawning aggregations occurring in late afternoon in the Red Sea. Feeds on algal turf.

Acanthurus polyzona (Bleeker 1868)

Barred surgeonfish

PLATE 61

Rhomboides polyzona Bleeker 1868: 277 (Mayotte I., Comoros; Réunion, Mascarenes); Bleeker 1874*.

Acanthurus fasciatus Bliss 1883: 53 (Mauritius, Mascarenes); Gudger 1929*; Borodin 1934; Baissac 1956.

Acanthurus polyzona: Randall in Fisher & Bianchi 1984*; SSF No. 243 [key only]; Lieske & Myers 1994*; Kuitert & Debelius 2001*; Randall 2002*; Heemstra *et al.* 2004*; Fricke *et al.* 2009.

Dorsal fin 9 spines, 23–25 rays; anal fin 3 spines, 21–23 rays; pectoral fins 16 rays; adults with ~19 upper teeth and ~20 lower teeth. Body depth 1.7–1.8 in SL; peduncle spine small; caudal fin truncate to slightly emarginate.

Body pale grey to olive, shading to white ventrally; ~8 vertical black bars on body, broadest dorsally and ventrally extending to a point (except last 3 bars nearly uniformly narrow), and first 5 bars extending onto dorsal-fin base; head with dark bar through eyes and another bar on cheeks; dorsal fin yellowish; anal fin entirely white. Attains 20 cm TL.



Acanthurus polyzona, 7 cm SL (Mauritius). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Madagascar, Comoros and Mascarenes.

REMARKS Known from mangroves, tidepools, reef flats and coral reefs, to ~15 m deep.

Acanthurus sohal (Gmelin 1789)

Sohal surgeonfish

PLATE 61

Chaetodon sohal Gmelin (ex Forsskål) 1789: 63, xiii [Red Sea].

Acanthurus carinatus Bloch & Schneider 1801: 216 (Red Sea).

Acanthurus sohal: Randall 1995*, 2002*; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010.

Dorsal fin 9 spines, 30 or 31 rays; anal fin 3 spines, 28 or (usually) 29 rays; pectoral fins 17 rays; up to 16 upper teeth and 18 lower teeth. Body depth ~2–2.2 in SL; peduncle spine long, ~1.8–2.1 in HL in adults; caudal fin of adults strongly lunate, caudal concavity 2.8–4 in SL.

Body with series of horizontal black stripes along sides, separated by pale greenish grey lines, converging at peduncle spine; the lines finer, paler and with wavy pattern on dorsal part of body, but broadening and becoming dark grey on nape and head above eyes; abdomen and head below eyes pale, with pale grey and greenish grey horizontal lines; dorsal, anal and pelvic fins mainly black, with bright blue margins; large orange blotch on body below pectoral-fin tips; peduncle spine and socket bright orange. Attains 40 cm TL.

DISTRIBUTION WIO: Red Sea to Persian/Arabian Gulf.

REMARKS Typically inhabits outer edge of fringing reefs exposed to surge, usually to ~20 m deep. Solitary or schooling; strongly territorial and highly aggressive. Peduncle spine reportedly venomous.

Acanthurus tennentii Günther 1861

Double-band surgeonfish

PLATE 61

Acanthurus tennentii Günther 1861: 337 (Sri Lanka); Randall 1956, 1984*, 1995; Baissac 1990.

Acanthurus plagiatus Peters 1877: 439 (Mauritius, Mascarenes); Bleeker 1879.

Acanthurus olivaceus (*non* Forster 1801): Sauvage 1891; Gudger 1929*; Baissac 1953, 1968, 1976, 1990; Fourmanoir & Guézé 1962; Cornic 1987.

Acanthurus tennentii: Baissac 1976; Harmelin-Vivien 1976; SSF No. 243.9*; Winterbottom *et al.* 1989; Randall & Anderson 1993; Debelius 1993*; Chabanet 1994; Randall 1995*, 2002*; Winterbottom & Anderson 1997, 1999; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Golani & Bogorodsky 2010; Fricke *et al.* 2013.

Dorsal fin 9 spines, 23 or 24 rays; anal fin 3 spines, 22 or 23 rays; pectoral fins 16 rays; up to 20 upper teeth and 22 lower teeth. Body depth 2–2.4 in SL (more elongate with growth); peduncle spine 2.5–3.8 in HL; caudal fin emarginate to lunate, caudal concavity from ~10 in SL in subadults, to ~5 in SL in large adults. Stomach thick-walled and gizzard-like.

Body dark brown to pale tan, without undulating lines; subadults (<12 cm SL) with horseshoe-shaped black mark behind upper end of gill opening (open end anterior-facing), breaking into 2 short horizontal bands in larger fish; chin black; black line along dorsal-fin base; peduncle spine surrounded by large black area rimmed with bright blue; caudal-fin margin white (broadest centrally), with narrow black submarginal line. Attains at least 31 cm TL.



Acanthurus tennentii, 18 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indian Ocean. WIO: southern Oman (rare), Kenya to South Africa (Park Rynie), Madagascar, Aldabra, Seychelles (common), Saya de Malha Bank, Mascarenes, Maldives and Sri Lanka; elsewhere to southern Indonesia (Lesser Sunda Is.).

REMARKS Inhabits shallow water, to ~40 m deep (usually in <20 m); found on coral reefs throughout the Indian Ocean, where it appears to be the counterpart of *A. olivaceus* of the Pacific Ocean.

Acanthurus thompsoni (Fowler 1923)

Thompson's surgeonfish

PLATE 61

Hepatus thompsoni Fowler 1923: 386 (Oahu I., Hawaii).

Acanthurus philippinus Herre 1927: 434, Pl. 5, Fig. 1 (Mindoro I., Philippines).

Acanthurus thompsoni: Randall 1956, 2002*; SSF No. 243.10*; Winterbottom *et al.* 1989*; Baissac 1990; Debelius 1993*; Randall & Anderson 1993; Letourneur 1998; Fricke 1999; Randall & Anderson 1999; Kuitert & Debelius 2001*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 9 spines, 23–26 rays; anal fin 3 spines, 23–26 rays; pectoral fins 17 rays; adults with 20 or 21 upper teeth, 24 lower teeth. Body oblong, depth 2.2–2.4 in SL; head profile distinctly convex; snout short, 7.9–8.2 in SL; peduncle depth 2.2–2.5 in HL; peduncle spine small; caudal fin deeply emarginate, caudal concavity of adults 5–9 in SL.

Body usually uniformly brown to dark brown, but capable of rapidly changing to pale greyish blue; darker brown spot in pectoral-fin axil (difficult to see on dark specimens), and small black spot on rear of dorsal-fin base; caudal fin usually white (fin same as body colour in Hawaiian specimens). Attains 27 cm TL.



Acanthurus thompsoni, 7 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Tanzania to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; not known from Red Sea, Gulf of Oman and Persian/Arabian Gulf; elsewhere to Cocos (Keeling) Is., Christmas I., Indonesia (Bali), Philippines, southern Japan, Great Barrier Reef, New Caledonia, Rapa Iti, Pitcairn Is., Marquesas Is. and Hawaii.

REMARKS Known from 4–75 m (Chave & Mundy 1994), but usually in <30 m. Feeds on zooplankton well above the bottom or else well away from the wall of drop-offs.

Acanthurus triostegus (Linnaeus 1758)

Convict surgeonfish

PLATE 62

Chaetodon triostegus Linnaeus 1758: 274 ('Indies').

Acanthurus zebra Lacepède 1802: 546, 548, Pl. 6, Fig. 3 (Indonesia).

Acanthurus triostegus: Valenciennes *in* Cuv. & Val. 1835; Günther 1861, 1879; Guichenot 1863; Playfair & Günther 1867; Gudger 1929; Baissac 1952, 1968, 1976, 1990; Fourmanoir & Guézé 1962; Harmelin-Vivien 1976, 1993; Randall 1984*, 2002*; SSF No. 243.11*; Cornic 1987*; Winterbottom *et al.* 1989*; Debelius 1993*; Randall & Anderson 1993; Chabanet 1994; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Manila & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Rhombotides triostegus: Bleeker 1874.

Acanthurus polyzona (non Bleeker 1868): Baissac 1976, 1990.

Acanthurus triostegus var. *polyzona* (non Bleeker 1868): Peters 1877, 1883.

Hepatus triostegus: Steindachner 1906.

Dorsal fin 9 spines, 22–25 rays; anal fin 3 spines, 19–22 rays; pectoral fins 14–16 rays; up to 16 upper teeth and 18 lower teeth. Body depth 1.8–1.9 in SL; peduncle spine small; caudal fin truncate to slightly emarginate.

Body olive-grey dorsally, shading to white ventrally, with 5 narrow brownish black bars (one on head through eyes). Attains 27 cm TL (commonly <20 cm TL).



Acanthurus triostegus, 8 cm SL (S Mozambique). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific (widespread). WIO: Yemen, Gulf of Aden to South Africa (juveniles to Algoa Bay, Eastern Cape), Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives, Lakshadweep, India and Sri Lanka; not known from northern Arabian Sea (Oman to northern India), Red Sea and Persian/Arabian Gulf; elsewhere to Indonesia, Philippines, southern Japan and Great Barrier Reef.

REMARKS Found inshore, in wave-affected areas of reefs, at 2–45 m; young abundant in tidepools. Grazes on filamentous algae on coral or rocky substrates, and adults form large feeding aggregations that may overwhelm territorial damselfishes.

Acanthurus tristis Randall 1993

Mimic surgeonfish

PLATE 62

Acanthurus pyroferus (non Kittlitz 1834): Winterbottom *et al.* 1989*.

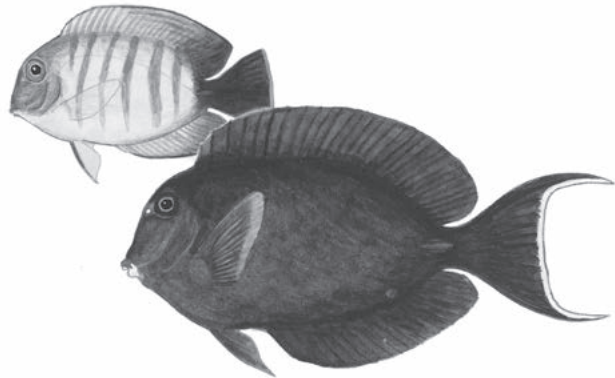
Acanthurus tristis Randall 1993: 4, Figs. 1–3 (Trincomalee, Sri Lanka);

Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999;

Kuiter & Debelius 2001*; Randall 2002*.

Dorsal fin 8 spines, 27 or 28 rays; anal fin 3 spines, 24–26 rays; pectoral fins 16 rays; up to 17 upper teeth and 22 lower teeth. Body depth 1.8–2 in SL; mouth somewhat protruding; dorsal profile of snout concave; peduncle spine 2.5–4.7 in HL; caudal fin of adults lunate, caudal concavity up to 4 in SL.

Adults dark brown, but capable of quickly changing to buff over central part of body (median fins and opercle remain dark brown); diffuse broad black band extending upward from chin and throat, across most of opercle, to upper end of gill opening, and meeting with similar black band extending upward from pectoral-fin axil; transverse white band on chin adjacent to lower lip, and another white band in black area on throat; peduncle spine pale, socket broadly black; caudal fin brown, with narrow white margin. Juveniles mimic the small angelfish *Centropyge eibli*. Attains at least 25 cm TL.



Acanthurus tristis, 7 cm SL, juvenile (Chagos); 16 cm SL, adult (Sri Lanka).

DISTRIBUTION Indian Ocean. WIO: Chagos, Maldives and Sri Lanka; elsewhere to Andaman Is. and southern Indonesia (Sumatra, Java and Bali), but possibly not Cocos (Keeling) Is. and Christmas I.

Acanthurus xanthopterus Valenciennes 1835

Yellowfin surgeonfish

PLATE 62

Acanthurus xanthopterus Valenciennes *in* Cuv. & Val. 1835: 215

(Seychelles); Guichenot 1863; Playfair & Günther 1867; Harmelin-Vivien 1976; Randall 1984*, 2002*; SSF No. 243.12*; Winterbottom *et al.* 1989;

Baissac 1990; Debelius 1993*; Randall & Anderson 1993; Chabanet 1994; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuiter &

Debelius 2001*; Heemstra *et al.* 2004; Fricke *et al.* 2009; Golani & Bogorodsky 2010; Fricke *et al.* 2013.

Acanthurus lamarrii Valenciennes *in* Cuv. & Val. 1835: 236

(Mauritius, Mascarenes).

Acanthurus gahmoides Guichenot 1863: C-8 (Réunion, Mascarenes);

Playfair & Günther 1867.

Rhombotides lamarrii: Bleeker 1874, 1879.

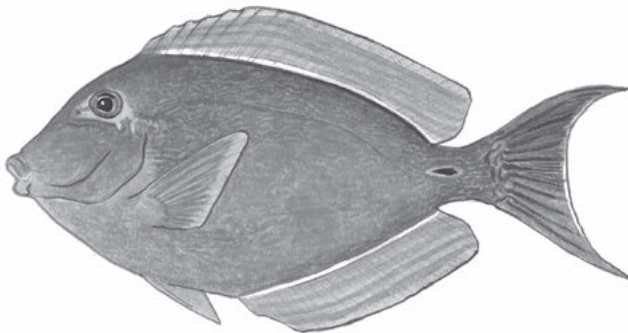
Rhomboides matoides: Bleeker 1874.

Acanthurus matoides: Peters 1877, 1883; Sauvage 1881; Gudger 1929*.

Acanthurus fuliginosus: Baissac 1953, 1968, 1976; Fourmanoir & Guézé 1962; Cornic 1987.

Dorsal fin 9 spines, 25–27 rays; anal fin 3 spines, 23–25 rays; pectoral fins 16 or 17 rays; 18 upper teeth and 21 lower teeth. Body depth 2–2.3 in SL, body more elongate with growth; dorsal profile of head convex; peduncle spine small, 4.4–5.7 in HL; caudal fin deeply emarginate to lunate, caudal concavity 4–7 in SL. Stomach gizzard-like.

Colour pattern can change quickly from uniformly purplish grey body to pattern of irregular longitudinal undulating bands of alternately dark yellowish grey and pale blue-grey (bands ~2 scales in width); broad yellow band in front of eyes, irregularly extending behind eyes and narrowly to upper end of gill opening; broad blue area around peduncle spine; dorsal and anal fins with pale blue band along bases, and 4 or 5 alternating longitudinal bands of pale blue and dull yellow; distal third of pectoral fins yellow. Attains 63 cm SL, ~70 cm TL.



Acanthurus xanthopterus, 42 cm SL (Maldives).

DISTRIBUTION Indo-Pacific (widespread). WIO: Tanzania (Zanzibar) to South Africa (KwaZulu-Natal), Madagascar, Aldabra, Seychelles, Mascarenes, Saya da Malha Bank, Chagos, Maldives and Sri Lanka; elsewhere to southern Japan, Australia, French Polynesia and Hawaii.

REMARKS Occurs in a variety of habitats, solitary or in small aggregations; juveniles mainly in protected and often turbid inshore waters, and adults in lagoons and bays but also on outer reefs. Generally inhabits deeper water than most other surgeonfishes, usually at >15 m (reported to ~90 m deep, but also seen in a few metres). Grazes predominantly on algal film on compact sand but also on hard surfaces.

GENUS *Ctenochaetus* Gill 1884

Resembles *Acanthurus*, but with different jaw structure and numerous flexible teeth. Dorsal fin 8 spines, 24–31 rays; anal fin 3 spines, 22–28 rays; pectoral fins 15–17 rays; pelvic fins 1 spine, 5 rays. All species feed on detritus with a high concentration of unicellular algae, which is scooped up from the sand or scraped from hard surfaces. Nine species, 3 in WIO.

KEY TO SPECIES

- 1a Dorsal fin 27–31 (usually 29) rays; anal fin 24–28 (usually 26) rays; caudal fin lunate, caudal concavity 3.7–6 in SL; upper-jaw teeth usually with 5 cusps, not counting the tip, and lower-jaw teeth with 3 cusps *C. striatus*
- 1b Dorsal fin 24–27 (usually 26) rays; anal fin 22–25 (usually 24) rays; caudal fin truncate to lunate, caudal concavity up to 5 in SL; upper-jaw teeth with 3 or 4 cusps, and lower-jaw teeth with 1 or 2 cusps 2
- 2a Caudal fin emarginate to lunate, caudal concavity 3.9–5.8 in SL; body orangish brown, with bluish longitudinal lines following scale rows and becoming small spots anteriorly and on head; black spot at rear of dorsal- and anal-fin bases; juveniles yellow on caudal fin only *C. binotatus*
- 2b Caudal fin truncate to slightly emarginate, caudal concavity at most 16.5 in SL; head and body with very small blue to yellow spots; no black spot at rear of dorsal- and anal-fin bases; juveniles entirely yellow *C. truncatus*

Ctenochaetus binotatus Randall 1955

Two-spot bristletooth

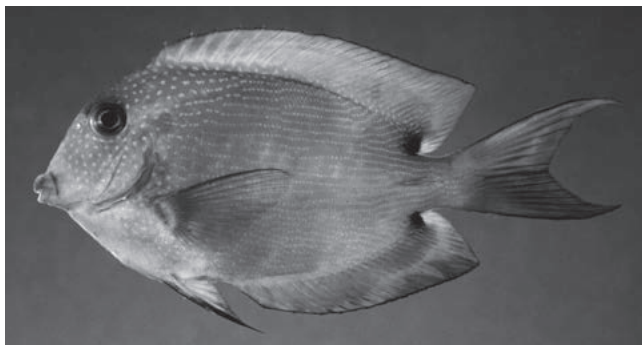
PLATE 62

Ctenochaetus binotatus Randall 1955: [155], 164, Fig. 1g (Pagapas Bay, Luzon, Philippines); SSF No. 243.13*; Baissac 1990; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Randall 2002*; Heemstra *et al.* 2004.

Dorsal fin 8 spines, 24–27 rays; anal fin 3 spines, 22–25 rays; pectoral fins 15–17 rays; 32–46 upper teeth, and 36–48 lower teeth (specimens 8–15 cm SL; a 3.5-cm-TL juvenile had 22 upper teeth and 22 lower teeth); margin of lips smooth. Body depth 1.9–2.3 in SL; caudal fin of adults lunate, caudal concavity 3.9–5.8 in SL (specimens >8 cm SL).

Body orangish brown, with slightly irregular longitudinal blue (or sometimes pale yellow) lines following scale rows and breaking into tiny spots anteriorly; iris blue; prominent

black spot at rear of dorsal- and anal-fin bases, extending onto adjacent body. Juveniles with brown or orangish brown body, with ~11 dark brown oblique stripes, and caudal fin usually abruptly bright yellow. Attains 20 cm TL.



Ctenochaetus binotatus, 10 cm SL (Comoros). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Mauritius, Rodrigues and Maldives; not known from Red Sea, Gulf of Oman and Persian/Arabian Gulf; elsewhere to Philippines, southern Japan, Marshall Is., Australia (Rowley Shoals), New Caledonia and Tuamotu Is.

REMARKS Inhabits coral reefs, at 2–53 m. Feeds on fine detritus whisked from the sediment, over reefs and on adjacent rubble-sand areas.

Ctenochaetus striatus (Quoy & Gaimard 1825)

Striped bristletooth

PLATE 62

Acanthurus striatus Quoy & Gaimard 1825: 373, Pl. 63, Fig. 3 (Guam, Mariana Is.).

Teuthis striatus: Barnard 1927.

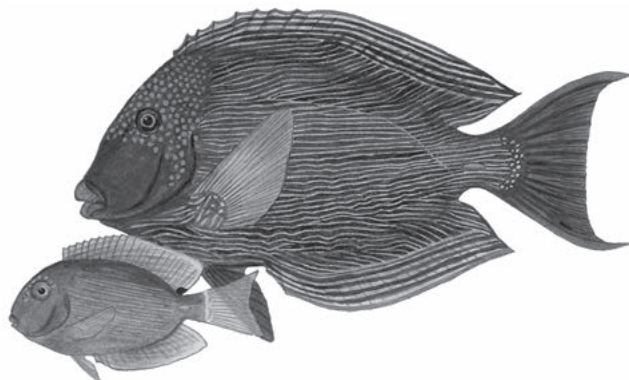
Acanthurus ctenodon Valenciennes in Cuv. & Val. 1835: 241, Pl. 289 (New Guinea; Caroline Is.); Günther 1861.

Ctenochaetus striatus: Baissac 1976, 1990; Harmelin-Vivien 1976; Randall 1984*, 1995*, 2002*; SSF No. 243.14*; Winterbottom *et al.* 1989; Randall & Anderson 1993; Chabanet 1994; Chabanet *et al.* 1995; Chabanet & Letourneur 1995; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Lieske & Myers 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 8 spines, 27–31 rays; anal fin 3 spines, 24–28 rays; pectoral fins 16 or 17 rays; 32–50 upper teeth, 36–62 lower teeth (specimens 8.3–21 cm SL); margin of lips smooth. Body depth 1.9–2.3 in SL; caudal fin of adults lunate, caudal concavity 3.7–6 in SL.

Adults typically dark grey-brown to orangish brown, with numerous pale longitudinal bluish lines following scale rows and extending onto basal parts of dorsal and anal fins

(can change from dark brown to buff, but still retains the linear pattern); nape and broad zone around eyes with numerous tiny orange-yellow spots; outer part of dorsal fin with narrow, longitudinal, alternating dark brown and pale bluish bands, most evident in soft portion of fin; anal fin with obscure bands. Small juveniles with 8–12 narrow red bands on body, sloping downward more posteriorly, and caudal-fin tips red. Larger juveniles and subadults with small black spot at rear of dorsal-fin base. Attains at least 26 cm TL.



Ctenochaetus striatus, 19 cm TL, adult (Red Sea); 5 cm TL, juvenile (Mauritius). Source: CFSA

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Mascarenes and Chagos; elsewhere to Philippines, southern Japan, New Guinea, Caroline Is., Mariana Is., Marshall Is., Great Barrier Reef, New Caledonia, French Polynesia, Rapa Iti and Pitcairn Is.

REMARKS The most common acanthurid at most localities where it occurs; found in a range of habitats, from lagoons to fringing reefs and large ocean reefs, to ~25 m deep, but usually in <15 m. Grazes in large aggregations.

Ctenochaetus truncatus Randall & Clements 2001

Yellow-ring bristletooth

PLATE 63

Acanthurus ctenodon var. b (*non* Valenciennes 1835): Playfair & Günther 1867.

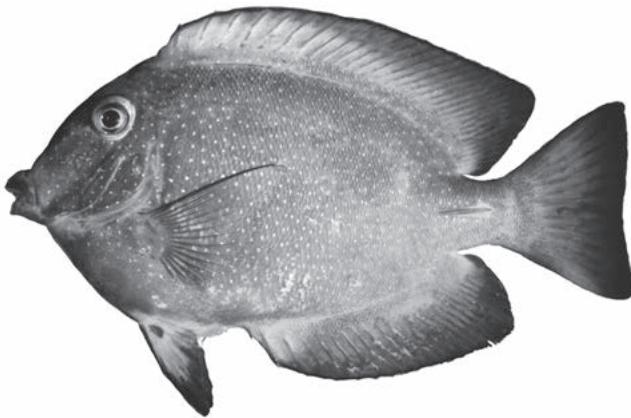
Acanthurus strigosus (*non* Bennett 1828): Bleeker 1874, 1879; Günther 1879; Peters 1883; Palmer 1950.

Ctenochaetus strigosus (*non* Bennett 1828): Baissac 1953, 1968, 1976, 1990; Cornic 1987*; SSF No. 243.15*; Winterbottom *et al.* 1989; Randall & Anderson 1993; Winterbottom 1993; Randall 1995*, 2002*; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*.

Ctenochaetus truncatus Randall & Clements 2001: 25, Pls. 3c, 6f–h (off La Digue, Seychelles); Randall 2002*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 8 spines, 25–27 rays; anal fin 3 spines, 23–25 rays; pectoral fins 15–17 rays; 36–42 upper teeth, 34–50 lower teeth (specimens 8.4–14 cm SL); margin of lips smooth to finely papillate (not crenulated). Body depth 1.8–2 in SL; caudal fin truncate to slightly emarginate and with caudal concavity up to ~16.5 in SL.

Body orangish brown, with numerous small pale blue to yellow dots on head, body and basal part of dorsal fin; eyes encircled by bright yellow area; median and pelvic fins brownish and tinged with yellow, caudal fin darkest, and dorsal fin may have faint longitudinal banding; young entirely bright yellow. Attains 18.5 cm SL.



Ctenochaetus truncatus, 13 cm SL (Comoros). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indian Ocean. WIO: Red Sea, southern Oman, Kenya to South Africa (Sodwana Bay; juveniles to Eastern Cape), Madagascar, Comoros, Seychelles, Mascarenes, St Brandon Shoals, Chagos, Maldives, probably Lakshadweep, India and Sri Lanka; elsewhere to Andaman Sea (Thailand), Cocos (Keeling) Is. and Christmas I.

REMARKS Found in relatively shallow water, on sheltered areas of coral and rocky reefs; collected to ~21 m deep.

GENUS *Naso* Lacepède 1801

Body oblong to oval, with pointed snout, and adults of some species with horn-like projection on forehead, usually in both males and females. Peduncle narrow, with 1 or 2 stout forward-projecting blade-like spines on each side, each on a bony plate. Caudal fin slightly rounded to deeply emarginate; some species with long filament at lobe tips (sometimes only in males). Dorsal fin 4–7 spines, 24–31 rays; anal fin 2 spines, 23–30 rays; pectoral fins 16–19 rays; pelvic fins 1 spine, 3 rays. Unlike most

other acanthurids, which feed primarily on algae or detritus, unicornfishes also feed on zooplankton, and they typically have greater depth ranges. Nineteen species, 13 in WIO.

KEY TO SPECIES

- | | | |
|----|--|-------------------------|
| 1a | Two bony plates (sharply keeled in adults) on each side of peduncle | 2 |
| 1b | Single bony plate on each side of peduncle | 12 |
| 2a | Teeth of adults incisors with rounded tips, smooth-edged, and each jaw with 30–35 or fewer teeth; no protuberance or horn on forehead; peduncle plates and keels bright orange (pale in preservative); curved yellow line from behind corners of mouth to below eyes; dorsal fin mainly yellow | <i>N. elegans</i> |
| 2b | Teeth of adults lanceolate, edges finely serrate, and each jaw with >35 teeth; forehead with or without protuberance or horn; colour not as above | 3 |
| 3a | No protuberance or horn on foreheads of adults | <i>N. hexacanthus</i> |
| 3b | Prominent bump or distinct bony rostral projection (horn) on forehead of adults | 4 |
| 4a | Forehead with distinct forward-jutting bony rostral projection (horn) | 5 |
| 4b | Forehead without horn, but snout with prominent convex protuberance | 8 |
| 5a | Back with prominent hump (developing at ~20 cm FL) below anterior dorsal-fin rays; snout profile straight and strongly sloping (at ~45° angle); large males with long horn in front of upper edge of eyes, adult females with bump at same site | <i>N. brachycentron</i> |
| 5b | No hump on back beneath dorsal-fin rays; snout profile not straight and strongly sloping, except both sexes of <i>N. unicornis</i> develop horn that does not project anterior to mouth | 6 |
| 6a | Horn not projecting forward of mouth; body depth of large adults <3 in FL; plates on peduncle blue in life | <i>N. unicornis</i> |
| 6b | Horn projecting forward of mouth; body depth of large adults >3 in FL; plates on peduncle not blue | 7 |
| 7a | Dorsal fin 5 spines; snout profile to base of horn forming ~60° angle; no dark lines or spots on head or body; no dark markings on head or body, edge of lips broadly white, and caudal-fin margin white; large adults with filament from caudal-fin tips | <i>N. annulatus</i> |

Continued ...

KEY TO SPECIES

- 7b Dorsal fin 6 spines; snout profile to base of horn nearly vertical; head with small dark spots, and body with vertical dark lines; no filament from caudal-fin tips *N. brevirostris*
- 8a Anal fin 2 spines, 23–25 rays; dorsal fin 5 spines, 24–26 rays; bump present on snout just above upper lip, becoming acute in large adults; caudal fin deeply emarginate in adults, with filament from tips in presumed males; no dark markings; plates on peduncle dull orange-red *N. fageni*
- 8b Anal fin 2 spines, 26–30 rays; dorsal fin 5 or 6 spines, 26–29 rays; broadly rounded bump present on snout at level of lower edge of eyes or slightly below; caudal fin of adults slightly emarginate to truncate; plates on peduncle not coloured 9
- 9a Dorsal fin 6 spines, 26 or 27 rays; caudal fin rounded to truncate in adults, with long filament from lobe tips; dorsal fin elevated, 1st spine 1.5–1.7 in HL; vertical blue lines on sides of body, with small blue spots above and below *N. vlamingii*
- 9b Dorsal fin 5 spines, 26–31 rays; caudal fin slightly emarginate to truncate in adults; dorsal fin not elevated, 1st dorsal spine 3–4 in HL; no blue spots or lines on body 10
- 10a Contour of back broadly and symmetrically rounded, with no convexity below spinous portion of dorsal fin; snout profile nearly vertical to ~120° angle before eyes, then straight to dorsal-fin origin; no small black spots on body *N. mcdadei*
- 10b Broad-based convexity in contour of back centred below spinous portion of dorsal fin; very large bulbous protuberance at front of snout, projecting forward of mouth in large males; body with small dark spots dorsally 11
- 11a Black spot about as large as eyes anteroventral to pectoral-fin bases, but fins without submarginal black band; convexity in contour of back below spinous portion of dorsal fin slightly developed *N. tuberosus*
- 11b No black spot anteroventral to pectoral-fin bases, but fins with submarginal black band; convexity in contour of back below spinous portion of dorsal fin strongly developed ... *N. tonganus*
- 12a Dorsal fin 4 spines; keel of plate on peduncle rounded at all sizes, and plate not set in black spot; ~30 irregular bluish grey bars on body; caudal fin bluish grey *N. thynnoides*
- 12b Dorsal fin 5 spines; keel of plate on peduncle with forward-projecting point, and plate set in black spot; no grey bars on body, but often 3–5 longitudinal stripes on upper sides; caudal fin yellow *N. minor*

Naso annulatus (Quoy & Gaimard 1825)

Whitemargin unicornfish

PLATE 63

Priodon annulatus Quoy & Gaimard 1825: 377 (Timor I. [Timor Sea]).

Naseus marginatus Valenciennes in Cuv. & Val. 1835: 280

(Tongatabu I., Tonga).

Priodon annularis Valenciennes in Cuv. & Val. 1835: 302,

Pl. 294 [unjustified emendation or misspelling of *P. annulatus*].

Naseus annulatus: Günther 1861.

Acanthurus incipiens Jenkins 1903: 480, Fig. 32 (Oahu I., Hawaii).

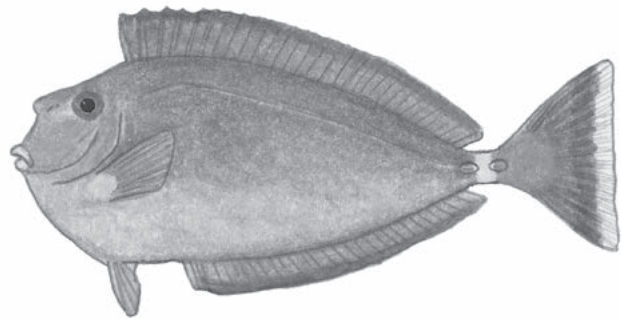
Naso annulatus: Smith 1961; Bauchot & Randall 1996; SSF No. 243.20*;

Kuiter & Debelius 2001*; Randall 2002; Manilo & Bogorodsky 2003.

Naso herrei Smith 1966: 647, Fig. 12a–b (Philippines).

Dorsal fin 5 spines, 28 or 29 rays; anal fin 2 spines, 27 or 28 rays; pectoral fins 17–19 rays. Body depth ~2.2–3 in SL (subadults to adults); adults with long tapering bony process (horn) anterior to eyes, projecting up to nearly one head length forward of mouth (appears as a bump in fish <20 cm TL); snout profile to base of horn at ~60° angle to horizontal axis of head and body; 2 plates on each side of peduncle, with knife-like keels in adults; caudal fin truncate in subadults, scalloped in adults, and large males with filamentous lobe tips.

Body bluish grey or bluish brown, paler ventrally, without any dark markings on head or body; lips white; peduncle of juveniles and subadults with distinctive white band, and caudal-fin margin white, except subadults develop black submarginal zone in fin; caudal fin of adults with blackish submarginal band, and narrow white margin and filaments. Attains at least 100 cm TL.



Naso annulatus, 29 cm TL (Mozambique).

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman to South Africa (KwaZulu-Natal), Madagascar, Seychelles and Mascarenes; elsewhere to Indonesia, Philippines, central Japan, Marshall Is., Australia, southern Great Barrier Reef, Lord Howe I., Tonga, Line Is., Tuamotu Is. and Hawaii.

REMARKS Found in shallow water to >25 m deep, usually in small aggregations, and large adults typically seen on steep drop-offs; difficult to approach.

Naso brachycentron (Valenciennes 1835)

Humpback unicornfish

PLATE 64

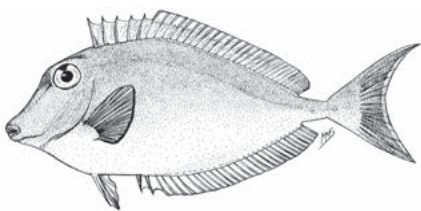
Naseus brachycentron Valenciennes in Cuv. & Val. 1835 (Waigeo I., West Papua, Indonesia); Günther 1861.

Naso rigoletto Smith 1951: 1128, Fig. 1 (Mozambique); Harmelin-Vivien 1976.

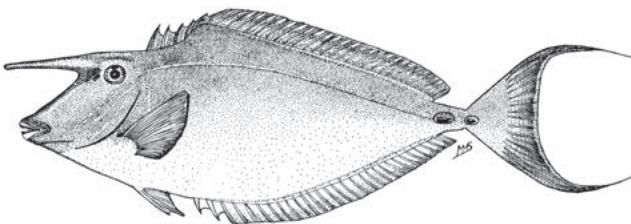
Naso brachycentron: Baissac 1976, 1990; SSF No. 243.21*; Winterbottom *et al.* 1989*; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Kuitert & Debelius 2001*; Randall 2002*; Fricke *et al.* 2009.

Dorsal fin 4 or 5 spines, 28–30 rays; anal fin 2 spines, 27 or 28 rays; pectoral fins 17 rays. Body depth ~2.3–2.7 in SL (subadults to adults); hump on back develops at ~20 cm SL, thus dorsal profile of adults distinctly concave from above eyes to origin of dorsal-fin rays; snout profile at ~45° angle to horizontal axis of head and body; adult males with long tapering horn anterior to eyes, which may project forward of mouth, and adult females with only a prominent bump before eyes; 2 plates on each side of peduncle, those of adults with sharp keel ending in forward-projecting point.

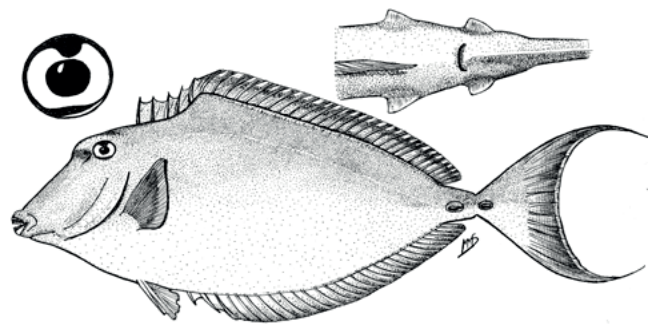
Head and upper half of body grey, lower half whitish to pale yellowish, the demarcation irregular; often with a few small pale blue spots behind eyes; large males may have dark bars on lower sides. Attains 90 cm TL.



Naso brachycentron, 22 cm TL, juvenile paratype of *N. rigoletto* (Mozambique). Source: Smith 1951



Naso brachycentron, 67 cm TL, male holotype of *N. rigoletto* (Mozambique). Source: Smith 1951



Naso brachycentron, 68 cm TL, female paratype, eye detail, and dorsal view of peduncle of *N. rigoletto* (Mozambique). Source: Smith 1951

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Sodwana Bay), Madagascar, Seychelles, Réunion, Mauritius, Maldives and Lakshadweep; not known from Red Sea, Oman and Persian/Arabian Gulf; elsewhere to Indonesia, Ryukyu Is., Mariana Is., Great Barrier Reef, New Caledonia and French Polynesia.

REMARKS Adults found in shallow reef areas, occasionally in small aggregations; difficult to approach underwater.

Naso brevirostris (Cuvier 1829)

Spotted unicornfish

PLATE 64

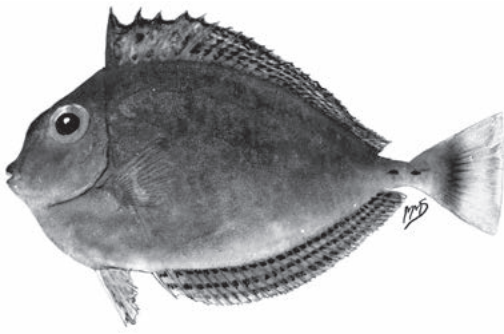
Naseus brevirostris Cuvier 1829: 225 [Indonesia]; Valenciennes in Cuv. & Val. 1835*; Guichenot 1863; Playfair & Günther 1867; Bleeker 1874, 1879; Peters 1877.

Naso longicornis Guérin-Méneville 1829–1838: 22, Pl. 35, Fig. 3 (Mauritius, Mascarenes).

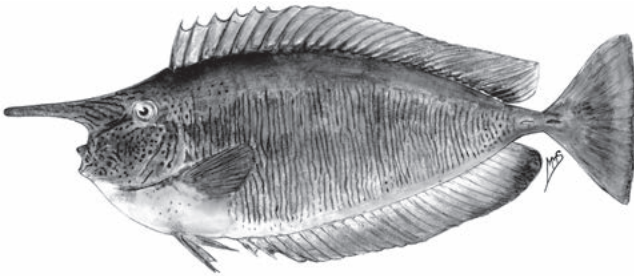
Naso brevirostris: Baissac 1953, 1969, 1976; Fourmanoir & Guézé 1962; Allen *et al.* 1976; Harmelin-Vivien 1976; SSF No. 243.22*; Cornic 1987*; Winterbottom *et al.* 1989*; Randall & Anderson 1993; Chabanet 1994; Winterbottom & Anderson 1997, 1999; Fricke 1999; Kuitert & Debelius 2001*; Randall 2002*; Manilo & Bogorodsky 2003; Lieske & Myers 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 6 spines, 27–29 rays; anal fin 2 spines, 27–29 rays; pectoral fins 16 or 17 rays. Body depth ~2–2.7 in SL (subadults to adults); broad-based tapering horn before eyes, in adults projecting up to one head length forward of mouth (appears as a bump in fish <10 cm TL); snout profile above mouth very short and nearly vertical; 2 plates on each side of peduncle, keels only moderately developed; caudal fin truncate to slightly rounded.

Body pale bluish grey to olive-brown background (one colour phase with anterior fourth of body abruptly pale); series of fine, vertical, dark grey lines on midsides, ending as rows of spots ventrally; head with small dark spots or reticular lines, and horn with oblique dark lines; opercular membrane white; edges of lips pale blue; caudal fin mainly whitish. Attains 60 cm TL (commonly <50 cm TL).



Naso brevirostris, 4 cm TL, juvenile (N Mozambique). Source: SSF



Naso brevirostris, 55 cm TL (Tanzania). Source: SSF

DISTRIBUTION WIO: Red Sea to South Africa (KwaZulu-Natal; young drifting to Algoa Bay, Eastern Cape), Seychelles, Mascarenes, Chagos, Maldives, India and Sri Lanka; not known from Oman or Persian/Arabian Gulf.

REMARKS Collected at 7–25 m at Chagos. Feeds on benthic algae when young, but with the development of the horn, its food habits shift principally to zooplankton.

Naso elegans (Rüppell 1829)

Elegant unicornfish

PLATE 64

Aspisurus elegans Rüppell 1829: 61, Pl. 16, Fig. 2 (northern Red Sea).

Naso lituratus (non Forster 1801): Smith 1949; Baissac 1952; Randall 1983, 1984; SSF No. 243.25*; Winterbottom *et al.* 1989*; Winterbottom & Anderson 1997.

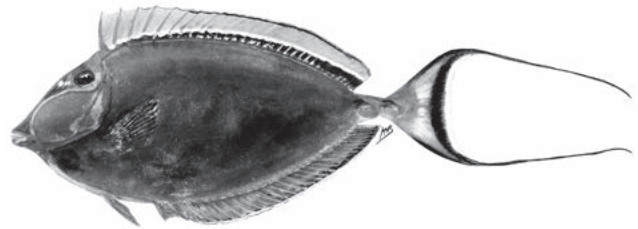
Callicanthus lituratus: Smith 1966.

Naso elegans: Kuitert & Debelius 2001*; Randall 2002*; Manilo & Bogorodsky 2003; Lieske & Myers 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 6 spines, 26–30 (usually 28) rays; anal fin 2 spines, 27–30 (usually 29) rays; pectoral fins 16 or (usually) 17 rays; 30–35 teeth in each jaw, teeth of adults incisiform with smooth rounded edges. Body depth 2.2–2.7 in SL (more elongate with growth); no horn or protuberance on forehead; snout profile

of adults nearly straight, forming ~45° angle to horizontal axis of head and body; 2 plates on each side of peduncle, each with large, sharp, forward-projecting keel; caudal fin emarginate, and with trailing filament from each lobe tip in adult males.

Body dark greyish brown (no fine undulating lines); narrow, curved yellow band from corners of mouth to below eyes, and snout blackish medially above band; lips orange; dull yellow area behind eyes, continuous with bright yellow dorsal fin; thin blue line along dorsal-fin base and black line above this (narrow on spinous portion of fin); anal fin and pelvic fins dark brown; dorsal and anal fins with narrow blue margin and black submarginal line; peduncle plates and keels brilliant orange, separated by white band; caudal fin yellowish, with black upper and lower margins and submarginal black band. Attains 45 cm SL.



Naso elegans, 60 cm TL including caudal filaments (N Mozambique). Source: SSF

DISTRIBUTION Indian Ocean (widespread), excluding Gulf of Oman to Persian/Arabian Gulf and India. WIO: Red Sea, southern Oman to South Africa (KwaZulu-Natal), Madagascar, Comoros, Seychelles, Mascarenes, Maldives and Sri Lanka; elsewhere to Andaman Sea and Indonesia (at least to Bali).

REMARKS Usually found inshore on coral reefs or rocky bottom, where it browses on algae, especially brown algae such as *Sargassum* and *Dictyota*. Long regarded as an Indian Ocean colour variant of *Naso lituratus* (Forster 1801) until the colour difference was linked to different counts of dorsal-, anal- and pectoral-fin rays.

Naso fageni Morrow 1954

Horseface unicornfish

PLATE 64

Naso tapeinosoma (non Bleeker 1854): Fowler & Bean 1929.

Naso fageni Morrow 1954: 799 (Busuk I, Philippines); SSF No. 243.23*; Randall 1995*, 2002*; Winterbottom & Anderson 1997, 1999;

Borden 1998; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003.

Cyphomycter cavallo Smith 1955: 173 (Pinda, Mozambique).

Rhinodactylus baixopindae Smith 1957: 686 (Pinda, Mozambique).

Naso (*Rhinodactylus*) *fageni*: Smith 1966.

Dorsal fin 5 spines, 24–26 rays; anal fin 2 spines, 23–25 rays; pectoral fins 17 rays. Body depth ~2–3 in SL (subadults to large adults); short protuberance on snout just above upper lip, projecting slightly forward of mouth in large adults (first appearing as small convexity at ~50 cm TL); 2 plates on each side of peduncle, each with large keel and forward-projecting point; caudal fin emarginate, caudal concavity 7–10 in TL, and large adults (perhaps only males) with filamentous lobe tips.

Body pale olive-grey, paler ventrally; median fins dark grey with black bands distally, except caudal fin shading to blackish posteriorly; pectoral fins grey, with hyaline outer margin and broad blackish submarginal zone; peduncle plates dull orange-red. Attains 80 cm TL.



Naso fageni, 60 cm TL (Saya de Malha Bank). © Alvheim © IMR/ASCLME

DISTRIBUTION Indo-Pacific (relatively few localities).

WIO: southern Oman, Kenya, Tanzania (Zanzibar), Mozambique, Aldabra, Seychelles and Saya de Malha Bank; elsewhere, Philippines and central Japan.

REMARKS Distinguished from all other species in the genus by its low dorsal- and anal-fin-ray counts. Observed as solitary individuals in deeper non-reef environments as well as on coral and rocky reefs; difficult to approach.

Naso hexacanthus (Bleeker 1855)

Sleek unicornfish

PLATE 65

Priodon hexacanthus Bleeker 1855: 421 (Ambon I., Moluccas, Indonesia).

Naseus vomer Klunzinger 1871: 514 (Egypt, Red Sea).

Callicanthus metoposphron Jenkins 1903: 482 (Oahu I., Hawaii).

Naso thorpei Smith 1966: 670, Fig. 9b (Mauritius, Mascarenes).

Naso (Atulonotus) vomer: Baissac 1976.

Naso tapeinosoma: Harmelin-Vivien 1976.

Naso hexacanthus: Randall 1984*, 2002*; SSF No. 243.24*;

Winterbottom *et al.* 1989*; Randall & Anderson 1993; Chabanet 1994;

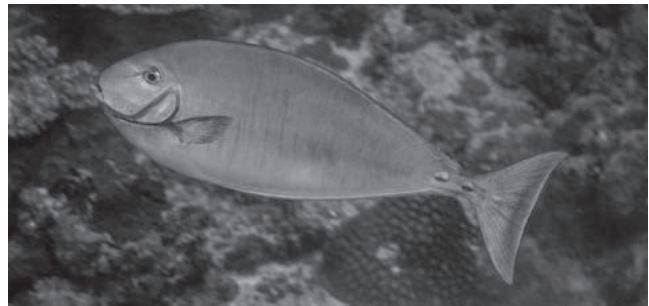
Winterbottom & Anderson 1997, 1999; Borden 1998;

Kuiter & Debelius 2001*; Fricke *et al.* 2009.

Naso vomer: Baissac 1990.

Dorsal fin usually 6 (rarely 5 or 7) spines, 26–29 rays; anal fin 2 spines, 27–30 rays; pectoral fins 17 or 18 rays. Body depth of adults 2.6–3 in SL; head profile sloping and smoothly convex; interorbital area strongly convex with slight median ridge; 2 large plates on each side peduncle, keels with forward-projecting point in adults; caudal fin emarginate in young, truncate in adults.

Upper body brown to bluish grey, lower body yellowish grey, the demarcation along midsides often abrupt and irregular; edge of opercle and preopercle usually with brown band; lower lip white; tongue of adults black; caudal fin blue, with broad brownish yellow margin narrowing towards tips. Capable of rapidly changing to pale greyish blue overall, as when at a wrasse cleaning station. Males in courtship quickly display broad bluish white zone on nape and front of upper body, followed by similarly coloured narrow bars that extend onto lower body. Attains 75 cm TL.



Naso hexacanthus (Tanzania). © A Sutton

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to Mozambique, Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; not known from Gulf of Oman, Persian/Arabian Gulf, India and Sri Lanka; elsewhere to Indonesia, Philippines, southern Japan, Wake I., Australia, New Caledonia, Lord Howe I., Pitcairn Is. and Hawaii.

REMARKS Adults usually seen in large schools on outer reef escarpments, where they feed on zooplankton, and occasionally at cleaning stations of *Labroides* wrasses by day, then returning to the shelter of the reef at night.

Naso mcdadei Johnson 2002

Squarenose unicornfish

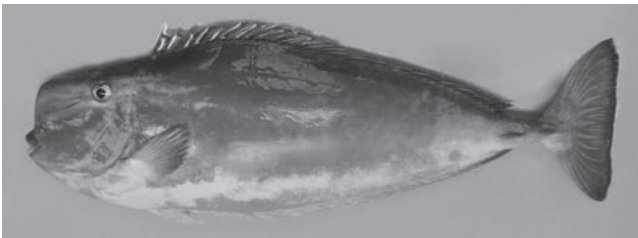
PLATE 65

Naso tuberosus (non Lacepède 1801): Gloerfelt-Tarp & Kailola 1984.

Naso mcdadei Johnson 2002: 295, Figs. 1a–d, 2a (Stradbroke I., Queensland, Australia); Randall 2002*; Senou *et al.* 2013*.

Dorsal fin 5 spines, 28–31 rays; anal fin 2 spines, 26–29 rays; pectoral fins 16 or 17 rays; teeth in jaws denticulate near tips, ~50–70 in each jaw, increasing in number with age. Body depth ~2.4–3 in SL (subadults to large adults); dorsal profile of body of adults broadly rounded, with no convexity below spinous portion of dorsal fin; adults with squarish protuberance anteriorly on head; 2 plates on each side of peduncle, keel of each large and with forward-projecting point; caudal fin emarginate in young, distinctly truncate in adults.

Body bluish grey to olive-grey, paler ventrally (no spots or distinctive markings on head, body or fins); dorsal fin with narrow pale margin; caudal fin with body colour, except for narrow white margin and broad dark submarginal zone; peduncle plates greenish brown. Attains at least 75 cm TL.



Naso mcdadei, 61 cm SL (Saya de Malha Bank). © Alvheim © IMR/ASCLME

DISTRIBUTION Indo-Pacific. WIO: South Africa (KwaZulu-Natal), Comoros, Mauritius, Saya de Malha Bank, Chagos and Maldives; elsewhere to Indonesia, Philippines, Timor Sea, Australia and Great Barrier Reef.

REMARKS First illustrated as *Naso tuberosus* Lacepède 1801 (from Mentawai Is., Sumatra, Indonesia) by Gloerfelt-Tarp & Kailola (1984). Generally found in moderately deep waters, such as steep drop-offs of offshore coral or rocky reefs. Feeds on algae and larger zooplankton.

Naso minor (Smith 1966)

Pony unicornfish

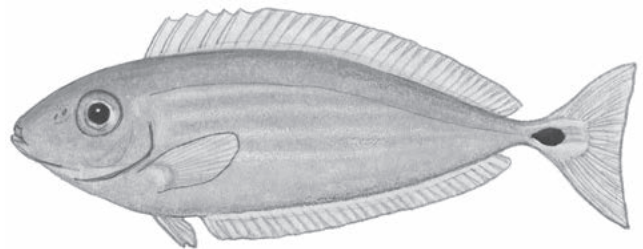
PLATE 65

Axinurus minor Smith 1966: 640, Fig. 1a (Pinda, Mozambique).

Naso minor: SSF No. 243.26*; Winterbottom 1992; Randall 1994, 2002*; Borden 1998; Kuitert & Debelius 2001*.

Dorsal fin 5 spines, 27–29 rays; anal fin 2 spines, 27–29 rays; pectoral fins 17 rays. Body depth 2.9–3.3 in SL; head profile smoothly convex, without any protuberance; short oblique groove on snout below nostrils, about equal to length of naked area containing nostrils; single peduncle plate, with large, sharp keel and forward-projecting point in adults; caudal fin slightly emarginate.

Head purplish grey and body grey, shading to whitish ventrally, sometimes with 3–6 dark bluish grey stripes on sides; lips blackish; iris dusky yellow; pale area beneath pectoral fins; caudal fin yellow; peduncle plate and keel black. Males in courtship display striking pattern of black on upper half of head and white bar in middle of body. Attains 22.5 cm SL.



Naso minor, 20 cm SL (Indonesia).

DISTRIBUTION Indo-Pacific (relatively few localities). WIO: Mozambique and Réunion; elsewhere, Indonesia, Philippines and Great Barrier Reef.

REMARKS Occurs in aggregations, at 8–40+ m; difficult to approach. Feeds on zooplankton well above the bottom.

Naso thynnoides (Cuvier 1829)

Single-spine unicornfish

PLATE 65

Axinurus thynnoides Cuvier 1829: 225 (Dorey Harbour,

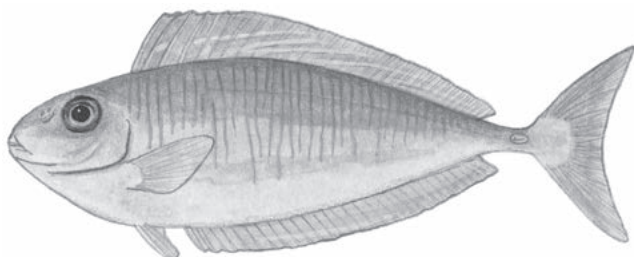
Papua New Guinea); Smith 1955; Smith & Smith 1963.

Naseus thynnoides: Bleeker 1857.

Naso thynnoides: Herre 1927; Harmelin-Vivien 1976; SSF No. 243.28*; Winterbottom 1992; Randall & Anderson 1993; Randall 1994, 2002*; Bauchot & Randall 1996; Winterbottom & Anderson 1997, 1999; Borden 1998; Fricke 1999; Kuitert & Debelius 2001*; Fricke *et al.* 2001.

Dorsal fin 4 or 5 spines, 28–30 rays; anal fin 2 spines, 28–30 rays; pectoral fins 16–18 rays; adults with 80–90 upper teeth, 70–80 lower teeth. Body depth 2.8–3.2 in SL; dorsal profile of head convex, without any bony protuberance, and interorbital space broad and flat; oblique groove on snout below nostrils, reaching half way from eyes to mouth; single peduncle plate, keel small and approximately semicircular; caudal fin emarginate.

Body grey, paler ventrally; ~30 narrow bluish grey vertical bars on body, becoming tiny irregular spots on head; diffuse yellow band across midsides; peduncle plate and keel dusky; caudal fin bluish grey. Attains 40 cm TL (commonly <25 cm TL).



Naso thynnoides, 23 cm FL (Comoros).

DISTRIBUTION Indo-Pacific. WIO: Kenya, Tanzania, Comoros, Seychelles, Réunion, Mauritius and Maldives; elsewhere to Indonesia, New Guinea, Ryukyu Is., Great Barrier Reef, Caroline Is. and Tuamotu Is.

REMARKS Occurs both in protected waters of lagoons and in exposed outer-reef areas, from shallows to at least 40 m (generally in >10 m). Sleeps on reefs at night, taking on a disruptive colour pattern. Usually seen in small roving aggregations, feeding on zooplankton.

Naso tonganus (Valenciennes 1835)

Bulbnose unicornfish

PLATE 65

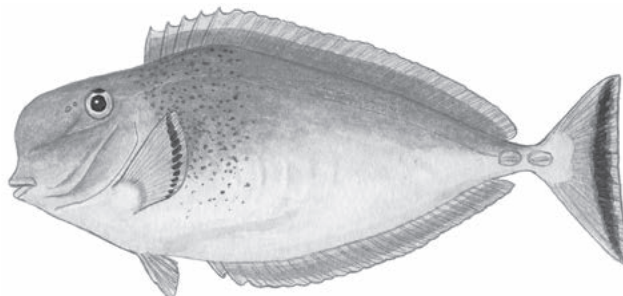
Naseus tonganus Valenciennes (ex Quoy & Gaimard) in Cuv. & Val. 1835: 292 (Tongatapu, Tonga Is.).

Naso tonganus: Kuitert & Debelius 2001*; Johnson 2002; Randall 2002*.

Dorsal fin 5 spines, 27–30 rays; anal fin 2 spines, 26–28 rays; pectoral fins 16–18 rays; teeth in jaws denticulate near tips, 22–46 in each jaw, number increasing with age. Body depth ~2.3–3 in SL (subadults to large adults); adults with large bulbous protuberance at front of head, projecting forward of mouth in large males; dorsal profile of body of adults distinctly convex beneath spinous portion of dorsal fin; 2 peduncle plates, keels on each with forward-projecting point; caudal fin emarginate in young, truncate in adults.

Body grey to olive, paler ventrally, with numerous tiny black spots on upper half to three-quarters of body (spots lost in large adults, except for large V-shaped area of small spots centred beneath hump on back); pectoral fins with broad blackish submarginal band; dorsal fin blackish basally (mainly

on membranes), with broad pale blue margin; caudal fin with narrow bluish white margin and broad blackish submarginal zone. Attains at least 60 cm SL.



Naso tonganus, 40 cm SL (Seychelles).

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa, Seychelles and Saya de Malha Bank (and probably other WIO islands); elsewhere to Indonesia, Ryukyu Is., Micronesia, Great Barrier Reef, New Caledonia, Samoa and Tonga.

REMARKS Solitary or in small groups on coral reefs. Feeds mainly on leafy or fleshy algae, but also on zooplankton when abundant. Fowler & Bean (1929) mistakenly placed *Naso tuberosus* Lacepède 1801 in the synonymy of this species, and other authors (such as Smith 1966) have likewise confused the two species.

Naso tuberosus Lacepède 1801

Humpnose unicornfish

PLATE 65

Naso tuberosus Lacepède (ex Commerson) 1801: 105, 111, Pl. 7,

Fig. 3 (Mauritius, Mascarenes); Harmelin-Vivien 1976; SSF No. 243.29*;

Baissac 1990; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Borden 1998; Kuitert & Debelius 2001*; Johnson 2002; Randall 2002*; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Naseus tuber Commerson in Cuvier 1829: 225 [no locality given]; Valenciennes in Cuv. & Val. 1835; Guichenot 1863.

Naso tuber: Liénard 1836.

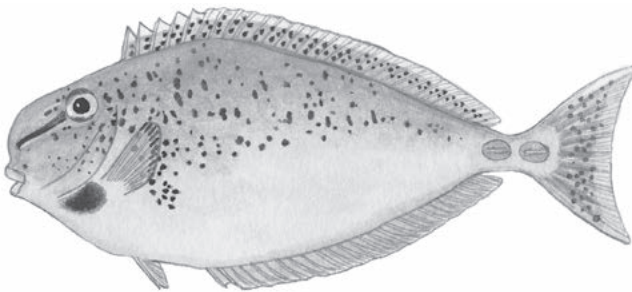
Naseus tuberosus: Günther 1861; Playfair & Günther 1867; Peters 1877, 1883; Gudger 1929.

Cyphomycceter tuberosus: Baissac 1952.

Dorsal fin 5 spines, 26–29 rays; anal fin 2 spines, 26–28 rays; pectoral fins 16–18 rays; teeth in jaws denticulate at tips, increasing in number with age, ~30–46 in each jaw. Body depth 2.3–2.7 in SL (subadults to adults); dorsal profile of body of adults broadly curved, with poorly defined convexity beneath spinous portion of dorsal fin, and adults with obtusely

rounded protuberance on front of head, but which does not project forward of mouth even in large individuals; 2 plates on each side of peduncle, each with large keel and forward-projecting point; caudal fin deeply emarginate in juveniles, slightly emarginate in adults.

Head and dorsal part of body grey, with small pale blotches and numerous small blackish spots on upper body (many may be vertically elongate), and ventral extension of small black spots beneath pectoral fins; lower half of body pale grey to white; large blackish spot (may be as large as eye) below and in front of pectoral-fin base (faint in preserved specimens); dorsal fin with broad bluish white margin; caudal fin with bluish white margin and broad dusky submarginal zone with blackish dots. Attains 60 cm SL.



Naso tuberosus, 60 cm TL (Mauritius).

DISTRIBUTION WIO: Mozambique to South Africa (Sodwana Bay), Seychelles, Madagascar, Mascarenes and Maldives (distribution likely much broader).

Naso unicornis (Forsskål 1775)

Blue-spine unicornfish

PLATES 65 & 66

Chaetodon unicornis Forsskål in Niebuhr 1775: 63, xiii (Jeddah, Saudi Arabia, Red Sea).

Naso fronticornis Lacepède 1801: 105, Pl. 7, Fig. 2 (Mauritius, Mascarenes); Liénard 1836.

Naseus fronticornis: Valenciennes in Cuv. & Val. 1835; Guichenot 1863.

Monoceros unicornis: Barnard 1927.

Naseus unicornis: Baissac 1953, 1968, 1976, 1990; Fourmanoir & Guézé 1962; Randall 1984*, 2002*; SSF No. 243.30*; Winterbottom *et al.* 1989; Randall & Anderson 1993; Chabanet *et al.* 1995; Winterbottom & Anderson 1997, 1999; Borden 1998; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 6 spines, 27–30 rays; anal fin 2 spines, 27–30 rays; pectoral fins 17 or 18 rays. Body depth ~2 in SL in subadults, to 2.4–2.6 in adults; tapering bony horn-like process in front of eyes, not projecting forward of mouth (first appears as

bump in fish ~12 cm TL); dorsal profile of snout to base of horn straight, forming ~45° angle to horizontal axis of head and body; 2 peduncle plates, each with sharp keel ending in forward-projecting point; caudal fin emarginate in young, truncate and with filament from lobe tips in adults. Males reported to have longer horn, larger peduncle keels, and longer caudal filaments than like-sized females.

Body olive-grey dorsally, slightly paler and more yellowish ventrally; lips whitish or blue; dull blue area sometimes around pectoral-fin bases; dorsal- and anal-fin margins bright blue; caudal fin orangish basally, shading to grey, with broad pale greenish margin and blue-edged filaments; peduncle plates and keels blue. One transient colour phase with blotchy pale greenish area beneath spinous portion of dorsal fin, narrowing to beneath pectoral fins. Keris larval stage (<4 cm TL) silvery on sides and back, with black spots on upper body. Attains probably 70 cm TL.



Naso unicornis, 60 cm TL (N Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to South Africa (Sodwana Bay), Madagascar, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, southern Japan, Marshall Is., Great Barrier Reef, Pitcairn Is., Marquesas Is. and Hawaii.

REMARKS Occurs primarily inshore on sheltered coral reefs and rocky shores, as well as in lagoons, estuaries and mangroves; will enter surprisingly shallow water for so large a fish; found in small groups. Feeds on larger brown algae, including *Sargassum*.

Naso vlamingii (Valenciennes 1835)

Bignose unicornfish

PLATE 66

Naseo vlamingii Valenciennes in Cuv. & Val. 1835: 293 (Moluccas, Indonesia).

Naso vlamingii: Herre 1927; Smith 1966; SSF No. 243.31*; Winterbottom *et al.* 1989; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Borden 1998; Kuitert & Debelius 2001*; Randall 2002*; Fricke *et al.* 2009; Fricke *et al.* 2013 [as *vlamingi*].

Dorsal fin 6 spines, 26 or 27 rays; anal fin 2 spines, 27–29 rays; pectoral fin 17–19 rays. Body depth ~2.2–2.6 in SL (subadults to adults); prominent convex protuberance on forehead of adults, centred just below level of lower edge of eyes; dorsal fin elevated and nearly uniform in height, 1st dorsal-fin spine 1.5–1.7 in HL; 2 peduncle plates, each with large keel with forward-projecting point in adults; caudal fin slightly emarginate in young, with filament from lobe tips appearing at ~15 cm TL, and fin truncate to slightly rounded with long filaments from tips in adults.

Adults dark grey-brown or dull red-brown to pale bluish grey background (able to change quickly), with small dark bluish spots on head and upper sides of body, merging to become dark bluish vertical lines on lower sides; broad blue band extending forward from eyes to apex of bump on forehead; lips blue; irregular blue mark behind pectoral-fin bases; caudal fin bluish basally, grey in broad middle zone, with diffuse yellowish margin, and blue upper and lower edges and filaments. The dark bluish markings can quickly change to brilliant blue, as during courtship or when visiting a cleaning station; one transient colour phase displays a broad pale bluish area anteriorly on upper body. Young with scattered small blue spots. Attains 60 cm TL.



Naso vlamingii, 58 cm TL (Marshall Is.). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (widespread). WIO: northern Mozambique, Madagascar, Comoros, Seychelles, Réunion, Chagos and Maldives; not known from Red Sea, Oman to Persian/Arabian Gulf and northern India; elsewhere to Indonesia, southern Japan, Marshall Is., Great Barrier Reef, Society Is. and Tuamotu Is.

REMARKS Usually seen in open water on outer reef areas, especially near drop-offs, but may also occur in lagoons;

known from 4–50 m. Feeds on zooplankton in midwater aggregations during the day and sleeps on the reef at night; has also been observed within or just below schools of nocturnally feeding species of barracudas (*Sphyræna forsteri* and *S. qenie*) and the carangid *Caranx sexfasciatus*, feeding on the faecal matter of those predaceous fishes.

GENUS *Paracanthurus* Bleeker 1863

Resembles *Acanthurus*, but pelvic fins with 3 rays, and peduncle spine not set in distinct socket. One species.

Paracanthurus hepatus (Linnaeus 1766)

Palette surgeonfish

PLATE 66

Teuthis hepatus Linnaeus 1766: 507 ('Mare indico' [Ambon I., Moluccas, Indonesia]).

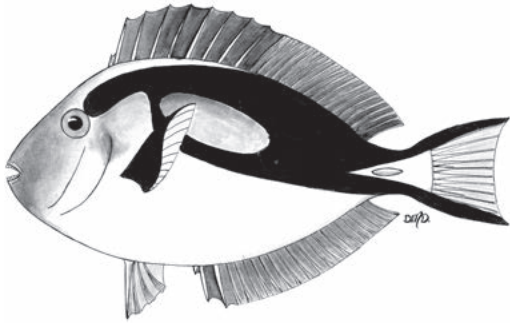
Acanthurus hepatus: Valenciennes in Cuv. & Val. 1835*; Günther 1861; Playfair & Günther 1867; Peters 1877, 1883; Gudger 1929.

Paracanthurus hepatus: Bleeker 1874; Baissac 1953, 1976, 1990; Harmelin-Vivien 1976; Cornic 1987*; Winterbottom *et al.* 1989; Chabanet 1994; Debelius 1999; Winterbottom & Anderson 1999; Kuitert & Debelius 2001*, Randall 2002*; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Paracanthurus teuthis: Smith 1949*; Fourmanoir & Guézé 1962*.

Dorsal fin 9 spines, 19 or 20 rays; anal fin 3 spines, 18 or 19 rays; pectoral fins 16 rays; pelvic fins 1 spine, 3 rays. Adult specimen (20.5 cm SL) with 14 upper teeth and 17 lower teeth. Scales on head between eyes and mouth enlarged to tuberculate plates, especially on cheeks and snout. Body depth of adults 2.1–2.4 in SL; single folding spine on each side of peduncle, but not in distinct socket, its length 3.3–4 in HL; caudal fin slightly rounded in juveniles, truncate with short pointed tips in adults.

Body bright blue, with black band curving upwards from eyes, broadening on body, continuing to full width of peduncle, and containing large elliptical blue area centred above pectoral-fin tips; caudal fin yellow centrally, yellow area extending forward and narrowing to enclose peduncle spine; ventral part of body yellowish in Indian Ocean fish. Juveniles coloured similar to adults. Attains ~26 cm TL.



Paracanthurus hepatus, 20 cm TL, juvenile. Source: SFSA

DISTRIBUTION Indo-Pacific (widespread). WIO: Kenya to South Africa (Sodwana Bay), Madagascar, Comoros, Réunion, Mauritius, Chagos, Maldives and Sri Lanka; elsewhere to Indonesia, southern Japan, Micronesia, Line Is. and Samoa.

REMARKS Typically found in clear water on exposed outer reef areas or in channels where there is consistent moderate to strong current. Feeds on zooplankton, but also browses on benthic algae. Has been observed off Bali, Indonesia, alternately feeding on zooplankton and benthic algae. Adults difficult to approach underwater; juveniles shelter among branches of live coral. Usually called the blue tang in the aquarium trade, but this name is reserved for *Acanthurus coeruleus* Bloch & Schneider 1801 from the Atlantic (Robins *et al.* 1991), also a popular aquarium fish.

GENUS *Zebrasoma* Swainson 1839

Deep-bodied and disc-like, with pointed snout, and tall dorsal and anal fins. Dorsal fin 4 or 5 spines, 23–31 rays; anal fin 3 spines, 19–25 rays; pectoral fins 14–17 rays; pelvic fins 1 spine, 5 rays; caudal fin truncate. Seven species, 4 in WIO.

KEY TO SPECIES

- 1a Dorsal fin very high, longest ray 2.1–2.5 in SL; body depth of adults 1.8–2 in SL; head and body with alternating dark and pale bars, the dark bars on body containing yellow lines and spots *Z. desjardini*
- 1b Dorsal fin not especially high, longest ray 2.7–4 in SL; body depth of adults 1.6–1.9 in SL; body without alternating dark and pale bars 2

Continued ...

KEY TO SPECIES

- 2a Dorsal fin 4 spines, 27–29 rays; anal fin 3 spines, 24 or 25 rays; body dark brown, with pale blue dots on head, body and median fins (dots fewer on juveniles, some on body present as short dashes); caudal fin yellow in juveniles, brownish yellow in adults *Z. gemmatum*
- 2b Dorsal fin 5 (rarely 6) spines, 23–25 rays; anal fin 3 spines, 19–21 rays; colour not as above 3
- 3a Body bright blue, with yellowish brown dots on head and anterior part of body; caudal fin and outer third of pectoral fins bright yellow *Z. xanthurum*
- 3b Body yellowish brown anteriorly, shading to dark brown posteriorly, with wavy, pale blue, longitudinal lines on body, and pale blue dots on nape, chest and head *Z. scopas*

Zebrasoma desjardini (Bennett 1836)

Indian sailfin tang

PLATES 66 & 67

Acanthurus velifer Bloch 1795: 106, Pl. 427, Fig. 1 [India, possibly Tharangambadi]; Baissac 1952.

Acanthurus desjardini Bennett 1836: 207 (Mauritius, Mascarenes); Günther 1861; Winterbottom *et al.* 1989*.

Hepatus coccinatus Von Bonde 1934: 449, Pl. 23, Fig. 3 (west coast of Zanzibar, Tanzania).

Acanthurus fasciatus: Baissac 1953.

Zebrasoma veliferum: Klausewitz 1982; Randall 1984*.

Zebrasoma desjardini: Randall & Anderson 1993*; Winterbottom & Anderson 1997, 1999; Kuitert & Debelius 2001*; Randall 2002*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*.

Dorsal fin 4 spines, 27–31 rays; anal fin 3 spines, 22–24 rays; pectoral fins 15–17 rays. Adults with up to 16 upper teeth and 18 lower teeth. Body depth of adults 1.8–2 in SL; mouth protruding, snout profile of concave; dorsal fin extremely elevated, longest ray 2.1–2.5 in SL; peduncle spine not broadly joined to body posteriorly (unlike other *Zebrasoma*), and no patch of bristle-like setae in front of peduncle spine; caudal fin truncate.

Body grey, with ~8 grey-brown vertical bars, each bar with 2 or 3 orange-yellow lines; bars break into spots ventrally and on anal fin; head with 2 dark brown bars (anterior bar passing through eye), and numerous close-set small pale yellow spots; dorsal fin with bands of spots similar to those on body; caudal fin with small pale blue spots. Juveniles with narrow grey and yellow bars on body, shading to black posteriorly, and head with 2 black bars. Attains 40 cm TL.



Zebrasoma desjardinii, 4 cm SL, juvenile (Rodrigues).
PC Heemstra © NRF-SAIAB



Zebrasoma desjardinii, 10 cm SL (Tanzania). M Mwale © NRF-SAIAB

DISTRIBUTION Indian Ocean. WIO: Red Sea to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Rodrigues, Mascarenes, Chagos, Maldives, Lakshadweep, India and Sri Lanka; elsewhere to Cocos (Keeling) Is. and Indonesia (Java), except not known from Christmas I.

REMARKS Found on coral reefs, in shallow water to ~30 m deep; usually solitary but occasionally in pairs. Browses on benthic algae.

Zebrasoma gemmatum (Valenciennes 1835)

Spotted tang

PLATE 67

Acanthurus gemmatus Valenciennes in Cuv. & Val. 1835: 255
(Mauritius, Mascarenes); Günther 1861.

Zebrasoma geminatus: Baissac 1952.

Zebrasoma gemmatum: Smith 1965; Kuitert & Debelius 2001*;
Randall 2002*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004;
Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 4 spines, 27 or 28 rays; anal fin 3 spines, 24 or 25 rays; pectoral fins 16 or 17 rays. Adults with up to 18 upper teeth and 20 lower teeth. Body depth of adults 1.6–1.9 in SL; snout moderately prolonged, its dorsal profile concave; dorsal fin elevated, longest ray 2.6–3.2 in SL (proportionately longer in smaller individuals); no patch of setae on sides of body in front of peduncle spine; caudal fin truncate to slightly rounded.

Body dark brown, with numerous small white spots (usually round, but may be horizontally elongate) on head, body and median fins; caudal fin yellow. Attains at least 23 cm TL.



Zebrasoma gemmatum, juvenile (Réunion). © E Morcel CC BY-SA 4.0

DISTRIBUTION WIO: South Africa (Kosi Bay to Eastern Cape), Madagascar and Mascarenes.

REMARKS Rare; territorial and solitary, on coral and rocky reefs or on mixed sand and rubble adjacent to reefs, in relatively deep water, to ~60 m (usually in >25 m). Targeted in the aquarium trade and traded for a high price.

Zebrasoma scopas (Cuvier 1829)

Two-tone tang

PLATE 67

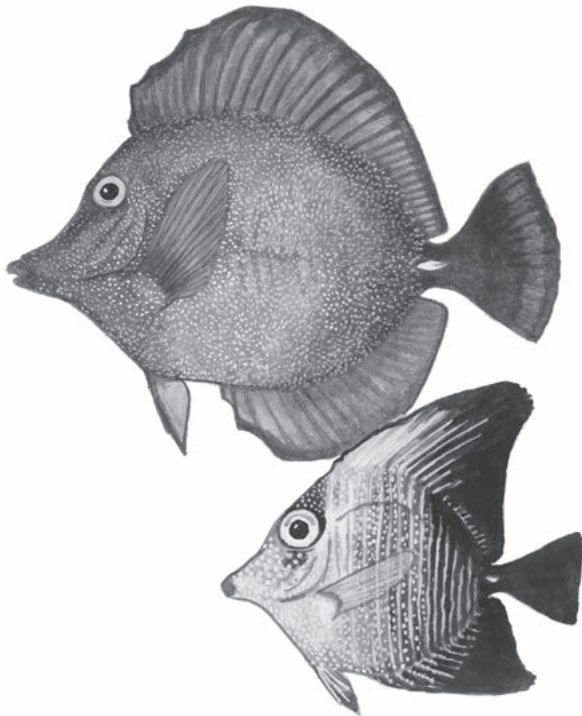
Acanthurus scopas Cuvier 1829: 224 (Banda Is., Moluccas, Indonesia).

Acanthurus rhombeus Kittlitz 1834: 196, Pl. 13, Fig. 16 (Uléa, Caroline Is.); Günther 1861.

Zebrasoma scopas: Randall 1955; Winterbottom *et al.* 1989*; Randall & Anderson 1993; Winterbottom & Anderson 1997, 1999; Fricke 1999; Randall 2002; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin usually 5 (rarely 4) spines, 23–25 rays; anal fin 3 spines, 19–21 rays; pectoral fins 14–16 rays. Body very deep, 1.4–1.8 in SL (small juveniles to large adults); snout protruding, its dorsal and ventral profiles strongly concave; dorsal fin very elevated, longest ray ~2–3.5 in SL (small juveniles to large adults); dense patch of bristle-like setae posteriorly on sides of body, and setae longer in males than in like-sized females; caudal fin truncate in adults, rounded in juveniles.

Body and head dark brown, shading slightly to yellowish brown anteriorly, with pale blue dots on head and front of body forming longitudinal rows of fine dashes, becoming solid irregular lines at midbody; fins dark brown, except pectoral fins with hyaline membranes; peduncle spine bright white. Juveniles similar in colour to adults but with 18 pale yellow vertical lines on body, scattered yellow dots anteriorly, and no longitudinal lines. Attains at least 21.5 cm TL.



Zebrasoma scopas, 11 cm TL, adult (Comoros); 3 cm SL, juvenile (Mauritius).

DISTRIBUTION Indo-Pacific (widespread). WIO: Gulf of Aden to South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Mascarenes, Chagos and Maldives; not known from Red Sea, Gulf of Oman or Persian/Arabian Gulf; elsewhere to Indonesia, South China Sea, Philippines, southern Japan, Caroline Is., Great Barrier Reef, New Caledonia, Rapa Iti and Pitcairn Is.; not known from Marquesas Is.

REMARKS Rare across its wide distribution but often locally abundant. Inhabits coral reefs; usually encountered in <25 m, but reportedly to ~60 m deep. Juveniles solitary, adults often in small aggregations. Grazes on algal turf and filamentous algae. A close relative of *Z. flavescens*, known from islands of the North Pacific, and the two species are difficult to distinguish except by colour; hybrids are common.

Zebrasoma xanthurum (Blyth 1852)

Yellowtail tang

PLATES 67 & 68

Acanthurus xanthurus Blyth 1852: 50 (Sri Lanka [locality probably in error: Randall 2001]); Playfair & Günther 1867; Klunzinger 1871.

Zebrasoma xanthurum: Ben-Tuvia & Steinitz 1952; ?Randall & Anderson 1993; Goren & Dor 1994; Kuitert & Debelius 2001*; Manilo & Bogorodsky 2003; Al-Badri & Jawad 2014.

Dorsal fin 5 spines, 24 or 25 rays; anal fin 3 spines, 19 or 20 rays; pectoral fins 15 rays. Adults with up to 20 upper teeth and 22 lower teeth. Body depth 1.7–1.9 in SL; snout protruding, its dorsal and ventral profile concave; dorsal fin elevated, longest ray 3.3–3.7 in SL; adults with velvet-like patch of setae posteriorly on body in front of peduncle spine; caudal fin rounded in juveniles and subadults, slightly rounded to truncate in adults.

Adults blue, with dark yellowish brown to blackish dots on head and anterior part of body; caudal fin and distal third of pectoral fins bright yellow. Juveniles and subadults with dark brown horizontal lines on body. Attains 22 cm SL.

DISTRIBUTION WIO: Red Sea, Gulf of Aden, Gulf of Oman and Persian/Arabian Gulf.

REMARKS Common throughout its range. Randall & Anderson (1993) reported an adult from the Maldives, which is possibly a misidentification.

GLOSSARY

emarginate – with a slightly concave margin.

denticulate – tooth-like.

keel – a narrow ridge on the sides of the caudal peduncle or at the base of the caudal fin, typically found in fast-swimming fishes with narrow caudal peduncle. Term is also used for sharp blade on the peduncle plates of *Naso* and *Prionurus* species.

keris larvae – the late post-larval stage of fishes of the genus *Naso*, which come inshore from the open ocean to metamorphose into juveniles.

lanceolate – broad at the base and tapering to a point.

setae – bristles.

SUBORDER SPHYRAENOIDEI

Ryu Doiuchi and Tetsuji Nakabo

A single family, Sphyraenidae, is recognised. After Johnson (1986) proposed that the Sphyraenidae is the primitive sister group to the scombroids, based on a morphological phylogeny, many authors included the family Sphyraenidae within the suborder Scombroidei. However, molecular research by Miya *et al.* (2013) demonstrated that the Sphyraenidae fall outside the strongly supported clade that contains 15 pelagic families, including typical scombroids such as the Scombridae, Trichiuridae and Gempylidae. Although the phylogenetic position of the Sphyraenidae in the larger Percomorpha clade is not well resolved, it is clear that this family is not a close relative of scombroids. Therefore, we place the Sphyraenidae in its own suborder Sphyraenoidei. Morphological and ecological diagnosis of the suborder is as noted in the family account.

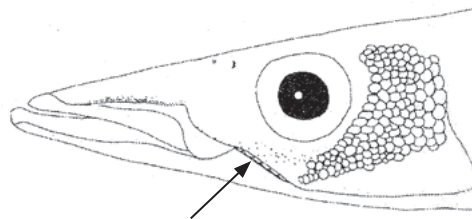
FAMILY SPHYRAENIDAE

Barracudas

Ryu Doiuchi and Tetsuji Nakabo

Body elongate, subcylindrical, deepest between origins of 1st and 2nd dorsal fins. Head and snout long, pointed; interorbital region almost flat. Mouth large, nearly horizontal, and lower jaw protruding. Teeth in upper jaw numerous, small, in single row, and 2 pairs of large canine-like teeth on symphysis of premaxilla, anterior pair shorter than posterior pair; teeth in lower jaw in single row, several anterior teeth smaller, a single large canine on symphysis of dentary; no teeth on vomer; palatines with single row of irregularly sized canines. Opercle usually with 1 or 2 membranous points posteriorly. Two low and widely separated dorsal fins, height and base of fins nearly equal: 1st dorsal fin

with 5 spines, and fin insertion opposite or behind pelvic-fin origins; 2nd dorsal fin with 1 spine, 9 (rarely 8) rays, and fin insertion opposite or slightly before anal fin. Pectoral fins short, tips barely reaching or extending only slightly past 1st dorsal-fin origin. Pelvic fins 1 spine, 5 rays. Anal fin 2 spines, 8 or 9 rays. Peduncle low, moderately compressed; caudal fin deeply forked, some large species with pair of phylloid protrusions at rear margin. Branchiostegal rays 7, membranes free from isthmus; gill rakers of 1st gill arch rod-like, tubercle-like or absent. Lateral line well-developed, straight. Scales on body cycloid, deciduous in some species; suborbital region with single row of scales in groove along lower margin, from rear of maxilla to below eye (Doiuchi & Nakabo 2005), but these scales covered with skin in some species. Vertebrae 12 + 12.

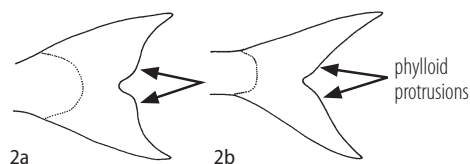


Suborbital groove with single row of scales. Source: Doiuchi & Nakabo 2005

Carnivorous pike-like fishes generally inhabiting shallow coastal waters; found in all tropical to temperate seas. Includes common food fishes and several game fish. Size range 30–205 cm TL. In some areas, large individuals of the larger species (especially *Sphyraena barracuda*) may be ciguatoxic. One genus, *Sphyraena* Bloch & Schneider 1801, with ~30 species, but a revision could result in several genera; 11 species in WIO.

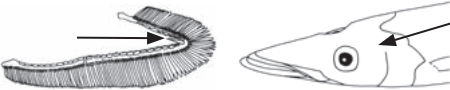

KEY TO SPECIES

- | | | |
|----|---|---------------------|
| 1a | First gill arch without gill rakers | 2 |
| 1b | First gill arch with gill rakers | 5 |
| 2a | LL scales 75–87; many oblique dark bars on upper half of body above lateral line; caudal fin blackish and with pale tips, and with pair of large phylloid protrusions on inner margin of fin lobes (except not in young <50 cm TL) | <i>S. barracuda</i> |
| 2b | LL scales 120–140; many dark bars on middle of body and crossing lateral line; caudal fin yellowish or dark and without pale tips, and no phylloid protrusions on inner margin of fin lobes, or with pair of small protrusions only | 3 |



Continued ...

KEY TO SPECIES

- 3a Dark bars on body chevron-shaped; last ray of 2nd dorsal fin longer than penultimate ray *S. putnamae*
- 3b Dark bars on body somewhat oblique on upper half and nearly vertical on lower half; last ray of 2nd dorsal fin not longer than penultimate ray 4
- 4a Caudal fin yellowish, and no phylloid protrusions on inner margin of fin lobes; bars on body not wider than interspaces, and bars extend only slightly below lateral line; LL scales 130–140 *S. jello*
- 4b Caudal fin dark with blackish margins, and with pair of small phylloid protrusions on inner margin of fin lobes in adults; bars on body slightly wider than interspaces; LL scales 120–130 *S. qenie*
- 5a Gill rakers of 1st gill arch tubercle-like with minute spines; dark blotch on body behind pectoral-fin axil *S. forsteri*
- 5b Gill rakers of 1st gill arch rod-like; no dark blotch on body behind pectoral-fin axil 6
- 6a Single gill raker on 1st gill arch; no patch of scales on temporal region 7
- 
- 6b Two gill rakers on 1st gill arch; patch of scales on temporal region 9
- 
- 7a Rear of maxilla not reaching to below anterior nostril; tip of lower jaw with well-developed fleshy knob; 1st dorsal-fin origin slightly behind pelvic-fin origins *S. helleri*

- 7b Rear of maxilla extending past posterior nostril; tip of lower jaw without fleshy knob, or with poorly developed fleshy knob; 1st dorsal-fin origin above or slightly before pelvic-fin origins 8
- 8a Body with narrow dark longitudinal stripe extending from upper pectoral-fin base; dark blotch on body just behind pelvic-fin bases; membrane of 1st dorsal fin transparent basally but dusky distally *S. africana*
- 8b No dark longitudinal stripe on body (sometimes with indistinct stripe running above pectoral-fin bases); no dark blotch on body just behind pelvic-fin base; membrane of 1st dorsal fin entirely transparent *S. acutipinnis*
- 9a Body with single yellow-brown longitudinal stripe running above pectoral-fin base (indistinct in some specimens); membrane of 1st dorsal fin transparent basally but dusky distally; rear edge of opercle with 1 membranous point; LL scales 80–94 *S. pinguis*
- 9b Body with 2 brownish yellow longitudinal stripes when fresh (upper stripe usually lost in preserved specimens), lower stripe running through upper pectoral-fin bases; membrane of 1st dorsal fin entirely transparent; rear edge of opercle not pointed; LL scales 78–85 10
- 10a Scales above lateral line 5–7.5, scales below lateral line 8.5–9.5; longitudinal stripes somewhat faint, lower stripe joining lateral line midway between end of 2nd dorsal-fin base and peduncle, and extending to middle of caudal-fin base *S. obtusata*
- 10b Scales above lateral line 8.5–9.5, scales below lateral line 10.5–11.5; longitudinal stripes distinct, especially lower stripe which extends to caudal-fin base just below lateral line *S. iburiensis*

Sphyraena acutipinnis Day 1876

Sharpfin barracuda

PLATE 68

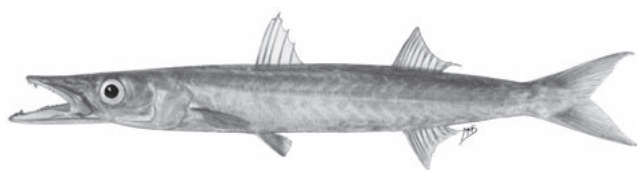
Sphyraena acutipinnis Day 1876: 342, Pl. 79, Fig. 1 (Sindh, Pakistan, Arabian Sea); De Sylva 1975*; SSF No. 224.1*; Randall 1995*; Fricke *et al.* 2009.

Sphyraena natalensis Von Bonde 1923: 10, Pl. 3, Fig. 2 (KwaZulu-Natal, South Africa).

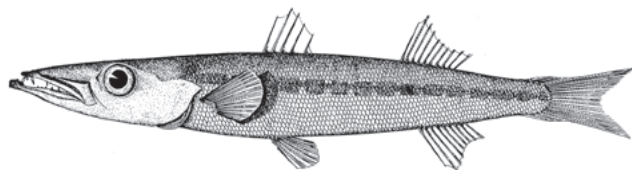
Eyes large; no fleshy knob on tip of lower jaw; rear of maxilla extending past posterior nostril and nearly reaching as far as eye. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; opercle with 1 membranous point posteriorly, just above pectoral-fin base.

First dorsal-fin origin over or slightly before pelvic-fin origins; pectoral-fin tips barely reaching or extending only slightly past 1st dorsal-fin origin. Second dorsal fin 1 spine, 8 or 9 rays. Anal fin 2 spines, 8 rays. Single rod-like gill raker on 1st gill arch. Scales in suborbital groove covered with skin; predorsal area scaly to above upper edge of preopercle; no patch of scales on temporal region; LL scales 119–136; scales above lateral line 10.5–11.5, scales below lateral line 12.5–13.5.

Head and body dark brown dorsally, silvery white below; usually without longitudinal stripe on sides of body, but sometimes with indistinct dark stripe running above pectoral-fin bases; 1st dorsal-fin membrane entirely transparent; pectoral fins dusky, with dark mark at base; no dark blotch on body behind pelvic-fin base; caudal fin yellowish, inner rear margin dusky. Attains 35 cm TL.



Sphyraena acutipinnis, 25 cm TL (South Africa). Source: Smith & Smith 1963



Sphyraena acutipinnis, holotype of *S. natalensis* (South Africa). Source: Von Bonde 1923

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Pakistan, Gulf of Oman to South Africa (Mossel Bay, Western Cape) (exact range in region uncertain because of confusion with *S. japonica* from western Pacific).

REMARKS Inhabits shallow coastal waters, usually found in large schools. Common food fish; caught with handlines and set nets.

Sphyraena africana Gilchrist & Thompson 1909

African barracuda

PLATE 68

Sphyraena africana Gilchrist & Thompson 1909: 256
(Durban, KwaZulu-Natal, South Africa); Williams 1959*;
De Sylva 1975*; Fricke *et al.* 2009.

Eyes large; tip of lower jaw with poorly developed fleshy knob; rear of maxilla extending past posterior nostril, but not reaching as far as eye. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; opercle with 1 membranous point posteriorly, just above pectoral-fin base. First dorsal-fin origin above to slightly before pelvic-fin origins; pectoral-fin tips not reaching 1st dorsal-fin origin. Second dorsal fin 1 spine, 8 or 9 rays. Anal fin 2 spines, 8 rays. Single rod-like gill raker on 1st gill arch. Scales in suborbital groove covered with skin; predorsal area scaly to above upper edge of preopercle; no patch of scales on temporal region; LL scales 129–138; scales above lateral line 11.5, scales below lateral line 14.5.

Head and body silvery grey dorsally, silvery white below; 1 narrow dark longitudinal stripe along sides of body, from upper pectoral-fin base to lower peduncle; 1st dorsal-fin membrane transparent basally, dusky distally; pectoral fins

dusky, with dark mark at base; dark blotch on body just behind pelvic-fin bases; caudal fin entirely dusky. Attains 50 cm TL.

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Tanzania to South Africa (KwaZulu-Natal); elsewhere, Taiwan and southern Japan.

REMARKS Inhabits shallow waters of bays and coral reefs; nocturnally active; caught with handlines.

Sphyraena barracuda (Edwards 1771)

Great barracuda

PLATE 69

Esox barracuda Edwards in Catesby 1771: 1 (Bahamas, western Atlantic); Walbaum 1792.

Sphyraena commersonii Cuvier in Cuv. & Val. 1829: 352 ('Indian Seas').

Sphyraena dussumieri Valenciennes in Cuv. & Val. 1831: 508
(Red Sea; Mauritius; Réunion).

Sphyraena affinis Rüppell 1838: 98 (Jeddah, Saudi Arabia, Red Sea).

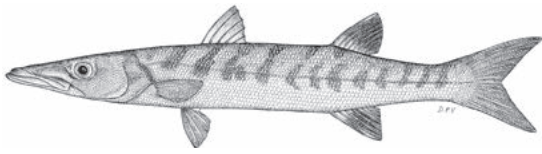
Sphyraena agam Rüppell 1838: 99, Pl. 25, Fig. 2 (Jeddah, Saudi Arabia, Red Sea).

Agrioposphyraena barracuda: Smith 1956*.

Sphyraena barracuda: Williams 1959*; De Sylva 1963*, 1975*;
SSF No. 224.3*; Randall 1995*; Fricke *et al.* 2009.

Eyes small; interorbital space flattened to slightly concave; tip of lower jaw with poorly developed fleshy knob; rear of maxilla nearly reaching below centre of eye in large adults, but not reaching as far as eye in young. Teeth laterally compressed, contiguous. Preopercle without membranous flap posteroventrally; opercle with 1 membranous point posteriorly above pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips barely or not reaching 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins; caudal fin distinctly double emarginate, and with pair of large phylloid protrusions at middle of rear margin (except not in young <50 cm TL). Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 8 or 9 rays. No gill rakers on 1st gill arch. Scales in suborbital groove not covered with skin; predorsal area scaly past upper edge of preopercle; patch of scales on temporal region; LL scales 75–87; scales above lateral line 10.5–11.5, scales below lateral line 11.5.

Head and body dark green to dark grey dorsally, silvery below, with many oblique dark bars on upper half of body above lateral line, and usually with several irregular black blotches posteroventrally; 1st dorsal fin entirely dark; 2nd dorsal fin and anal fin dusky; pectoral fins and pelvic fins pale; caudal fin blackish with pale tips (especially with age). Attains 205 cm TL.



Sphyraena barracuda, 22 cm SL, juvenile (South Africa). Source: Whitfield 1998



Sphyraena barracuda, 66 cm TL, adult (Mozambique).
Source: Smith & Smith 1963

DISTRIBUTION Circumglobal in tropical to subtropical seas, except eastern Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa, Madagascar, Seychelles, Mascarenes and Maldives; elsewhere to Indonesia, southern Japan, Tuamotu Is. and Hawaii.

REMARKS Largest species in the family. Found mostly near surface; adults inhabit range of habitats, from coral reefs to open bays; juveniles and young (<30 cm TL) more often inhabit sheltered areas such as mangroves, estuaries, seagrass beds and tide pools. Diurnal and solitary or in small schools. Large adults often ciguatoxic; rare attacks on humans, usually with one fierce, quick strike.

Sphyraena forsteri Cuvier 1829

Bigeye barracuda

PLATE 69

Sphyraena forsteri Cuvier in Cuv. & Val. 1829: 353 (New Guinea);

De Sylva 1975*; SSF No. 224.6*; Randall 1995*.

Sphyraena toxeuina Fowler 1904: 502, Pl. 9 (Padang, Sumatra, Indonesia);

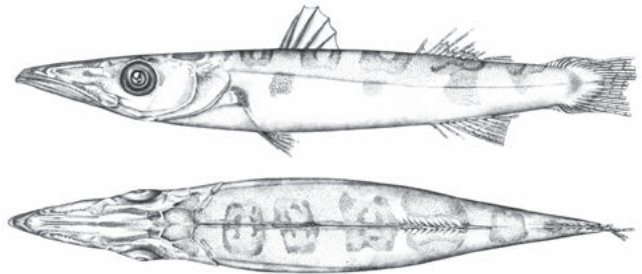
Williams 1959*.

Callosphyraena toxeuina: Smith 1956*.

Eyes very large; tip of lower jaw with poorly developed fleshy knob; rear of maxilla extending past posterior nostril and nearly reaching as far as eye. Teeth laterally compressed, contiguous. Preopercle with rounded membranous flap posteroventrally; opercle with 2 membranous points posteriorly, the lower point at level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips reaching or extending past 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins. Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 8 rays. Several tubercle-like gill rakers with minute spines on 1st gill arch. Scales in

suborbital groove not covered with skin; predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; LL scales 112–133; scales above lateral line 15.5–16.5, scales below lateral line 16.5.

Head and body bluish grey dorsally, silvery white below; dark blotch on body behind pectoral-fin axil; 1st and 2nd dorsal fins transparent, but distal half dusky yellow; pectoral fins pale yellowish; caudal fin dusky; young individuals (<10 cm SL) with some dark transverse bands on upper half of body. Attains 65 cm TL.



Sphyraena forsteri, lateral and dorsal views of juvenile. Source: SSF

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea (provisional) to South Africa, Comoros, Seychelles and Mascarenes; elsewhere to India, Indonesia, New Guinea, Taiwan, southern Japan, Australia, New Caledonia, Tonga and Marquesas Is.

REMARKS Inhabits lagoons and slopes on outer edges of coral reefs; nocturnally active; caught with handlines and trolling.

Sphyraena helleri Jenkins 1901

Heller's barracuda

PLATES 69 & 70

Sphyraena helleri Jenkins 1901: 387, Fig. 1 (Oahu I., Hawaii).

Sphyraena novaehollandiae (non Günther 1860): SSF No. 224.8*.

Australuzza novaehollandiae: Smith 1956*.

Eyes large; tip of lower jaw with well-developed fleshy knob; upper jaw relatively short, rear of maxilla not reaching below anterior nostril. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; opercle with 1 membranous point posteriorly, just above pectoral-fin base. First dorsal-fin origin slightly behind pelvic-fin origins; pectoral fins very short, tips well in front of 1st dorsal-fin origin. Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 8 rays. Single rod-like gill raker on 1st gill arch. Scales in suborbital groove covered with skin; predorsal area scaly to

above upper edge of preopercle; no patch of scales on temporal region; LL scales 140–150; scales above lateral line 14.5–16.5, scales below lateral line 15.5–16.5.

Head and body silvery grey to dark grey dorsally, silvery white below; 2 yellowish longitudinal stripes on each side of body, upper stripe from upper edge of opercle to upper peduncle, and lower stripe from pectoral-fin base to middle of caudal-fin base; 1st dorsal-fin membrane transparent; pelvic fins and anal fin transparent; pectoral fins and caudal fin dusky. Attains 50 cm TL.



Sphyraena helleri. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Probably throughout tropical and subtropical Indo-Pacific. WIO: East Africa, Comoros and Mascarenes (exact range uncertain because of confusion with *S. novaehollandiae*).

REMARKS Description here based on specimens from the Comoros and southern Japan. Inhabits shallow waters of bays and coral reefs, usually seen in large vertical schools by day, but mainly nocturnal; caught with set nets and gillnets.

Sphyraena iburiensis Doiuchi & Nakabo 2005

lburi barracuda

PLATE 70

Sphyraena iburiensis Doiuchi & Nakabo 2005: 133, Figs. 1–3 (Iburi, Kochi Prefecture, Japan).

Eyes large; no fleshy knob on tip of lower jaw; rear of maxilla barely reaching as far as anterior nostril, and not reaching eye. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; rear margin of opercle projected with an obtuse tip just above level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips usually not reaching 1st dorsal-fin origin, but may extend slightly beyond; pelvic-fin origins slightly behind middle of pectoral fins. Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 9 rays. Two rod-like gill rakers on 1st gill arch. Predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; scales in suborbital groove in single row, not covered with skin; pores of suborbital canal sparsely distributed before and below eye; LL scales 81–85; scales above lateral line 8.5–9.5, scales below lateral line 10.5–11.5.

Head and body greenish blue dorsally, silvery white below; 2 distinct brownish yellow longitudinal stripes on each side of body: upper stripe from eye and along lateral line to upper caudal-fin base, and lower stripe from snout tip through eye and upper pectoral-fin base to caudal-fin base just below lateral line; 1st dorsal-fin membrane entirely transparent; pectoral fins dusky with dark mark at base; caudal fin yellowish, entire margin dusky. Attains 30 cm TL.

DISTRIBUTION Indo-Pacific: records from Red Sea, Andaman Sea, and western Pacific (southern Japan).

REMARKS Description here based on specimens from off Japan; an underwater photograph from the Red Sea was the first record of *S. iburiensis* from a region outside Japanese waters. Inhabits shallow coastal waters; commercially fished in Japan, commonly collected throughout the year with set nets located relatively near shore.

Sphyraena jello Cuvier 1829

Pickhandle barracuda

PLATE 70

Sphyraena jello Cuvier in Cuv. & Val. 1829: 349

(Visakhapatnam, India); Smith 1956*; Williams 1959*; De Sylva 1975*; SSF No. 224.7*; Randall 1995*.

Sphyraena permisca Smith 1956: 45, Pl. 2, Fig. 8 (Bazaruto I., Mozambique).

Eyes small; no fleshy knob on tip of lower jaw; rear of maxilla just reaching eye. Teeth laterally compressed, contiguous. Preopercle without membranous flap posteroventrally; opercle with 2 membranous points posteriorly, lower point at level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips reaching or extending slightly past 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins; caudal fin without pair of small phylloid protrusions on inner margin of fin lobes. Second dorsal fin 1 spine, 9 rays, and last ray not elongate compared to penultimate ray. Anal fin 2 spines, 8 rays. No gill rakers on 1st gill arch. Scales in suborbital groove not covered with skin; predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; LL scales 130–140; scales above lateral line 14.5–15.5, scales below lateral line 15.5–16.5.

Head and body dusky blue-green dorsally, silvery below; many dark bars laterally, each bar somewhat oblique in upper half and nearly vertical in lower half, bars about equal in width to silvery interspaces, and bars fainter behind 2nd dorsal fin; dorsal fins, pectoral fins and pelvic fins pale; anal fin pale, yellowish distally; caudal fin yellowish. Attains 140 cm TL.



Sphyraena jello, 28 cm TL (Sri Lanka). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa (KwaZulu-Natal), Madagascar, Seychelles and Sri Lanka; elsewhere to Bay of Bengal, Taiwan, Australia, New Caledonia, Fiji and Tonga.

REMARKS Inhabits bays, estuaries and turbid inner lagoons, also seaward reefs; diurnally active and solitary or young in small schools; caught with trawls, set nets and gillnets.

Sphyraena obtusata Cuvier 1829

Yellowtail barracuda

PLATE 70

Sphyraena obtusata Cuvier in Cuv. & Val. 1829: 350 (Puducherry, India); Doiuchi & Nakabo 2005*.

Sphyraena flavicauda Rüppell 1838: 99, Pl. 25, Fig. 3 (Massawa, Eritrea, Red Sea); SSF No. 224.5*; Randall 1995*; Fricke *et al.* 2009.

Sphyraenella flavicauda: Smith 1956*.

Eyes large; no fleshy knob on tip of lower jaw; rear of maxilla reaching or extending past anterior nostril, but not as far as eye. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; rear margin of opercle projected with obtuse tip just above level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips not reaching 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins. Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 9 rays. Two rod-like gill rakers on 1st gill arch. Predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; scales in suborbital groove covered with skin; pores of suborbital canal relatively densely distributed before and below eyes; LL scales 78–85; scales above lateral line 5–7.5, scales below lateral line 8.5–9.5.

Head and body generally dark green dorsally, silvery white below; 2 faint stripes on each side of body: upper stripe dark yellow, running through eye, along lateral line to upper peduncle, and lower stripe brown, running from snout tip through eye and upper pectoral-fin base to middle of caudal-fin base; 1st dorsal-fin membrane entirely transparent; pectoral fins dusky with dark mark at base; pelvic fins and anal fin transparent; caudal fin yellowish, entire margin dusky. Attains 45 cm TL.



Sphyraena obtusata, 33 cm TL (Red Sea). Source: SSF

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa, Seychelles, Mascarenes and India; Lessepsian migrant to Mediterranean Sea; elsewhere to Bay of Bengal, Indonesia, Philippines, Taiwan, southern Japan, New Caledonia and Lord Howe I.

REMARKS Inhabits coral and rocky reefs, usually forming large horizontal schools during daytime; caught with set nets and gillnets.

Sphyraena pinguis Günther 1874

Yellowstripe barracuda

PLATE 71

Sphyraena pinguis Günther 1874: 157 (Yantai, Shandong Province, China); Doiuchi & Nakabo 2005*.

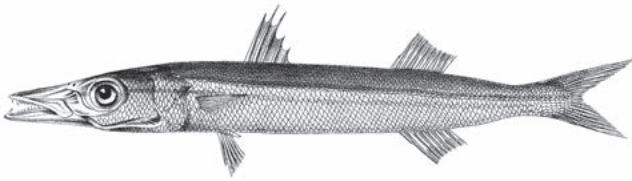
Sphyraena obtusata (*non* Cuvier 1829): Randall 1995*.

Sphyraena chrysotaenia Klunzinger 1884: 128, Pl. 9, Fig. 3

(Al-Qusayr, Egypt, Red Sea); Williams 1959*; SSF No. 224.4*.

Eyes large; no fleshy knob on tip of lower jaw; rear of maxilla extending past anterior nostril, but not as far as eye. Teeth laterally compressed, widely separated. Preopercle with produced membranous flap posteroventrally; opercle with 1 membranous point posteriorly, above level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips barely reaching or extending slightly past 1st dorsal-fin origin; pelvic-fin origins below or slightly behind middle of pectoral fins. Second dorsal fin 1 spine, 9 rays. Anal fin 2 spines, 9 rays. Two rod-like gill rakers on 1st gill arch. Scales in suborbital groove not covered with skin; predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; LL scales 80–94; scales above lateral line 7.5–9.5, scales below lateral line 10.5–12.5.

Head and body dark brown dorsally, silvery white below; single dark yellow-brown longitudinal stripe (indistinct in some specimens) from snout tip through eye, above pectoral-fin base, to middle of caudal-fin base; 1st dorsal-fin membrane transparent basally, dusky distally; pectoral fins brownish on upper half, transparent on lower half, with dusky mark at base; caudal fin brownish yellow with dusky rear margin. Attains 40 cm TL.



Sphyraena pinguis, ~19 cm SL, holotype of *S. chrysotaenia* (Red Sea).
Source: Klunzinger 1884

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa; elsewhere to Indonesia, Philippines, Yellow Sea, Taiwan, southern Japan, New Guinea and Australia.

REMARKS Inhabits shallow coastal waters and open bays; juveniles form large schools in midwater, adults form smaller schools near bottom. Common food fish, caught with trawls, set nets and gillnets.

Sphyraena putnamae Jordan & Seale 1905

Sawtooth barracuda

PLATE 71

Sphyraena putnamae Jordan & Seale 1905: 4, Pl. 13 (Hong Kong, China).

Sphyraena raghava Chaudhuri 1917: 500, Figs. 20–21

(Satpara, outer channel of Chilika Lake, Odisha, India).

Sphyraena bleekeri Williams 1959: 122, Pl. 2d (Msuka Bay, North Pemba, Tanzania); De Sylva 1975*.

Sphyraena putnamiae [sic]: SSF No. 224.9*; Randall 1995*.

Eyes small; tip of lower jaw with poorly developed fleshy knob; rear of maxilla reaching as far as eye. Teeth laterally compressed, contiguous. Preopercle without membranous flap posteroventrally; opercle with 2 membranous points posteriorly, lower point at level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral-fin tips not or just reaching 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins. Second dorsal fin 1 spine, 9 rays, and last ray longer than penultimate ray. Anal fin 2 spines, 8 or 9 rays. No gill rakers on 1st gill arch. Scales in suborbital groove not covered with skin; predorsal area scaly to past upper edge of preopercle; patch of scales on temporal region; LL scales 123–136; scales above lateral line 16.5–17.5, scales below lateral line 16.5–18.5.

Head and body bluish grey dorsally, silvery below; many dark chevron markings along sides of body crossing lateral line; 1st dorsal fin dark, especially distally; 2nd dorsal fin and anal fin dusky; pectoral fins entirely dark; caudal fin entirely dark and without pale tips. Attains 87 cm TL.



Sphyraena putnamae, 46 cm SL (Seychelles). Source: SSF

DISTRIBUTION Tropical and subtropical Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa and Seychelles; elsewhere to Bay of Bengal, Philippines, Hong Kong, Taiwan, southern Japan, Great Barrier Reef, New Caledonia and Vanuatu.

REMARKS Inhabits shallow waters of bays and coral reefs; nocturnally active, but forms large schools during daytime; caught with handlines, gillnets and set nets.

Sphyraena qenie Klunzinger 1870

Blackfin barracuda

PLATE 71

Sphyraena qenie Klunzinger 1870: 823 (Al-Qusayr, Egypt, Red Sea);

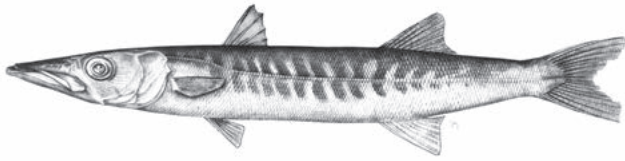
Smith 1956*; Williams 1959*; De Sylva 1975*; SSF No. 224.10*;

Randall 1995*.

Sphyraena tessera Smith 1956: 43, Pl. 2, Fig. 6 (Assumption I., Seychelles).

Eyes small; no fleshy knob on tip of lower jaw; rear of maxilla just reaching eye. Teeth laterally compressed, contiguous. Preopercle without membranous flap posteroventrally; opercle with 2 membranous points posteriorly, lower point at level of pectoral-fin base. First dorsal-fin origin well behind pelvic-fin origins; pectoral fins relatively long, tips extending past 1st dorsal-fin origin; pelvic-fin origins slightly behind middle of pectoral fins; caudal fin with pair of small phylloid protrusions on inner margin of fin lobes in adults. Second dorsal fin 1 spine, 9 rays, and last ray not longer than penultimate ray. Anal fin 2 spines, 8 rays. No gill rakers on 1st gill arch. Scales in suborbital groove not covered with skin; predorsal area scaly past upper edge of preopercle; patch of scales on temporal region; LL scales 120–130; scales above lateral line 15.5, scales below lateral line 16.5.

Head and body grey dorsally, silvery below; body with many dark bars laterally, each bar oblique and broader than silvery interspaces in upper half, and bars nearly vertical and narrower than interspaces in lower half; dorsal fins dark; pectoral fins pale; caudal fin dark with blackish margins. Attains 140 cm TL.



Sphyraena qenie, 29 cm TL (Indonesia).
Source: SSF (note: lower caudal-fin tip damaged)

DISTRIBUTION Tropical and subtropical Indo-Pacific to eastern Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa (KwaZulu-Natal), Madagascar and Seychelles; elsewhere to Indonesia, Australia, New Caledonia, Tuamotu Is., Marquesas Is., Hawaii and Gulf of California.

REMARKS Found near coral reefs; usually seen in semi-stationary schools during daytime, and probably disperses to feed at night.

GLOSSARY

ciguatoxic – ciguatoxin is produced by the dinoflagellate *Gambierdiscus toxicus*, which is ingested by certain big reef fishes. The toxin accumulates in the, skin, roe and viscera. When ingested it affects the nervous system in humans.

SUBORDER SCOMBROIDEI

Bruce B Collette

Perciform fishes with epiotics separated by supraoccipital; interorbital commissure of supraorbitals widely incomplete or absent; gill membranes free from isthmus; premaxillae beak-like, upper jaw non-protrusile (except in *Scombrobrax*); predorsal bones lost (except for a small one in *Ruvettus*, *Thyrsites* and *Tongaichthys*, and 3 well-developed ones in *Gasterochisma*); vertebrae ≥ 30 .

Four families of scombroids are recognised: Scombrobracidae (monotypic), Gempylidae (16 genera, 25 species), Trichiuridae (10 genera, ~40 species) and Scombridae (15 genera, 51 species). There has been debate in the literature as to the exact relationships among tunas, billfishes and other scombroids (Collette *et al.* 1984; Johnson 1986; Carpenter *et al.* 1995). From its original description by Roule (1921) *Scombrobrax heterolepis* (black mackerel)

has been considered as related to gempylid fishes. In most instances wherein *Scombrobrax* differs from the gempylids, it differs in the direction of percoids, hence Collette *et al.* (1984) included *Scombrobrax* within the Scombroidei and used it as the basal scombroid. Roule originally placed the species in a separate suborder, and this was followed by Bond & Uyeno (1981) largely based on the specialisations of vertebrae 5–12, which are expanded to form thin-walled bullae that accommodate evaginations of the swimbladder. Collette *et al.* (1984) felt that this autapomorphy was not sufficient to justify recognition of a separate suborder. Johnson (1986) placed it just outside the Scombroidei and instead used the barracudas (family Sphyrnidae) as basal scombroids. However, genetic data (*Tmo-4C4* nuclear locus) presented by Orrell *et al.* (2006) shows barracudas to be only distantly related to scombroids, and *Scombrobrax* to indeed be a basal scombroid. Furthermore, parsimony analysis of both nucleotide and amino-acid sequences generated from 590 base pairs of the cytochrome *b* gene, and a 628-base-pair segment of the lactate dehydrogenase B locus resolves a monophyletic Scombroidei distant from the Xiphioidei (billfishes) (Orrell *et al.* 2006). Also, scombroids have the more advanced type-II sperm, whereas xiphioids have the more primitive type-I sperm (Van der Straten *et al.* 2006).

KEY TO FAMILIES

- 1a Pelvic fins small or moderate, with 1 spine, 5 rays 2
- 1b Pelvic fins absent or reduced to small scale-like process 3

- 2a Teeth on jaws weak, moderate or strong, but no large fangs; at least 2 small keels on each side of peduncle, and with larger keel in between in many species; vertebrae 31–64 **SCOMBRIDAE**
- 2b Two or 3 large fangs at front of upper jaw; no keels on peduncle; vertebrae 30 **SCOMBROLABRACIDAE**

- 3a Body extremely elongate and compressed; single nostril on each side of head **TRICHIURIDAE**
- 3b Body moderately elongate and compressed; 2 nostrils on each side of head **GEMPYLIDAE**

Subsequent to the compilation of the above key, the family Scombrobracidae has been recognised as a separate suborder. *NOTE: No scombrid or billfish colour plate images were supplied or identified by the author.*

SUBORDER

SCOMBROLABRACOIDEI

Ryu Doiuchi

A single species, *Scombrolabrax heterolepis*, is recognised in this suborder. In general appearance it closely resembles the scombroid family Gempylidae, but differs from the scombroids in having a protrusible upper jaw, serrated preopercle and opercle and 30 vertebrae. Because of the mixed percoid and scombroid characteristics, Scombrolabracidae has often been placed in its own suborder. Recent molecular phylogeny conducted by Miya *et al.* (2013) demonstrated that the Scombrolabracidae formed a strongly supported clade together with 14 other pelagic families including classical scombroid members such as Scombridae, Trichiuridae and Gempylidae. However, exact position of the Scombrolabracidae within the clade still remains unresolved.

FAMILY SCOMBROLABRACIDAE

Black mackerel

Phillip C Heemstra

Body slender and oblong, with 2 dorsal fins: 1st dorsal fin entirely spinous, base more than twice length of soft-rayed 2nd dorsal fin; anal fin similar to and opposite 2nd dorsal fin; pectoral fins long and pointed, almost reaching anal-fin origin; pelvic fins slightly longer than eye diameter; no keels on peduncle; caudal fin forked, fin length ~1.5 in HL. Mouth large, terminal; upper jaw slightly protrusile, with 2 or 3 large fangs at front; lateral teeth smaller and more numerous in upper jaw than in lower jaw; small teeth on vomer and palatines. Eyes huge; interorbital area flat. Two large nostrils on each side of snout. Four or 5 well-developed denticulate gill rakers on lower limb, ~10 clusters of minute spines on upper limb, and large denticulate gill raker at corner of 1st gill arch. Lateral line single, running close to dorsal-fin contour and ending before last fin ray. Scales irregular in size and shape, very deciduous. Swimbladder of adults forms delicate bubble-like evaginations that fit into lateral, thin-walled, egg-shaped bony bullae of vertebral centra 5–12 (Bond & Uyeno 1981), which develop large circular openings ventrally in adults. Vertebrae 13 + 17 = 30; no supraneural bones in front of dorsal fin.

Monotypic; the single species was formerly placed in the family Gempylidae (snake mackerels) by some authors (e.g., Grey 1960; Gosline 1968).

Scombrolabrax heterolepis Roule 1921

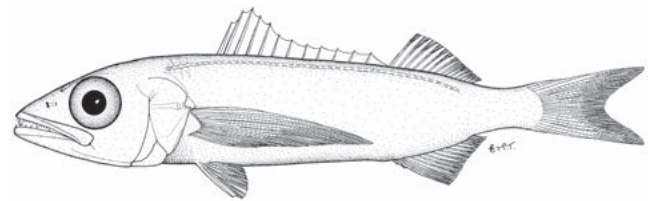
Black mackerel

PLATE 71

Scombrolabrax heterolepis Roule 1921: 1534 (Madeira, northeastern Atlantic); Roule 1922*; Higgins, Mori & Uyeno 1970*; Potthoff, Richards & Ueyanagi 1980*; SSF No. 246.1*; Bineesh *et al.* 2012*.

First dorsal fin 12 spines; 2nd dorsal fin 1 spine, 14–16 rays; anal fin 2 or 3 spines, 16–18 rays; pectoral fins 17–19 rays; pelvic fins 1 spine, 5 branched rays; LL scales 44–49. Body depth ~3.7 in SL; HL ~3 in SL; eye diameter ~3.4 in HL.

Head and body uniformly dark brown, fins darker. Attains ~30 cm TL (~200 g).



Scombrolabrax heterolepis, 22 cm SL. Source: SSF

DISTRIBUTION Circumglobal in all tropical and subtropical seas, except eastern Pacific and southeastern Atlantic. WIO: India, Arabian Sea, Mozambique Channel, South Africa, Seychelles Bank and Saya de Malha Bank.

REMARKS Epipelagic and mesopelagic in open ocean, in ~100–900 m. Rare; in WIO, larvae and adults have been recorded from Mozambique Channel, 13 juveniles were trawled on Saya de Malha Bank, in 95–102 m, and a single adult was collected off India, in 220–350 m.

GLOSSARY

bullae (pl. **bullae**) – a rounded structure.

denticulate – tooth-like.

evaginations – pouched-shaped structures.

supraneural bones – unpaired bones above the neural spines of the anterior vertebrae, between the skull and the origin of the dorsal fin.

FAMILY GEMPYLIDAE

Snake mackerels

Phillip C Heemstra

Body elongate and compressed or somewhat fusiform (*Lepidocybium* and *Ruvettus*); mouth large; teeth in jaws strong, often fang-like at front of upper jaw; conical fleshy tip (dermal process) on jaws of some species. Eyes moderate to very large. Two nostrils on each side of snout. Two dorsal fins; base of spinous 1st dorsal fin longer than soft-rayed 2nd dorsal fin (excluding finlets when present); anal fin similar to 2nd dorsal fin; separate finlets present behind 2nd dorsal fin and anal fin in some species. Pectoral fins shorter than head length. Pelvic fins small, rudimentary, or reduced to small spine or entirely absent in adults of some species. Caudal fin forked, rays attached only to distal edges of hypurals; no keels on peduncle, except fleshy midlateral keels in *Lepidocybium*. Gill rakers reduced to small spiny tubercles, except for large raker at angle of 1st arch. Lateral line single or double. Scales small to minute, and variously modified in *Lepidocybium* and *Ruvettus*. Vertebrae ~35, but >45 vertebrae in *Gempylus*, *Diplospinus* and *Paradiplospinus*.

Large, swift predators; found in all oceans, usually at ~200–500 m, but often migrating to surface at night. Most species attain >100 cm TL. Comprehensive review of the family by Nakamura & Parin (1993). About 16 genera and 26 species; 12 genera and 14 species in WIO at depths of <200 m. Diagnoses of genera are not given here because all genera occurring in WIO other than *Rexea* are recognised as represented by a single species.

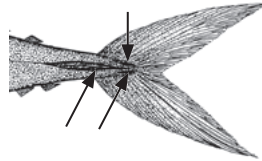
KEY TO GENERA OR SPECIES

- 1a Total dorsal-fin spines + rays = 65–72; distance from anus to anal-fin origin subequal to snout length; body greatly elongate and without finlets 2
- 1b Total dorsal-fin spines + rays = 30–51; distance from anus to anal-fin origin subequal to eye diameter 3
- 2a Anus midway between snout tip and caudal-fin tip; distance from anus to anal-fin origin subequal to head length; dorsal fin 30–36 spines, 35–44 rays; anal fin 2 small spines, 28–35 rays, and front of fin with almost no membrane *Diplospinus multistriatus*
- 2b Anus much closer to caudal-fin tip than to snout tip; distance from anus to anal fin subequal to snout length; dorsal fin 36–39 spines, 28–33 rays; anal fin 2 spines, 25–31 rays, and fin membrane intact *Paradiplospinus gracilis*

Continued ...

KEY TO GENERA OR SPECIES

- 3a Peduncle with prominent fleshy midlateral keel extending onto caudal-fin base, and 2 other smaller keels (above and below) rear of main keel; dorsal fin small and very low, with 8–9 spines; lateral line sinuous; 2nd dorsal fin and anal fin each followed by 4–6 finlets *Lepidocybium flavobrunneum*



- 3b No keels on peduncle or caudal-fin base; dorsal fin >12 spines; lateral line single or bifurcate, not sinuous 4

- 4a Body rough, covered with rows of sharp bony tubercles; lateral line obscure; maxilla extends past rear of eye; belly with low midventral ridge between pelvic fins and anus *Ruvettus pretiosus*

- 4b Body smooth, without spiky tubercles; lateral line obvious; maxilla not reaching past eye; no ridge along belly 5

- 5a Pelvic fins rudimentary, with 0–4 rays 6

- 5b Pelvic fins not rudimentary, with 1 spine, 5 rays 9

- 6a Lateral line single 7

- 6b Lateral line double 8

- 7a Dagger-shaped spine followed by recumbent (nearly embedded) spine in front of anal fin; lateral line straight; 2 finlets behind 2nd dorsal fin and anal fin *Nealotus tripes*



- 7b No free spines in front of anal fin; lateral line curves abruptly downwards and runs midlaterally to caudal fin *Promethichthys prometheus*

- 8a Body greatly elongate and compressed, depth 15–19 in SL; dorsal fin 26–32 spines, 11–14 rays + 5 or 6 finlets; anal fin 2 free spines, 10–12 rays + 6 or 7 finlets; both lateral lines originating below first spine of dorsal fin *Gempylus serpens*

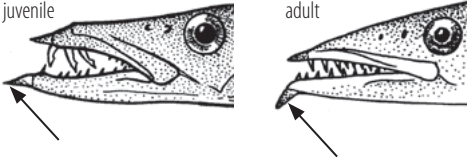
- 8b Body depth 5–8 in SL; dorsal fin 17–19 spines, 14–16 rays; 2 small finlets behind 2nd dorsal fin and anal fin; lower lateral line branches off below dorsal-fin spines 4–6, running downwards then midlaterally to caudal fin *Rexea*

- 9a Lateral line double 10

- 9b Lateral line single 11

Continued ...

KEY TO GENERA OR SPECIES

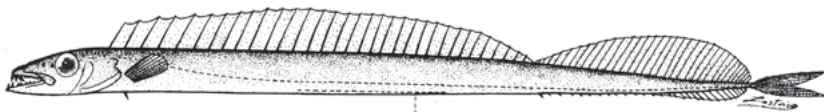
- 10a Fleshy tip on both jaws; 1st dorsal fin 17–19 spines, 2nd dorsal fin 1 small spine, ~13 rays; 2nd dorsal fin and anal fin each followed by 4–6 finlets; lower lateral line curves downward and runs along midbody; mouth and branchial cavities not black *Thyrsitoides marleyi*
- 10b No fleshy tip on jaws; 1st dorsal fin 15–16 spines, 2nd dorsal fin 1 spine, 17–20 rays; no finlets; lower lateral line runs near ventral contour of body; mouth and branchial cavities usually black *Neopinnula orientalis*
- 11a Conical fleshy tip on both jaws; lateral line nearly straight; 2nd dorsal fin 19–24 rays; anal fin 2 spines (both minute), 18–21 rays; 2nd dorsal fin and anal fin each followed by 2 or 3 finlets in adults *Nesiarchus nasutus*
- juvenile adult
- 
- 11b No fleshy tips on jaws; lateral line curves abruptly downward (below rear of 1st dorsal fin) and curves thereafter; 2nd dorsal fin 11–13 rays + 5–7 finlets; anal fin 1 spine, 10–12 rays + 5–7 finlets *Thyrsites atun*

Diplospinus multistriatus Maul 1948

Striped escolar

Diplospinus multistriatus Maul 1948: 42, Fig. 17 (from stomach of *Alepisaurus ferox*; off Madeira, northeastern Atlantic); Karrer 1975; Mikhaylin 1976, 1983; Nakamura 1986*; SSF No. 247.1*; Nakamura & Parin 1993*.

Body very slender, greatly elongated, depth 13–18 in SL; HL 5.3–6 in SL. Maxilla reaches eye; lower jaw slightly projecting; upper jaw with small conical fleshy tip, and 6 or 7 fang-like teeth; no teeth on vomer. Anus midway between snout tip and caudal-fin tip; distance from anus to anal-fin origin equal to HL. Dorsal fin 30–36 spines, 35–44 rays; length of 2nd dorsal-fin base about half that of 1st. Pectoral fins 11–13 rays. Pelvic fins reduced to minute spine in adults.



Diplospinus multistriatus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

Anal fin 2 small spines, 28–35 rays, and front of fin with almost no membrane. Lateral line single, descending gently near pectoral fins and running near ventral profile posteriorly. Scales deciduous. Vertebrae 57–61.

Body silvery, with longitudinal dark dotted lines; gill membranes black. Attains 33 cm SL.

DISTRIBUTION Circumglobal in open ocean of both hemispheres; recorded from west coast of southern Africa, thus likely to occur off False Bay, South Africa, in WIO.

REMARKS Females mature at ~16 cm SL. Mesopelagic and oceanic, to ~1 000 m deep; migrates upward to ~100–200 m at night.

Gempylus serpens Cuvier 1829

Snake mackerel

PLATE 72

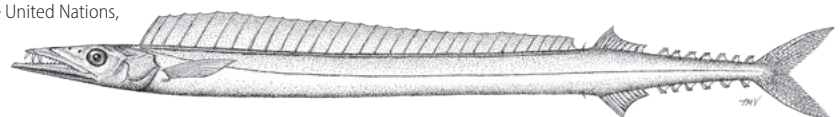
Gempylus serpens Cuvier 1829: 200 (Jamaica, western Atlantic); Matsubara & Iwai 1952*; Nakamura 1986*; SSF No. 247.2*; Nakamura & Parin 1993*.

Body greatly elongated and strongly compressed, depth 15–18 in SL; HL 5.5–6 in SL. First dorsal fin 26–32 spines; 2nd dorsal fin 1 minute spine, 11–14 rays + 5–7 finlets. Pectoral fins 12–15 rays. Pelvic fins rudimentary, 1 spine, 3 or 4 rays. Lateral line double, both lines originating below spines of 1st dorsal fin: upper line running close to 1st dorsal-fin base, ending below last dorsal-fin spine; lower line runs midlaterally to caudal-fin base. Scales on rear part of body only. Vertebrae 48–55.

Head, body and fins dark brown; fins with somewhat darker margins. Attains 100 cm SL (commonly ~60 cm SL).

DISTRIBUTION Circumglobal in tropical and subtropical seas, including WIO, but not known from Red Sea.

REMARKS Males mature at ~43 cm SL, and females at ~50 cm SL; fecundity 300 000 to 1 million eggs. Common; epipelagic and mesopelagic, from surface to ~200 m deep; usually solitary. Feeds on a variety of epipelagic fishes.



Gempylus serpens, 100 cm TL. Source: SSF, composite

Lepidocybium flavobrunneum (Smith 1843)

Escolar

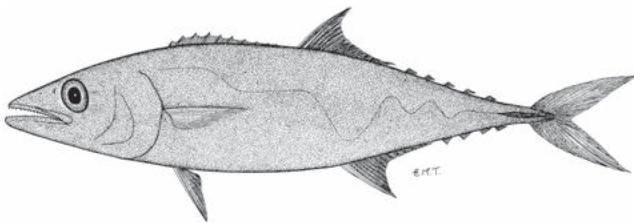
PLATE 72

Cybius flavobrunneum Smith 1843: Pl. 20 (Cape of Good Hope, South Africa).

Lepidocybium flavobrunneum: SFSA No. 862*; Parin & Bekker 1973; Nakamura 1986; SSF No. 247.3*; Nakamura & Parin 1993*.

Body oblong, slightly compressed, depth 4.1–4.3 in SL. First dorsal fin very low, 8–10 spines, 16–18 rays + ~6 finlets; anal fin 12–15 rays + 4 or 5 finlets; pectoral fins 15–17 rays; pelvic fins well-developed, with 1 spine, 5 rays. Peduncle with prominent fleshy midlateral keel, flanked by smaller keels (above and below) on caudal-fin base. Vomer and palatines with small uniserial teeth. Scales small, each surrounded by network of tubules bearing pores. Lateral line single and sinuous. Vertebrae 31.

Body uniformly dark brown, becoming almost black with age. Attains ~200 cm SL and ~80 kg.



Lepidocybium flavobrunneum, ~55 cm TL (Japan). Source: SSF

DISTRIBUTION Circumglobal in tropical to subtropical seas.

WIO: Kenya to South Africa, Madagascar and Mascarenes (apparently not in northern WIO); elsewhere to Australia, Japan, Hawaii, Peru, California, Gulf of Mexico, Caribbean and Canada.

REMARKS Sporadically distributed, in ~200–1 100 m. A bycatch of tuna longline fisheries. Flesh very oily, with purgative properties.

Nealotus tripes Johnson 1865

Black snake mackerel

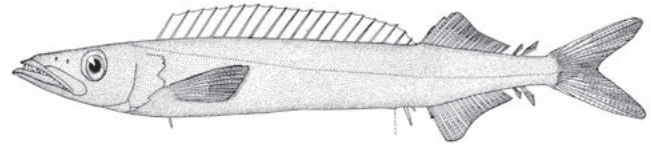
PLATE 72

Nealotus tripes Johnson 1865: 434 (Madeira, northeastern Atlantic); Matsubara & Iwai 1952*; Nakamura & Parin 1993*.

Body elongate and compressed, depth 7–9 in SL; body width about half depth. First dorsal fin 20 or 21 spines; 2nd dorsal fin 1 spine, 16–19 rays + 2 finlets; anal fin with dagger-shaped spine followed by smaller recumbent spine, 15–19 rays + 2 finlets; pelvic fins reduced to 1 small spine. Some fang-like

teeth in each jaw; no teeth on vomer. Scales large, deciduous. Lateral line single, nearly straight and oblique, running from nape to caudal-fin base.

Body blackish brown; dorsal fins and anal fin pale brown; buccal and branchial cavities and peritoneum black. Attains 25 cm SL.



Nealotus tripes, 20 cm SL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to temperate seas. WIO: Oman, South Africa (KwaZulu-Natal), Seychelles, Saya de Malha Bank and Walters Shoals.

REMARKS Found in 95–2 825 m.

Neopinnula orientalis (Gilchrist & Von Bonde 1924)

Sackfish

PLATE 72

Epinnulla orientalis Gilchrist & Von Bonde 1924: 15, Pl. 4,

Fig. 1 (South Africa); Barnard 1927; SFSA No. 865*.

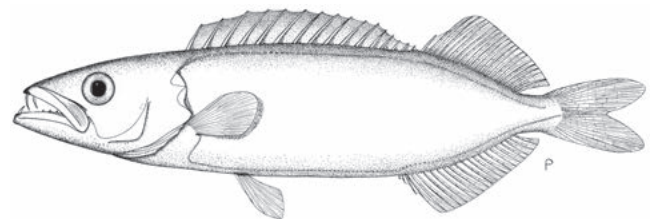
Neopinnula orientalis: Matsubara & Iwai 1952*; Parin & Bekker 1972*;

Nishikawa & Nakamura 1978*; SSF No. 247.4*;

Nakamura & Parin 1993*.

Body oblong, compressed, depth ~4.2 in SL; HL ~3.3 in SL. First dorsal fin 26 spines; 2nd dorsal fin 1 spine, 17–20 rays; anal fin with 2 small free spines and 1 embedded spine, 17–19 rays; no finlets; pectoral fins 13–15 rays; pelvic fins well-developed, with 1 spine, 5 rays. Some fang-like teeth in each jaw. Lateral line double, running near dorsal and ventral profiles: upper line with ~85 scales, and lower line with ~30 scales from shoulder to chest, and ~115 scales from chest to caudal fin.

Body greenish brown to dark brown; 1st dorsal fin blackish; buccal and branchial cavities usually black. Attains ~30 cm SL.



Neopinnula orientalis, 20 cm TL (WIO). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Arabian Sea, Kenya to South Africa (Cape Point, Western Cape), Madagascar and Saya de Malha Bank; elsewhere to Indonesia, Philippines, Japan and Australia.

REMARKS Benthopelagic, on outer continental shelf and slope, in 200–618 m.

Nesiarchus nasutus Johnson 1862

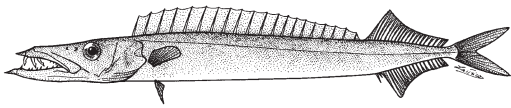
Black gemfish

PLATE 72

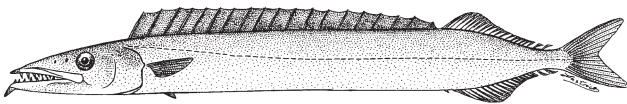
Nesiarchus nasutus Johnson 1862: 173, Pl. 22 (Madeira, NE Atlantic); Nakamura & Parin 1993*.

Body fusiform, strongly compressed, depth 10–13 in SL; head large, HL 4.2–4.6 in SL; interorbital width less than eye diameter. Well-developed conical fleshy tip on both jaws; lower jaw distinctly projecting; some large fangs and smaller conical teeth in both jaws; no teeth on vomer. First dorsal fin 19–21 spines; 2nd dorsal fin 1 spine, 19–24 rays; pectoral fins 12–14 rays; pelvic fins shorter than pectoral fins; anal fin 2 spines (both minute), 18–21 rays + 2 or 3 finlets. Lateral line single, nearly straight, running from above opercle to middle of peduncle.

Body dark brown with violet tinge; fins black. Attains 130 cm SL.



Nesiarchus nasutus, juvenile. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission



Nesiarchus nasutus, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to temperate seas, except eastern Pacific. WIO: South Africa (larvae collected off False Bay) and Somalia (adult fish collected).

REMARKS Benthopelagic and mesopelagic, in ~200–1 200 m, along continental slope, sea mounts and islands; larvae found in tropical waters. Feeds on fishes, squid and crustaceans.

Paradiplospinus gracilis (Brauer 1906)

Slender escolar

Lepidopus gracilis Brauer 1906: 291, Pl. 12, Fig. 5 (off west coast of South Africa, in SE Atlantic).

Paradiplospinus gracilis: Bussing 1965*; Parin & Bekker 1972*; Mikhaylin 1976; SSF No. 247.5*; Nakamura & Parin 1993*.

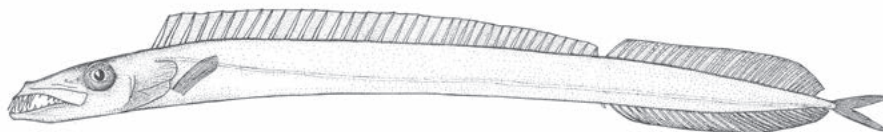
Diplospinus gracilis: Karrer 1973.

Body extremely elongate, compressed, depth 12–16 in SL; head large, HL 4.1–6.9 in SL. Teeth fang-like in both jaws. First dorsal fin 35–39 spines; 2nd dorsal fin 26–30 rays, its base 2.8–3 into length of 1st dorsal-fin base; anal fin with 2 minute free spines, 24–29 rays, and fin membrane intact; no finlets; pectoral fins 12–14 rays; pelvic fins reduced to minute spine in adults; caudal fin tiny, forked. Lateral line single, usually conspicuous, curving downwards past pectoral fins. Vertebrae 63–67.

Body brownish black dorsally and silvery white below, without conspicuous markings; buccal, branchial and abdominal cavities and anus blackish; 1st dorsal-fin base, opercular region and caudal fin dark brownish. Attains 52 cm SL.

DISTRIBUTION Probably circumpolar in Southern Hemisphere; recorded off Namibia and South Africa in southeastern Atlantic, but in WIO may also occur off False Bay, South Africa.

REMARKS Benthopelagic, on upper continental slope, in 360–620 m; juveniles pelagic and probably mesopelagic.



Paradiplospinus gracilis, 27 cm SL (S Atlantic). Source: Nakamura 1990

Promethichthys prometheus (Cuvier 1832)

Roudi

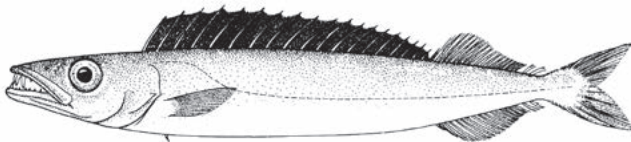
PLATE 72

Gempylus prometheus Cuvier in Cuv. & Val. 1832: 213, Pl. 222
(St Helena I., South Atlantic).

Promethichthys prometheus: Nakamura 1986; Nakamura & Parin 1993*;
Adam *et al.* 1998*.

Body oblong, depth 6.5–7 in SL. No fleshy conical tips on jaws. Upper jaw with several moveable and fixed fangs anteriorly; lower jaw with shorter fang on each side anteriorly; both jaws with numerous sharp, compressed teeth laterally; no teeth on vomer; palatines with series of small teeth. First dorsal fin 17–19 slender spines; 2nd dorsal fin 1 spine, 17–20 rays + 2 finlets, and fin base <½ length of 1st dorsal-fin base; anal fin 2 or 3 small embedded spines, 15–17 rays + 2 finlets; pectoral fins 13–15 rays; pelvic fins lost in adults (>40 cm SL), but represented by small spine in smaller specimens. Gill-raker rudiments with 1–3 sharp cusps, the angular raker triple-rooted. Lateral line single, strongly curved downwards at pectoral fins and running midlaterally to caudal fin. Vertebrae 33–35.

Body greyish to coppery brown; fins blackish in adults, yellowish with black tips in juveniles; buccal and branchial cavities black. Attains at least 100 cm SL.



Promethichthys prometheus, ~41 cm SL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate seas, but probably not eastern Pacific. WIO: Somalia, Kenya, Mozambique, Walters Shoals, Comoros, Seychelles, Réunion, Mauritius, Maldives and southern India.

REMARKS Benthopelagic, over continental slope and outer shelf, around islands and seamounts, in ~100–750 m. Feeds on fishes, squid and crustaceans.

GENUS *Rexea* Waite 1911

Body oblong and compressed, its depth 5–8 in SL. Dorsal fin 17–19 spines; pelvic fins small, or represented by 1 small spine, or entirely absent in adults. Lateral line double: upper line follows dorsal contour of body, and lower line branches off below dorsal-fin spines 3–7, running midlaterally to caudal-fin base. Seven species, 3 in WIO.

KEY TO SPECIES

- 1a Body naked except for LL scales; 1st dorsal-fin base 2.7–3.3 length of 2nd dorsal-fin base + 2 finlets; pectoral-fin length 1.6–2 in HL *R. bengalensis*
- 1b Wide swathe of scales between dorsal fin and anal fin; 1st dorsal-fin base 2.3–2.5 length of 2nd dorsal-fin base + 2 finlets 2
- 2a Swathe of scales extends forward to below mid-spines of 1st dorsal fin; spinescent gill rakers with 2–4 sharp cusps; lower lateral line branches off below 1st dorsal-fin spines 4–5 and runs midlaterally to caudal fin *R. prometheoides*
- 2b Swathe of scales extends forward to between front end of 2nd dorsal fin and anal fin; spinescent gill rakers with 1 (rarely 2) sharp cusps; lower lateral line branches off below dorsal-fin spines 5–7 and runs nearer ventral contour of body than to upper lateral line *R. nakamurai*

Rexea bengalensis (Alcock 1894)

Bengal escolar

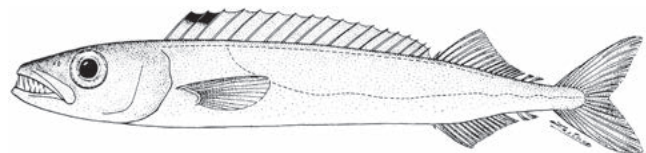
PLATE 73

Thyrstes bengalensis Alcock 1894: 117, Pl. 6, Fig. 1 (off Chennai, India, Bay of Bengal).

Rexea bengalensis: Nakamura & Parin 1993*; Adam *et al.* 1998.

Body oblong, depth 6–7 in SL. No scales and no fleshy tips on jaws. Upper jaw with 6 fang-like teeth in front, and lower jaw with shorter fang on each side in front; both jaws with numerous sharp and compressed teeth laterally; no teeth on vomer; palatines with small teeth. First dorsal fin 18 or 19 slender spines; 2nd dorsal fin 1 spine, 14–16 rays + 2 finlets, and fin base ~3 in length of 1st dorsal-fin base; anal fin 2 small spines, 11–13 rays + 2 finlets; pectoral fins 13–15 rays; pelvic fins represented by 1 small spine or entirely lost. Gill-raker rudiments with 3 or 4 sharp cusps, the angular raker triple-rooted. Lateral line double: upper line follows dorsal-fin contour, and lower line originates below 5th dorsal-fin spine, slightly curvy, and runs slightly lower than midlaterally. Vertebrae 34.

Body greyish to coppery brown; fins blackish in adults, yellowish with black tips in juveniles. Attains 20 cm SL.



Rexea bengalensis. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Mozambique Channel, Madagascar, Saya de Malha Bank, Maldives, southern India and Sri Lanka; elsewhere to Bay of Bengal, Andaman Sea, Indonesia, Philippines, southern Japan, Australia and New Guinea.

REMARKS Benthopelagic, over continental slope and outer shelf, around islands and seamounts, in 143–820 m.

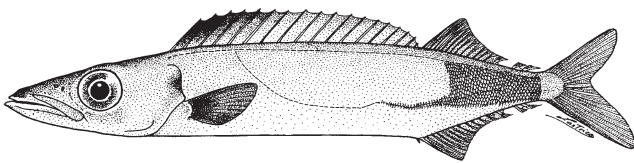
Rexea nakamurai Parin 1989

Scalytail escolar

Rexea nakamurai Parin 1989: 14, Figs. 1, 4 (Kyushu-Palau Ridge, NW Pacific); Nakamura & Parin 1993*.

Body oblong, depth 6–7 in SL; broad scaled area between 2nd dorsal fin and anal fin. No dermal tips on jaws; upper jaw with 6 fangs in front; lower jaw with shorter fang on each side in front; both jaws with numerous, sharp, compressed teeth laterally; no teeth on vomer; palatines with small teeth. First dorsal fin 18 or 19 slender spines, 2nd dorsal fin 1 spine, 14–16 rays + 2 finlets, and fin base 2.7–3.3 in length of 1st dorsal-fin base; anal fin 2 small spines, 11–13 rays + 2 finlets; pectoral fins 13–15 rays; no pelvic fins in adults, fins represented by 1 small spine in smaller specimens. Gill-raker rudiments with 1 (rarely 2) sharp cusps, the angular raker triple-rooted. Lateral line double; lower line originates below 5th or 6th spine of dorsal fin, and runs slightly lower than midlaterally. Vertebrae 34.

Body greyish to coppery brown; first 2 membranes of dorsal fin blackish in adults, yellowish with black tips in juveniles. Attains 38 cm SL.



Rexea nakamurai. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (patchy). WIO: Nazareth Bank; elsewhere to Indonesia, Japan and Hawaii.

REMARKS Matures at ~25 cm SL. Benthopelagic, over continental slope and outer shelf, around islands and seamounts, in 340–370 m.

Rexea prometheoides (Bleeker 1856)

Royal escolar

PLATE 73

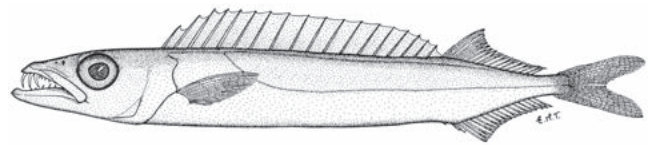
Thyrsites prometheoides Bleeker 1856: 42 (Ambon I., Moluccas, Indonesia).

Rexea solandri (non Cuvier 1832): Matsubara & Iwai 1952; Smith 1968*.

Rexea prometheoides: Parin & Bekker 1972*; SSF No. 247.6*; Nakamura & Parin 1993*; Fricke *et al.* 2009.

Body oblong and compressed, depth 5–7 in SL. Scales in broad swathe on rear half of body and peduncle. First dorsal fin 18 or 19 spines, and fin base 2.2–2.5 length of 2nd dorsal-fin base; 2nd dorsal fin 1 spine, 14–17 rays + 2 finlets; anal fin 1 small spine, 14–16 rays + 2 finlets; pectoral fins 13 or 14 rays; pelvic fins absent in adults, or represented by rudimentary spine in smaller specimens. Lateral line double, lower line originating below 4th spine of dorsal fin.

Body greyish blue dorsally, silvery below; first 2 membranes of dorsal fin black. Attains ~40 cm SL.



Rexea promethoides, 18 cm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique, Madagascar, Seychelles, Réunion, Mauritius, Nazareth Bank and Saya de Malha Bank; elsewhere, Indonesia, Philippines, Japan, Australia and Fiji.

REMARKS Common off Kenya in 200–500 m; collected off Mozambique in 106–550 m, from Madagascar in 71–328 m, from Nazareth Bank in ~300 m, and from Saya de Malha Bank below 2 700 m.

Ruvettus pretiosus Cocco 1833

Oilfish

PLATE 73

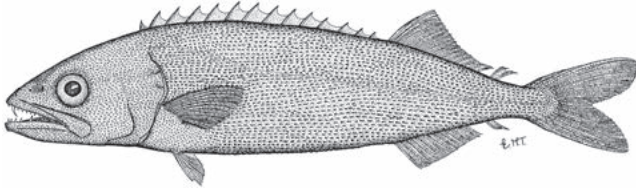
Ruvettus pretiosus Cocco 1833: 18 (Strait of Messina, Sicily, Mediterranean Sea); SFSA No. 861*; Parin & Bekker 1973; SSF No. 247.7*; Nakamura & Parin 1993*.

Ruvettus delagoensis Gilchrist & Von Bonde 1924: 16 (off Maputo Bay, Mozambique); Winterbottom 1974; Randall 2007*.

Body oblong, depth ~4–5 in SL; skin rough, scales minute and cycloid, interspersed with rows of spinous bony tubercles; belly with low midventral ridge between pelvic fins and anus. First dorsal fin low, with 13–15 spines; 2nd dorsal fin 15–18 rays + 2 finlets; anal fin 15–18 rays + 2 finlets; pectoral fins 13–15 rays,

and fins longer than pelvic fins; pelvic fins well-developed, with 1 spine, 5 rays. Lateral line single, often obscure.

Body dark bronzy brown to charcoal, without distinguishing marks. Attains 200 cm TL (commonly <150 cm SL).



Ruvettus pretiosus, 25 cm SL (S Mozambique). Source: SSF

DISTRIBUTION Circumglobal in tropical to temperate seas, including Mediterranean Sea. WIO: Mozambique to South Africa (KwaZulu-Natal), Madagascar, Comoros, Seychelles and Réunion.

REMARKS The maximum size of 3 m TL given in Nakamura & Parin (1993) is an error. Found in 30–700 m (usually 200–400 m). Flesh very oily; the meat can be purgative unless grilled.

Thyrsites atun (Euphrasen 1791)

Snoek

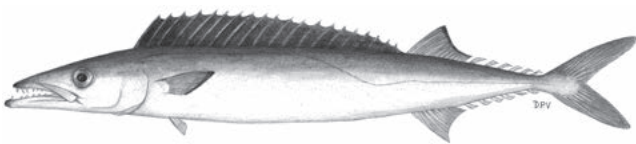
PLATE 73

Scomber atun Euphrasen 1791: 315 (Cape of Good Hope, South Africa).

Thyrsites atun: SFSA No. 863*; Haigh 1972*; Parin & Bekker 1972*; Van der Elst 1981*; SSF No. 247.8*; Nakamura & Parin 1993*; Heemstra & Heemstra 2004*.

Body oblong and compressed, depth 7–9 in SL. Lower jaw protruding; several large fangs at front of upper jaw. Eyes large. First dorsal fin 18–21 spines; 2nd dorsal fin relatively high, with 11–13 rays + 5–7 finlets; anal fin 1 spine, 10–12 rays + 5–7 finlets; pectoral fins 14 or 15 rays; pelvic fins 1 spine, 5 rays, and fins much smaller than pectoral fins; caudal fin forked, lobes slender. Lateral line single, running close to dorsal-fin contour anteriorly, abruptly curving downward midway, running somewhat curvy midlaterally to caudal fin.

Body dark blue-grey dorsally, sides silvery grey, and belly pale silvery white; 1st dorsal fin blue-grey to black; pectoral fins, 2nd dorsal fin and caudal fin dark grey; pelvic fins and anal fin pale. Attains 200 cm SL (commonly <75 cm SL).



Thyrsites atun, 18 cm FL (WIO). Source: SSF

DISTRIBUTION WIO: coastal regions at ~35°–55° S: including southern Africa (Angola in southeastern Atlantic, to Eastern Cape, South Africa) and Saint-Paul and Amsterdam Is.; elsewhere, southern coast of Australia, Tasmania, New Zealand, South America and Tristan da Cunha.

REMARKS Mesopelagic, in cold waters of Southern Hemisphere, to ~550 m deep, but often migrating to surface at night. Forms schools, usually near bottom or in midwater, but sometimes near surface. Feeds on a wide variety of pelagic fishes (especially sardines and anchovies), crustaceans (chiefly euphausiids) and cephalopods. For South African fish 50% maturity occurs at ~73 cm FL (at 3 years). Spawns in winter/spring over outer continental shelf and upper slope (in 150–400 m) of Agulhas Bank off south coast of South Africa; the pelagic eggs and larvae are transported to two known nursery areas where they remain until maturity. Highly valued commercial fish and game fish, especially in South Africa; flesh tasty, eaten fresh or smoked and salted.

Thyrsitoides marleyi Fowler 1929

Black snoek

PLATE 73

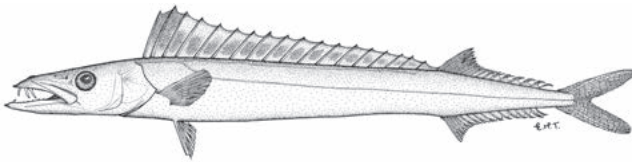
Thyrsitoides marleyi Fowler 1929: 256, Fig. 2 (KwaZulu-Natal, South Africa); Smith 1937; SFSA No. 866*; Forster *et al.* 1970*; SSF No. 247.9*; Nakamura & Parin 1993*.

Body slender, elongated and compressed, depth 8–10 in SL. Snout sharply conical, lower jaw pointed and projecting; small fleshy tip on both jaws; fang-like teeth in upper jaw; lateral teeth in both jaws conical; no teeth on vomer; small teeth on palatines. First dorsal fin rather higher anteriorly, 17–19 spines, second spine longest, equal to body depth; 2nd dorsal fin 1 spine, ~13 rays + 4–6 finlets; anal fin 2 spines, 11 or 12 rays + 4–6 finlets; pectoral fins 13–15 rays; pelvic fins well-developed (almost as long as pectoral fins), 1 spine, 5 rays. Body covered with small, thin, cycloid scales. Lateral line double: upper line running below 1st dorsal-fin base, and lower line originating below 4th spine of dorsal fin and running midlaterally; ~195 scales in upper branch, ~315 in lower branch. Gill-raker rudiments with 1 or 2 small sharp cusps; no long gill raker at angle of gill arch. Vertebrae 34.

Body and fins dark brown, may have metallic reflections. Attains 150 cm SL (commonly <100 cm SL).



Thyrsitoides marleyi, 170 cm TL (Hawaii). © JE Randall, Bishop Museum



Thyrsitoides marleyi, 46 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific (patchy). WIO: Red Sea, Mozambique to South Africa (Eastern Cape), Madagascar, Comoros, Seychelles, Mauritius and St Brandon Shoals; elsewhere, Andaman Sea, Indonesia, Taiwan, Japan, Australia, New Caledonia and Hawaii.

REMARKS Mesopelagic; often near surface at night, to ~400 m deep or more during daytime.

GLOSSARY

benthopelagic – occurring near or just above the bottom of the sea.

hypurals – the fan-shaped series of bones (sometimes fused to one or two plates) to which the caudal-fin rays are attached.

mesopelagic – the region of the oceanic zone from 200 m to 1 000 m.

recumbent spine – a spine that is more or less parallel to the horizontal (lying down), rather than almost vertical.

spinescent – with spines.

FAMILY TRICHIURIDAE

Cutlassfishes

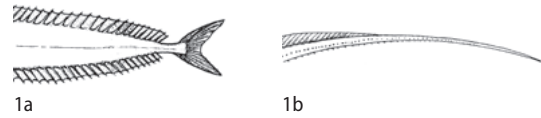
Wouter Holleman

Body exceptionally elongate and compressed; dorsal fin continuous, running almost entire length of body, with or without notch between spinous and rayed parts, and rayed portion longer than spinous portion; anal fin often reduced to single (sometimes modified) spine and embedded spinules; pectoral fins reduced; pelvic fins absent or reduced to flattened scale-like spine and 0–2 rudimentary rays; caudal fin small and forked, or absent and body attenuate. Mouth large, not protrusile; lower jaw extends beyond upper jaw, and tip of jaws often with dermal process; fang-like teeth at front of upper jaw and sometimes in lower jaw, and both jaws laterally with single row of sharp, compressed teeth. Nostrils single. Gill rakers spinescent. Lateral line single, usually closer to ventral contour than to dorsal contour of body. No scales.

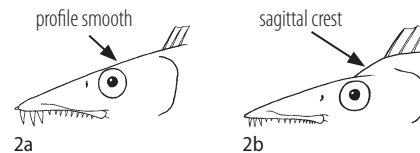
Circumglobal in tropical to temperate seas. Most species are benthopelagic on continental shelf, from surface to ~2 000 m; juveniles often inhabit shallower water than adults. Several species are commercially exploited; flesh excellent to eat, sold fresh or dried-salted. Ten genera and at least 40 species; 7 genera and at least 15 species in WIO.

KEY TO GENERA

- 1a Caudal fin small and forked; pelvic fins reduced to scale-like process (flattened spine) with 0–2 tiny rays 2
 1b No caudal fin and body tapering to a point; pelvic fins absent or reduced to scale-like processes 4



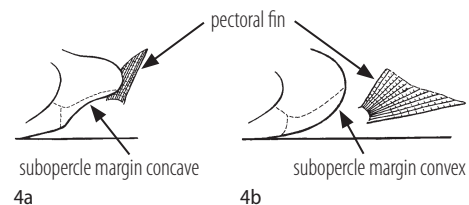
- 2a Head profile smooth from tip of snout to dorsal-fin origin, without sagittal crest; dorsal fin with notch between spinous and rayed portions *Benthodesmus*
 2b Head profile with prominent bony sagittal crest; no notch between spinous and rayed portions of dorsal fin 3



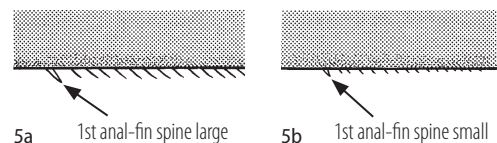
- 3a HL ~7 in TL; eyes fairly large, situated near dorsal profile *Lepidopus*
 3b HL ~8 in TL; eyes moderate and midlaterally placed *Evoxymetopon*



- 4a No pelvic fins; free margin of subopercle concave 5
 4b Pelvic fins appear as 2 scale-like structures; free margin of subopercle convex 6



- 5a Length of 1st spine of anal fin equal to about half eye diameter; anal-fin spinules protruding through skin; 2 small canines in upper jaw, projecting forward *Lepturacanthus*
 5b Length of 1st spine of anal fin less than pupil diameter; anal-fin spinules minute, only slightly breaking through skin; no canines in upper jaw *Trichiurus*



Continued...

KEY TO GENERA

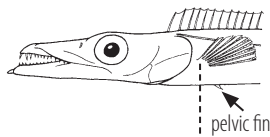
- 6a Pectoral fins short, not reaching lateral line; anal-fin origin below 47th–50th dorsal-fin rays *Tentoriceps*
- 6b Pectoral fins long, reaching beyond lateral line; anal-fin origin below 31st–35th or 41st–43rd dorsal-fin rays
..... *Eupleurogrammus*

GENUS *Benthodesmus* Goode & Bean 1882

Body extremely elongate and compressed; head profile smooth, without elevated frontal ridges; nape flattened, without sagittal crest; posteroventral margin of gill cover convex; lower jaw extends beyond upper jaw, tips of both jaws with short dermal process; fangs at front of both jaws, and slightly compressed teeth laterally; no teeth on vomer; palatines with 1 row of teeth. Gill rakers of 1st gill arch with spines. Dorsal fin 31–46 spines, 68–112 rays, and shallow notch between spinous and rayed portions; anal fin 2 close-set spines, 64–102 rays, external rays developed throughout or confined to rear part of fin; pelvic fins diminutive and consisting of single flattened scale-like spine and 1 rudimentary ray; caudal fin small and forked. All species benthopelagic, mostly on upper to mid-continental slope, at 200–960 m; juveniles epipelagic to mesopelagic. Eleven species, distributed in all temperate to tropical seas; 4 species in WIO at depths of <200 m.

KEY TO SPECIES

- 1a Pelvic-fin origin in front of pectoral-fin bases; dorsal-fin 31–42 spines 2
- 1b Pelvic-fin origin slightly behind pectoral-fin bases; dorsal fin >42 spines 3



Continued...

KEY TO SPECIES

- 2a Dorsal fin 31–34 spines; lower rear margin of gill cover convex or rounded *B. oligoradiatus*
- 2b Dorsal fin 38–42 spines; lower rear margin of gill cover concave *B. tenuis*
- 3a Pectoral-fin rays long, extending to mid-height of dorsal fin; dorsal-fin spines 42–46 *B. elongatus*
- 3b Pectoral-fin rays short, not reaching lateral line; dorsal-fin spines 61–64 *B. vityazi*

Benthodesmus elongatus (Clarke 1879)

Elongate frostfish

PLATE 74

Lepidopus elongatus Clarke 1879: 294, Pl. 14
(Hokitika Beach, New Zealand).

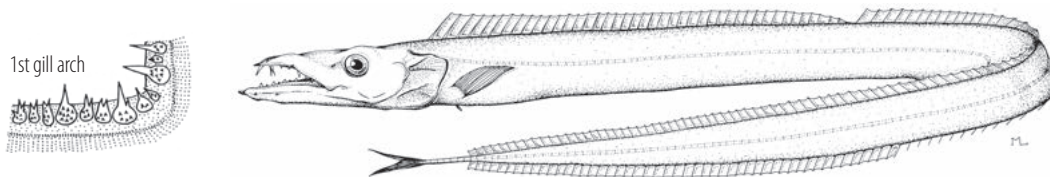
Benthodesmus elongatus: SSF 248.3*; Nakamura & Parin 1993*.

Dorsal fin 42–46 spines, 99–108 rays; anal fin 2 spines, 91–98 rays, and fin origin below 4th–8th dorsal-fin rays, but external rays developed only in rear third of fin; pectoral fins long, extending to mid-height of dorsal fin; pelvic-fin origin just behind pectoral-fin bases; caudal fin small, deeply forked. Body depth 31–46 in SL; snout to anus 2.6–2.8 in SL; HL 8.6–9.3 in SL; eye diameter 4.2–6.7 in HL. Mouth large, extending to rear edge of eyes; 2 pairs of large fangs at front of upper jaw, with smaller caniniform teeth at sides of both jaws. Gill rakers with 1 or 2 large spines and several smaller spines at bases. Lateral line runs along midside. Vertebrae 151–159.

Body silvery; jaws and opercle blackish; inside of mouth and gill cavity black. Attains 100 cm SL.

DISTRIBUTION Tropical to temperate seas of Southern Hemisphere (patchy), including southeastern Australia, New Zealand, Sala y Gómez Ridge, southern Brazil and Argentina, and East Africa. WIO: Kenya, Mozambique, South Africa and Madagascar Ridge.

REMARKS Adults benthopelagic, to ~950 m deep; juveniles mesopelagic, at 77–500 m.



Benthodesmus elongatus, 43 cm TL and 1st gill arch (South Africa). Source: SSF

1st gill arch drawing: © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

Benthodesmus oligoradiatus Parin & Becker 1970

Sparse-rayed frostfish

Benthodesmus oligoradiatus Parin & Becker 1970: 355, Fig. 2 (Arabian Sea); Nakamura & Parin 1993*; Adam *et al.* 1998.

Dorsal fin 31–34 spines, 68–74 rays; anal fin 2 spines, 64–67 rays, and spines set below 1st–3rd dorsal-fin rays; anus below notch in dorsal fin; pectoral fins very short, not reaching lateral line; pelvic fins represented by 1 spine, inserted below or before pectoral-fin bases; caudal fin very small and shallowly forked. Body depth 17–26 in SL; snout to anus 2.2–2.4 in SL; HL 5.8–6.6 in SL; eye diameter 4.9–5.6 in HL. Two widely spaced fangs at front of upper jaw, and 3 smaller depressible fangs laterally; lower jaw with 1 fixed fang anteriorly, and ~20 lateral teeth. Lateral line runs along midside. Vertebrae 105–109.

Body silvery; jaws and opercle blackish; inside of mouth and gill cavity black. Attains 51 cm SL.

DISTRIBUTION Indian Ocean (patchy). WIO: Arabian Sea, Maldives and Sri Lanka; elsewhere to Bay of Bengal.

REMARKS Adults benthopelagic on seamounts and continental slope, at 375–600 m; juveniles mesopelagic, at 100–300 m.

Benthodesmus tenuis (Günther 1877)

Slender frostfish

PLATE 74

Lepidopus tenuis Günther 1877: 437 (off Inoshima Bay, Japan).
Benthodesmus tenuis: Nakamura & Parin 1993*; Adam *et al.* 1998.

Dorsal fin 38–42 spines, 78–87 rays; anal fin 2 spines, 69–76 rays, fin origin below 6th–11th dorsal-fin rays, and external rays developed for entire base; anus below 4th–7th dorsal-fin rays; pectoral fins reaching lateral line; pelvic-fin origins slightly in front of pectoral-fin bases. Body depth 18–35 in SL; snout to anus 2.2–2.4 in SL; HL 7–8.7 in SL; snout length 2.3–2.8 in HL; eye diameter 5.9–7.5 in HL. Mouth extends to below front edge of eyes; 2 pairs of large

fangs at front of upper jaw, and smaller caniniform teeth at sides of both jaws. Gill rakers with 1 large spine with several smaller spines at base. Lateral line runs along midside. Vertebrae 122–132.

Body silvery; jaws and opercle blackish; inside of mouth and gill cavity black. Attains 72 cm SL (commonly ~50 cm SL).

DISTRIBUTION Tropical to temperate waters of all oceans (patchy), except not eastern Pacific. WIO: Maldives and Hydra Seamount.

REMARKS Benthopelagic, at 200–850 m.

Benthodesmus vityazi Parin & Becker 1970

Vityaz frostfish

PLATE 74

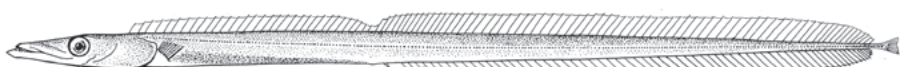
Benthodesmus vityazi Parin & Becker 1970: 360, Fig. 2
(equatorial central Pacific: 0°04' N, 154°05' W);
Nakamura & Parin 1993*.

Dorsal fin 61–64 spines, 88–93 rays; anal fin 2 spines, 80–85 rays, fin origin below 4th–7th dorsal-fin rays, external rays developed only in last third of fin; anus below 1st–4th dorsal-fin rays; pectoral fins very short, not reaching lateral line; pelvic-fin origins just behind pectoral-fin bases. Body depth 31–40 in SL; snout to anus 2.3–2.6 in SL; HL 7–7.9 in SL; snout length 2.4–2.7 in HL; eye diameter 5.2–5.9 in HL. Two widely spaced, laterally flattened, fixed fangs near front of upper jaw, with row of 6–8 very small teeth between jaw symphysis and fangs, and 8–9 small teeth lateral to fangs, and ~10 larger teeth behind; lower jaw with pair of small fixed fangs anteriorly, and ~14 lateral teeth. Lateral line runs along midside. Vertebrae 137–142.

Body silvery; jaws and opercle blackish; inside of mouth and gill cavity black. Attains 77 cm SL.

DISTRIBUTION Indo-Pacific (patchy). WIO: off Somalia.

REMARKS Adults benthopelagic, at 640–820 m; juveniles mesopelagic, at 170–900 m.

*Benthodesmus oligoradiatus*, ~19 cm SL.

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

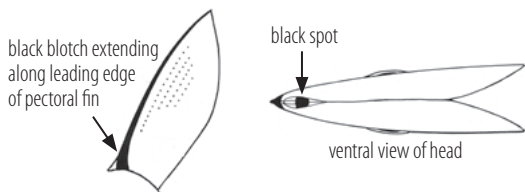
*Benthodesmus vityazi*, 27 cm SL, holotype (central equatorial Pacific). Source: Parin & Becker 1970

GENUS *Eupleurogrammus* Gill 1862

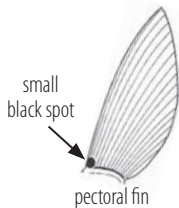
Body elongate and extremely compressed, ribbon-like, and tapering to a point; no notch in dorsal fin; pectoral fins reach beyond lateral line; pelvic fins reduced to scale-like processes; no caudal fin; lower rear margin of gill cover convex. Two species in Indo-Pacific, both in WIO.

KEY TO SPECIES

- 1a Pair of fangs at front of lower jaw; black blotch on base of anterior margin of pectoral fins; dermal process at tips of both jaws black, and black spot just behind dermal process on bottom of lower jaw *E. glossodon*



- 1b No fangs in lower jaw; small blackish spot at base of pectoral-fin spine; dermal process of upper jaw black, but no black spot on bottom of lower jaw *E. muticus*



set below 11th–14th dorsal-fin rays. Body depth 13–17 in TL; HL 8.3–8.7 in TL; eyes placed close to dorsal profile, eye diameter ~7–8 in HL. Mouth with dermal process on tips of both jaws; maxilla extends to below front edge of eye; 2 or 3 pairs of fangs in upper jaw, and 1 pair of fangs at front of lower jaw; 1 row of sharp, compressed, lateral teeth in both jaws. Gill rakers with single spine with several nubbins at base. Lateral line almost straight, running closer to ventral contour of body.

Body steely blue with metallic reflections, becoming silvery after death; dorsal-fin membrane slightly tinged with black along spines; black blotch on base of anterior margin of pectoral fins; black spot just behind dermal process on bottom of lower jaw. Attains 70 cm TL.

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf to India, Sri Lanka and Gulf of Mannar; elsewhere to Bay of Bengal, Thailand, Malaysia and Indonesia.

REMARKS Benthopelagic in coastal waters, to ~80 m deep, coming near surface at night. Feeds on a variety of small crustaceans, squid and fishes. Caught with shore seines, bag nets and coastal trawls.

Eupleurogrammus muticus (Gray 1831)

Smallhead hairtail

PLATE 74

Trichiurus muticus Gray 1831: 10 (India).

Eupleurogrammus muticus: Nakamura & Parin 1993*; Randall 1995*;

Carpenter *et al.* 1997; Nakamura & Parin 2001;

Manilo & Bogorodsky 2003.

Eupleurogrammus glossodon (Bleeker 1860)

Longtooth hairtail

Trichiurus glossodon Bleeker 1860: 38 (Bengkayang, western Borneo, Indonesia).

Eupleurogrammus glossodon: Nakamura & Parin 1993*; Randall 1995*;

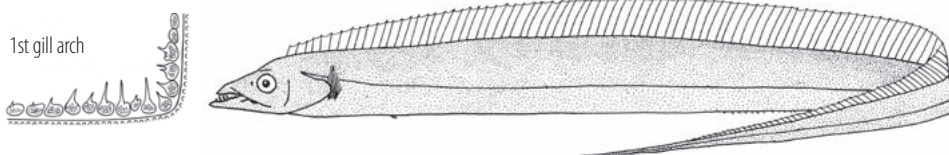
Carpenter *et al.* 1997; Nakamura & Parin 2001;

Manilo & Bogorodsky 2003.

Dorsal fin without spines, 118–132 rays; anal fin reduced to spinules embedded in skin, and fin origin below 31st–35th dorsal-fin rays; pectoral fins 1 spine, 13 rays, and fin slightly shorter than snout; pelvic fins reduced to scale-like spines,

Dorsal fin 3 spines, ~140 rays; anal fin short, with embedded spinules starting below 41st–43rd dorsal-fin rays; pectoral fins 1 spine, 12 rays, fins as long as snout; pelvic fins reduced to scale-like spines; no caudal fin. Body depth 15–17 in TL; head small, HL 10–11 in TL; eyes placed well below dorsal profile, eye diameter ~6–8 in HL. Mouth with dermal process on tips of both jaws (that of lower jaw larger); maxilla reaching to below front edge of eye; 2 or 3 pairs of fangs in upper jaw, and no fangs at front of lower jaw; series of sharp, compressed lateral teeth in both jaws. Gill rakers with long spines with many small nubbins at base. Lateral line almost straight, running slightly below midbody. Precaudal vertebrae ~39–41.

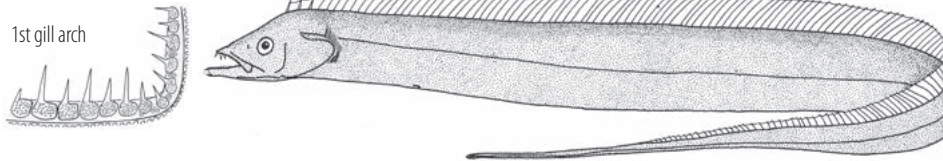
Body steely blue with metallic reflections, becoming silvery grey after death; dorsal-fin membrane semi-transparent, rear



Eupleurogrammus glossodon, 27 cm TL and 1st gill arch. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

part of fin with some black; small blackish spot at base of pectoral-fin spine; dermal process of upper jaw black, that of lower jaw black above and grey below. Attains 70 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to India and Sri Lanka; elsewhere to Bay of Bengal, Thailand, Malaysia, Indonesia and South China Sea.



Eupleurogrammus muticus, ~45 cm TL and 1st gill arch. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

GENUS *Evoxymetopon* Gill 1864

Body elongate and compressed; head profile slightly convex and rising steeply from snout tip to dorsal-fin origin, forming prominent sagittal crest; caudal fin small and deeply forked; lower rear margin of gill cover rounded. Four species, 2 in WIO.

KEY TO SPECIES

- | | | |
|----|--|---------------------|
| 1a | Dorsal-fin elements ~83; head profile slightly rounded | <i>E. moricheni</i> |
| 1b | Dorsal-fin elements 91–93; head profile straight | <i>E. poeyi</i> |

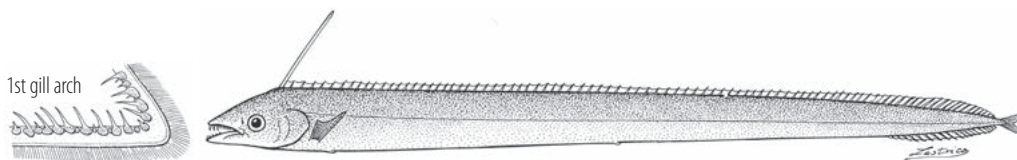
Evoxymetopon moricheni

Fricke, Golani & Applebaum-Golani 2014

PLATE 74

Evoxymetopon moricheni Fricke, Golani & Applebaum-Golani 2014: 239, Figs. 1–3 (Eilat, Israel, Gulf of Aqaba, Red Sea).

Dorsal fin elements ~83, 1st spine not elongate; anal fin 1 spine, oval, scale-like and below 34th dorsal-fin ray, and 17 visible rays, anteriormost rays minute and embedded; pelvic fins scale-like with 2 rays; pectoral fins 12 rays, upper 2 and lower 4 rays not divided. Body depth at anus ~59% pre-anal length; HL ~30% pre-anal length; eye diameter 5.2 in HL. Head profile slightly convex, with frontal ridges slightly elevated at nape, forming slight sagittal crest. Upper jaw with 5 large fangs; 1 row of sharp, conical teeth in both jaws. Nostril crescent-shaped. Gill rakers with sharp spines. Lateral line fairly straight, midlateral. Vertebrae 33 + 55.



Evoxymetopon poeyi, lateral view and 1st gill arch.

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

REMARKS Benthopelagic in coastal waters, to ~80 m deep, coming near surface at night; also enters estuaries. Feeds on a wide variety of small fishes, squid and crustaceans. Caught with shore seines, bag nets and coastal trawls; sold mostly dried-salted, mixed with other trichiurids, and sometimes fresh.

Dead specimen with silvery white head and body; blackish margins on snout, head and front of dorsal-fin base. Attains at least 83 cm SL.

DISTRIBUTION Known only from the holotype from the northern Red Sea.

REMARKS Found drifting offshore on the sea. The first record of the genus from the Red Sea.

Evoxymetopon poeyi Günther 1887

Poeyi's scabbardfish

Evoxymetopon poeyi Günther 1887: 39, Pl. 43 (Mauritius, Mascarenes); Nakamura & Parin 1993*; Fricke 1999; Fricke *et al.* 2009.

Dorsal-fin elements 91–93, and first spine extremely elongate; anal fin 1 scale-like spine, fin origin below 35th dorsal-fin ray, anteriormost rays embedded; pectoral fins small and triangular, situated low, with anterior rays shortest; pelvic fins reduced to scale-like spines. Body depth 52–56% pre-anal length; HL 23–26% pre-anal length; head profile relatively straight. Mouth large, not protractile; 3 pairs of fangs at front of upper jaw, 1 pair of small fangs at front of lower jaw; sharp conical teeth in both jaws, upper teeth larger and more widely spaced. Nostrils slit-like. Gill rakers with sharp spine with minute nubbins at base. Lateral line nearly straight but slightly oblique along midbody. Vertebrae 35 + 64.

Body silvery white; all fins pale brown; lining of opercle blackish. Attains 200 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Mauritius and Réunion; elsewhere, Ryukyu Is. and Kyushu-Palau Ridge.

REMARKS Benthopelagic; seems abundant near seamounts and sometimes near shore. Feeds on larger fishes. Of no special fisheries interest.

GENUS *Lepidopus* Goüan 1770

Body elongate and compressed; head with frontal crests converging from just before middle to behind rear edge of eyes; eyes large, placed close to dorsal profile. Dorsal fin with 7–10 weak spines, hardly differing from rays; 1st spine of anal fin rudimentary but 2nd spine strong, anterior spinules embedded but posterior rays visible; caudal fin small and deeply forked. Nine species, 1 in WIO at depths of <200 m.

Lepidopus caudatus (Euphrasen 1788)

Silver scabbardfish

PLATE 74

Trichiurus caudatus Euphrasen 1788: 52, Pl. 9,

Fig. 2 (Cape of Good Hope, South Africa).

Lepidopus argenteus Bonnaterra (ex Goüan) 1788: 58, Pl. 87, Fig. 364 (Montpellier, France, Mediterranean Sea).

Lepidopus caudatus: Parin & Bekker 1973; Nakamura 1986; SSF 248.4*; Nakamura & Parin 1993*; Heemstra & Heemstra 2004; Fricke *et al.* 2007.

Dorsal fin ~6–8 spines, 90–102 rays; anal fin 2 spines, 59–66 rays, rear 15–24 rays breaking through skin and connected by membrane; 2nd spine of anal fin strong, plate-like or triangular, shorter than pupil of eye, and inserted below 38th–42nd dorsal-fin rays; pectoral fins large, reaching beyond lateral line, with 1 spine, 11 rays, some rays branched; pelvic fins minute, inserted below 8th or 9th dorsal-fin ray. Body depth 11–15 in SL; HL 5.7–6.8 in SL; snout length 2.4–2.7 in HL; upper jaw 2.7–3 in HL. Head profile slightly concave, rising gently to eyes and then more steeply to dorsal-fin origin; sagittal crest confined to nape; eyes nearly exceeding dorsal profile, eye diameter 4.9–6.2 in HL; interorbital area flat or slightly concave, width 1.3–1.6 in eye diameter. Mouth with dermal process at tips of both jaws, that of lower jaw larger;

3 pairs of fangs at front of upper jaw; 1 row of compressed lateral teeth in both jaws; palatines with teeth. Gill rakers with 1 or 2 long sharp spines with few small spines at base. Lateral line runs along midside, slightly obliquely. Vertebrae 38–44 + 65–72.

Body uniformly silvery; dorsal fin with melanophores on membranes between first 3 or 4 spines, and narrow black margin on most of fin length (Southern Hemisphere populations). Attains 210 cm TL (commonly ~117 cm SL) and ~8 kg.

DISTRIBUTION Widespread but scattered: Black Sea and Mediterranean Sea; eastern Atlantic (France to Senegal; Angola to Cape of Good Hope and northern Walvis Ridge); Indo-Pacific: South Africa (Cape Point to Eastern Cape) and Agulhas Bank in WIO, seamounts ~30°–35° S, and southern Australia and New Zealand in western Pacific; and eastern Pacific (Peru).

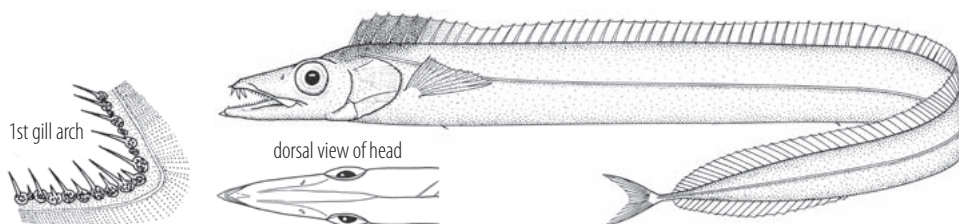
REMARKS The status of Southern Hemisphere populations requires further study. Benthopelagic on continental shelf, at edge and upper slopes, at 40–620 m (usually 100–250 m), over sandy and muddy bottoms. Shoaling, and migrates to midwater at night; occasionally found inshore in upwellings when it appears at surface. Feeds on a variety of crustaceans, squid and small fishes. Important in northeastern Atlantic commercial fisheries.

GENUS *Lepturacanthus* Fowler 1905

Body extremely elongate and strongly compressed, ribbon-like, and tapering to a point; no pelvic fins or caudal fin; pectoral fins fairly long, reaching above lateral line; anal-fin spinules breaking through skin. Anteriormost pair of fangs in upper jaw long and projecting through slit in lower jaw; lower rear margin of opercle concave. At least 2 species, both in WIO.

KEY TO SPECIES

- | | | |
|----|---|--------------------|
| 1a | Snout short, ~3 in HL; eyes large, diameter 5–7 in HL; total dorsal-fin elements 123–133 | <i>L. pantului</i> |
| 1b | Snout long, ~2–2.5 in HL; eyes small, diameter 7–9 in HL; total dorsal-fin elements 113–123 | <i>L. savala</i> |



Lepidopus caudatus, lateral view, 1st gill arch and dorsal view of head

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

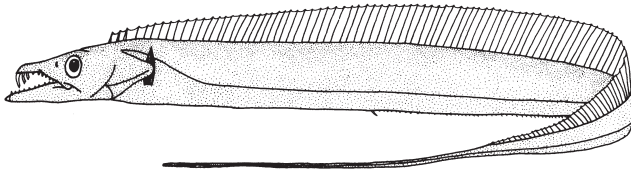
Lepturacanthus pantului (Gupta 1966)

Coromandel hairtail

Trichiurus pantului Gupta 1966: 170 (Parganas District, West Bengal, India).
Lepturacanthus pantului: Nakamura & Parin 1993*.

Dorsal fin 3 spines, 120–131 rays, spines and anterior rays short, rays increasing in length to about midway and then decreasing; anal fin 1 long spine, set below 36th–40th dorsal-fin rays, and 74–84 smaller spinules; pectoral fins slightly shorter than snout, with 1 spine, 10 or 11 rays. Body depth 18–21 in TL; snout short, ~3 in HL; eyes large, eye diameter ~5–7 in HL. Mouth with small dermal process at tips of both jaws; 3 (sometimes 4) pairs of barbed fangs, and 2 smaller, forward-pointing canine teeth in upper jaw, anteriormost fangs very long and protruding through slit in lower jaw; 1 row of compressed lateral teeth in both jaws. Gill rakers with single moderate spine with many small nubbins at base. Lateral line slopes downward at pectoral fins, running midway between midbody and ventral contour. Precaudal vertebrae 35–39.

Body steely blue with metallic reflections, becoming silvery grey after death; margin of anus and tapering part of body black; dorsal-fin margin, inside of opercle, and anterior shoulder girdle usually jet-black. Attains 92 cm TL.



Lepturacanthus pantului, ~55 cm TL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indian Ocean: east coast of India (Hooghly River estuaries, Bay of Bengal) to Gulf of Mannar.

REMARKS Benthopelagic or pelagic in estuaries and coastal waters, to ~80 m deep. Feeds on a wide variety of small fishes and crustaceans (mostly young clupeids and prawns). Caught with bag nets in estuaries and with shore and boat seines in inshore waters, and sold fresh or dried-salted.

Lepturacanthus savala (Cuvier 1829)

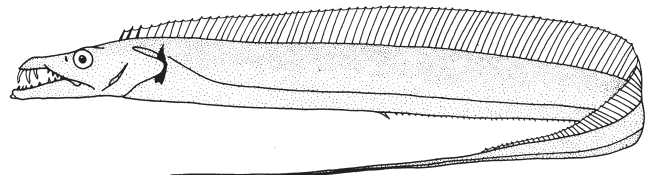
Savalani hairtail

PLATE 75

Trichiurus savala Cuvier 1829: 219 (Puducherry, India).
Trichiurus armatus Gray 1831: 9 (Indian Ocean).
Lepturacanthus savala: Nakamura & Parin 1993*;
 Manilo & Bogorodsky 2003.

Dorsal fin 3 or 4 spines, 110–120 rays; anal fin reduced to ~75 small spinules breaking through skin, but first spine fairly long, its origin below 36th–39th dorsal-fin rays; pectoral fins slightly shorter than snout, with 1 spine, 10 rays, fins reaching above lateral line. Body depth 28–30 in TL; snout long, ~2–2.5 in HL; eyes small, eye diameter ~7–9 in HL; mouth large with dermal process at tips of both jaws; 2 (usually)–3 pairs of barbed fangs and 2 pairs of small forward-pointing canine teeth in upper jaw, anteriormost fangs very long and protruding through slit in lower jaw; 1 row of compressed lateral teeth in both jaws. Gill rakers with single, moderate spine with many small nubbins at base. Lateral line slopes downwards at pectoral fins, running closer to ventral contour. Precaudal vertebrae 36–40.

Body steely blue with metallic reflections; margin of anus pale, and tapering part of body usually white; tips of both jaws black, and inside of opercle and anterior pectoral girdle blackish. Attains 100 cm TL (commonly ~30–70 cm TL).



Lepturacanthus savala, ~80 cm TL. Source: Nakamura 1984

DISTRIBUTION Indo-Pacific. WIO: India to Sri Lanka; elsewhere to Bay of Bengal, Thailand, Malaysia, Indonesia, Philippines, China, New Guinea and northern Australia.

REMARKS Benthopelagic in coastal waters, to ~100 m deep. Feeds on prawns and small fishes (mostly *Setipinna*, *Anchiovella* and *Harpadon*). Caught mainly inshore with seines, bag nets and coastal bottom trawls, and marketed fresh or dried-salted.

GENUS *Tentoriceps* Whitley 1948

Body elongate and strongly compressed, ribbon-like, tapering to a point. One species currently recognised.

Tentoriceps cristatus (Klunzinger 1884)

Crested hairtail

PLATE 75

Trichiurus cristatus Klunzinger 1884: 120, Pl. 13, Fig. 5a
(Al-Qusayr, Egypt, Red Sea).

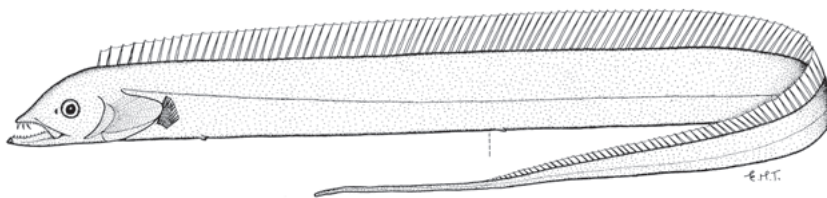
Tentoriceps cristatus: Whitley 1948; SSF No. 248.5*; Nakamura & Parin 1993*; Goren & Dor 1994; Golani & Bogorodsky 2010.

Dorsal fin continuous (no notch), 5 spines, 126–144 rays; anal fin 1 minute spine + 1 scale-like spine, spines set below 47th–50th dorsal-fin rays, followed by minute embedded spinules; pectoral fins short, not reaching lateral line; pelvic fins reduced to scale-like processes; no caudal fin. Body depth ~18–21 in TL. Head profile evenly convex; lower rear margin of gill cover straight to slightly convex. Eyes large and laterally placed, eye diameter 5–6 in HL. Mouth small, not reaching front edge of eyes; dermal process at tips of both jaws; 3 pairs of fangs in upper jaw, and 2 pairs of fangs in lower jaw; 1 row of sharp compressed lateral teeth in both jaws. Gill rakers with several spines of varying sizes. Lateral line runs slightly below midbody. Vertebrae 47–52 + 115–120.

Body silvery white, becoming silvery grey with dark cloud-like patches after death; jaws and dorsal fin dusky; bases of dorsal fin and anal fin sooty. Attains 90 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique Channel, Saya de Malha Bank, St Brandon Shoals and Chagos; elsewhere, Andaman Sea, Indonesia, Philippines, Korea, southern Japan, and northern and southeastern Australia.

REMARKS Benthopelagic or pelagic in coastal waters, at 30–110 m. Fished in Asia with bottom trawls and bag nets and marketed fresh or dried-salted.



Tentoriceps cristatus, ~30 cm TL (NW Australia). Source: SSF

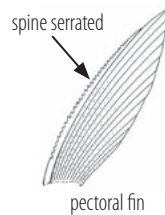
1st gill arch, fin and spine drawings sourced from Nakamura 1984. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

GENUS *Trichiurus* Linnaeus 1758

Body elongate, extremely compressed, and tapering to a point. Dorsal fin long and continuous (no notch between spinous and rayed portions); anal-fin spinules mostly buried in skin; pectoral fins fairly long, reaching beyond lateral line; no pelvic fins or caudal fin. Lower rear margin of gill cover concave. Eleven species, possibly 3 in WIO at depths of <200 m.

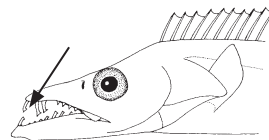
KEY TO SPECIES

- 1a Pectoral-fin spine serrate on anterior edge; first spine of anal fin set below ~36th dorsal-fin ray *T. gangeticus*

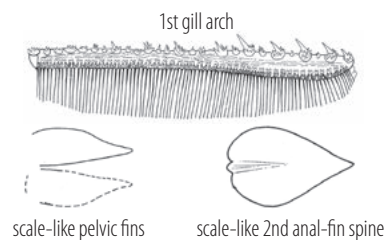
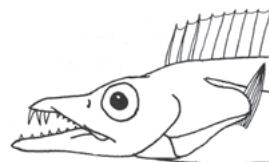


- 1b Pectoral-fin spine not serrate; first spine of anal fin set below 39th–41st dorsal-fin rays 2

- 2a Fangs in jaws with barbs; total dorsal-fin elements >120 *T. lepturus*



- 2b Fangs in jaws without barbs; total dorsal-fin elements <120 *T. auriga*



Trichiurus auriga Klunzinger 1884

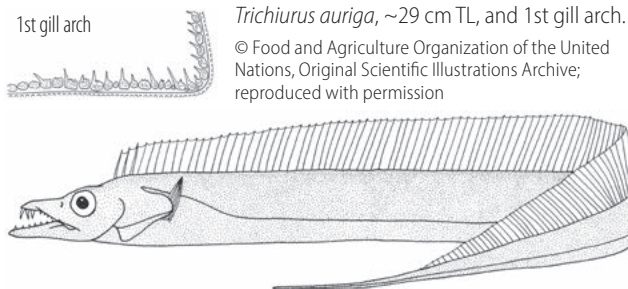
Pearly hairtail

PLATE 75

Trichiurus auriga Klunzinger 1884: 120, 121, Pl. 12, Fig. 1 (Al-Qusayr, Egypt, Red Sea); Silas & Rajagopalan 1974; Nakamura & Parin 1993*; Adam *et al.* 1998; Nakamura & Parin 2001; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010.

Dorsal fin 3 spines, 106–111 rays; anal fin reduced to ~80 spinules barely breaking through skin, and fin origin below 40th or 41st dorsal-fin ray; pectoral fins as long as snout, with 1 spine, 9–11 rays. Body depth 15–19 in TL; HL 5.4–5.9 in TL; eyes large, eye diameter 6.6–7.9 in HL. Mouth large; small dermal process at tips of both jaws; 2 or 3 pairs of fangs at front of upper jaw, and 1 pair of fangs at front of lower jaw, and all fangs without barbs; 1 row of sharp, compressed, lateral teeth in both jaws; palatines with minute teeth. Gill rakers with 1 medium-length spine with a few smaller spines, and numerous small nubbins at base. Lateral line runs about midway between midbody and ventral contour. Vertebrae 36 or 37 + 101–108.

Body pearly white, slightly dusky dorsally. Attains 35 cm TL.



DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, East Africa to northern Mozambique, Maldives, India and Sri Lanka; elsewhere, Indonesia to Timor Sea and northern Australia.

REMARKS Benthopelagic, at 250–350 m. Feeds on deepwater shrimps and small fishes, such as myctophids (lanternfish). Caught as bycatch in deepwater trawls.

Trichiurus gangeticus Gupta 1966

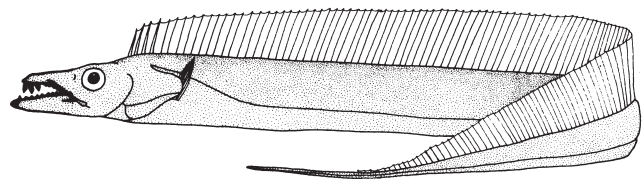
Ganges hairtail

Trichiurus gangeticus Gupta 1966: 169 (Parganas District, West Bengal, India); Nakamura & Parin 1993.

Lepturacanthus serratus Dutt & Thankam 1967: 756, Fig. B (Waltair [Visakhapatnam], Andhra Pradesh, India).

Dorsal fin 4 spines, 116–129 rays; anal fin reduced to 73–90 minute spinules slightly breaking through skin, and fin origin below ~36th dorsal-fin ray; pectoral fins 1 spine with serrated anterior edge, 10 or 11 rays. Body depth ~23–26 in TL; eyes large, placed near dorsal profile, eye diameter 6–7 in HL. Mouth very large; dermal process at tips of both jaws; 2 or 3 pairs of barbed fangs at front of upper jaw, 1 pair of barbed fangs in lower jaw; single series of sharp lateral teeth in both jaws. Gill rakers with single spines with several nubbins at base. Lateral line runs obliquely from origin to nearer ventral contour of body. Precaudal vertebrae 39 or 40.

Body bright silvery white, with semi-transparent fin membranes; preserved specimens darker. Attains 50 cm TL.



Trichiurus gangeticus, ~42 cm TL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indian Ocean: east coast of India (Hooghly River estuaries, Bay of Bengal) to Gulf of Mannar.

REMARKS Benthopelagic to pelagic in coastal waters and estuaries, often at surface at night. Feeds on a wide variety of small fishes and crustaceans. Caught mainly with shore seines, bag nets and coastal bottom trawls; sold fresh or dried-salted, mixed with other trichiurids.

Trichiurus lepturus Linnaeus 1758

Largehead hairtail

PLATE 75

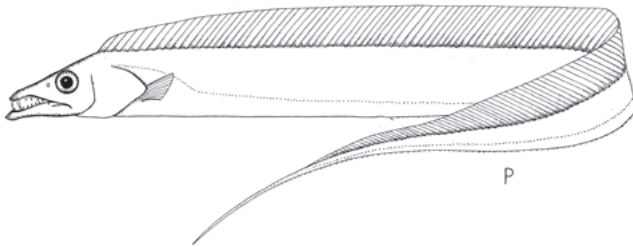
Trichiurus lepturus Linnaeus 1758: 246 (America; China); Tucker 1956; SSF No. 248.6*; Nakamura & Parin 1993*; Randall 1996*; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010. *Clupea haumela* Fabricius in Niebuhr (ex Forsskål) 1775: 72, xiii (Al-Mukha, Yemen, Red Sea).

Trichiurus malabaricus Day 1865: 20 (Kochi, Malabar coast, India).

Dorsal fin fairly high, with 3 spines, 130–135 rays; anal-fin spine below 39th–41st dorsal-fin rays, remaining 100–105 rays embedded or just breaking through skin; pectoral fins 1 spine, 11–13 rays, and fins about as long as snout. Body depth 13–16 in TL; head large, HL 6.8–7.6 in TL; eyes large, eye diameter 5–7 in HL. Mouth large; maxilla reaches to below front edge of eye; dermal process at tips of both jaws; 2 or 3 pairs of barbed fangs at front of upper jaw, and 1 pair of barbed fangs near

tip of lower jaw; 1 row of compressed lateral teeth in both jaws, and also often some fang-like teeth in larger specimens; palatines with minute teeth. Lateral line drops to below pectoral fins and runs near ventral body contour. Vertebrae 37–41 + 128–134.

Body steely blue with silvery reflections, becoming uniformly silvery grey after death; dorsal fin sometimes tinged pale yellow; pectoral fins semi-transparent. Attains 120 cm TL.



Trichiurus lepturus, 35 cm TL (South Africa). Source: SSF

DISTRIBUTION Circumglobal in temperate to tropical seas, including Mediterranean Sea and throughout coastal waters of WIO.

REMARKS *Trichiurus japonicus* was originally described by Temminck & Schlegel from Japan as *Trichiurus lepturus japonicus*, and then synonymised with *T. lepturus* by Tucker (1956). *Trichiurus japonicus* has subsequently been determined to be a valid species by Chakraborty & Iwatsuki (2006). Chakraborty & Iwatsuki (2006) show that fish from West Africa and the western Atlantic are genetically distinct from Indo-Pacific fish, thus Indo-Pacific populations may in time be recognised as a separate species (for which the name *Trichiurus haumela* would be available). Benthopelagic on continental shelf, to ~350 m deep, occasionally in shallow waters and at surface at night. Young and immature fish feed on euphausiids (krill) and other small planktonic crustaceans; adults feed on a variety of fishes and occasionally on squid and crustaceans. Caught mainly with bag nets in estuaries, with trolling, shore and boat seines, set nets, bottom and midwater longlines inshore, and bottom trawls offshore; the most important commercially fished trichiurid or gempylid, with >1 million tonnes trawled in 2010.

GLOSSARY

attenuate – thin and stretched out.

euphausiids – shrimp-like, planktonic crustaceans, which include krill.

FAMILY SCOMBRIDAE

Mackerels, Spanish mackerels, bonitos and tunas

Bruce B Collette

Moderate- to large-sized, body elongate and fusiform, moderately compressed in some genera. Snout pointed; mouth rather large; premaxillae beak-like, free from nasal bones which are separated by ethmoid. Teeth on jaws strong, moderate or weak; no true canines; palate and tongue may bear teeth. First dorsal fin usually short and long, and separated from 2nd dorsal fin, and depressible into a groove; finlets present behind 2nd dorsal fin and anal fin. Pelvic fins moderate or small; some members with fleshy interpelvic process between inner edges of the fins. Caudal fin deeply forked, with supporting caudal rays completely covering hypural plate; at least 2 small keels on each side of caudal-fin base, and more derived species also with larger median keel on peduncle. Lateral line simple. Body covered with small to moderate scales or with scaly ‘corselet’ (area of larger thick scales behind head and around pectoral fins) and rest of body covered with tiny scales or naked. Vertebrae 31–66.

Swift epipelagic predators; some species occur in coastal waters, others are oceanic. Mackerels (*Scomber* and *Rastrelliger*) filter plankton with their long gill rakers; tunas, bonitos and Spanish mackerels feed on larger prey, including small fishes, crustaceans and squids. The main predators of smaller individuals are other predacious fishes, particularly large tunas and billfishes. Scombrids are dioecious (separate sexes) and most display little or no sexual dimorphism in structure or colour pattern. Females of many species attain larger sizes than males. Batch spawning of most species takes place in tropical and subtropical waters, frequently inshore. Eggs are pelagic and hatch into planktonic larvae (Collette *et al.* 1984 reviewed the eggs and larvae of Scombroidei; Collette *et al.* 2019 has extensive text on biology).

Mackerels and tunas support important commercial and recreational fisheries as well as substantial artisanal fisheries worldwide. Catches in cold- and warm-temperate waters predominate over catches in tropical waters, with more than half the world catch taken in the northeastern Atlantic, northwestern Pacific and southeastern Pacific (Fishing Areas 27, 61 and 87, respectively). Many species of tunas and mackerels are targeted by long-distance fisheries. Principal commercial fishing gears used for near-surface schooling fish include purse seines, driftnets, hook-and-line/bait boat fishing and trolling; standard and deep longlines are used for (usually

larger) fish occurring at least temporarily in deeper water. Numerous artisanal fisheries deploy a variety of gear, including bag nets, cast nets, lift nets, drift gillnets, beach seines, hook-and-line, handlines, harpoons, specialised traps and fish corrals, while recreational fishing involves mostly surface trolling and pole-and-line fishing.

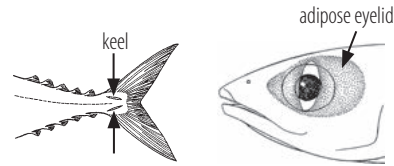
The family Scombridae can be divided into 2 subfamilies: Gasterochismatinae (which contains only the peculiar Southern Ocean *Gasterochisma melampus*) and Scombrinae. Major morphological features were discussed by Collette (1979). On the basis of internal osteological characters, Collette & Chao (1975) and Collette & Russo (1979) divided the Scombrinae into 2 groups of tribes. In the first group, the more primitive mackerels (tribe Scombrini) and Spanish mackerels (tribe Scomberomorini) are characterised by: 1) a distinct notch in the hypural plate that supports the caudal-fin rays, 2) absence of a bony support for the median fleshy keel on the peduncle (when present), and 3) preural vertebral centra not greatly shortened compared with other vertebrae. In the second group, bonitos (tribe Sardini) are a group of 4 genera and 7 species intermediate between Spanish mackerels (tribe Scomberomorini) and higher tunas (tribe Thunnini). Sardini lack any trace of a specialised subcutaneous vascular system or dorsally projecting cartilaginous ridges on the tongue, and the bony structure underlying their median fleshy keel on the peduncle is incompletely developed; they also lack prominent paired frontoparietal fenestra on the dorsal surface of the skull (otherwise characteristic of most Thunnini). Thunnini contains 5 genera, 4 of which are unique among bony fishes in having a counter-current heat-exchanger system, which allows them to retain metabolic heat (thus, the fish is warmer than the surrounding water). Of this tribe, 3 genera (*Auxis*, *Euthynnus* and *Katsuwonus*) and the yellowfin group of *Thunnus* have central and lateral heat exchangers, whereas the specialised bluefin group of *Thunnus* have lost the central heat exchanger and evolved very well-developed lateral heat exchangers (Graham & Dickson 2001). These and other physiological and morphological adaptations are of great interest to physiologists and evolutionary biologists.

Fifteen genera and 51 species (Collette *et al.* 2001; Collette 2003); 13 genera and 26 species in WIO.

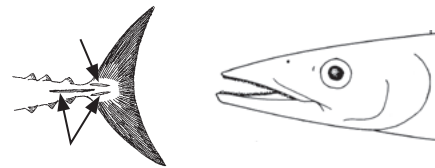
KEY TO GENERA

- 1a Body covered with large cycloid scales; pelvic fins huge in juveniles, proportionally smaller at larger sizes, and depressible into groove at all sizes *Gasterochisma*
 1b Body naked or covered with small scales; pelvic fins small, without groove 2

- 2a Peduncle with 2 small keels; 5 dorsal and anal finlets; adipose eyelids covering front and rear of eye 3



- 2b Peduncle with 2 small keels plus 1 large median keel in between; 6–10 dorsal and anal finlets; no adipose eyelids 4

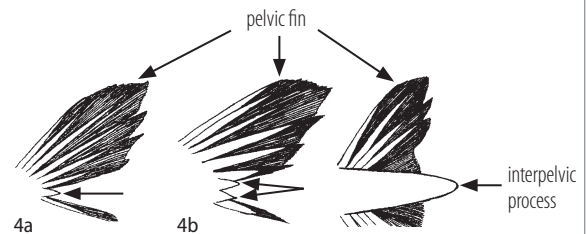


- 3a Body covered with moderately large scales; gill rakers longer than gill filaments, plainly visible through open mouth; no teeth on vomer or palatines *Rastrelliger*

- 3b Body covered with small scales; gill rakers shorter than gill filaments, barely visible through open mouth; teeth present on vomer and palatines *Scomber*

- 4a Two lateral lines, lower joining the upper behind pectoral-fin bases and again at caudal-fin base; interpelvic process single and small; vertebrae 31 *Grammatocygnus*

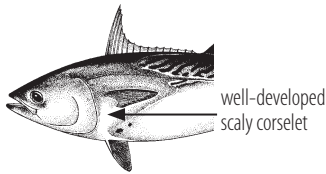
- 4b One lateral line; interpelvic process single or double; vertebrae 41–64 5



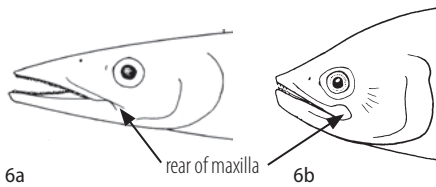
Continued ...

KEY TO GENERA

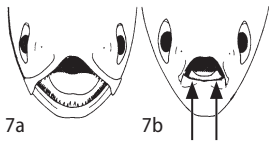
- 5a Teeth in jaws strong, compressed, almost triangular or knife-like; corselet of scales obscure 6
- 5b Teeth in jaws slender, conical, not compressed; corselet of scales well-developed 7



- 6a Snout as long as rest of head; no gill rakers; 1st dorsal fin 23–27 spines; rear end of maxilla concealed under preorbital bone; vertebrae 62–64 *Acanthocybium*
- 6b Snout much shorter than rest of head; GR 1–27; 1st dorsal fin 12–22 spines; rear end of maxilla exposed; vertebrae 41–56 *Scomberomorus*



- 7a Tongue without longitudinal cartilaginous ridges 8
- 7b Tongue with 2 longitudinal cartilaginous ridges 10



- 8a Teeth in jaws tiny, 40–55 on each side of both jaws; GR 70–80 on 1st arch, fine and numerous; body elongate, distance from snout tip to 2nd dorsal-fin origin 61–65% FL; maxilla length 35–38% HL *Allothunnus*

- 8b Teeth in jaws larger and more prominent, 10–30 on each side of both jaws; GR 8–27 on 1st arch; body less elongate, distance from snout tip to 2nd dorsal-fin origin 48–61% FL; maxilla length 43–56% HL 9

- 9a Upper body with 5–10 narrow, dark, longitudinal stripes; no teeth on tongue; jaw teeth moderate; 1st dorsal fin 17–23 spines; interpelvic process small and paired *Sarda*
- 9b No stripes on body; tongue with 2 patches of teeth; jaw teeth large, prominent; 1st dorsal fin 13–15 spines; interpelvic process single and large *Gymnosarda*

- 10a Dorsal fins widely separated, interdorsal space at least equal to length of 1st dorsal-fin base; 1st dorsal fin 10–12 spines; interpelvic process single, as long or longer than longest pelvic-fin ray *Auxis*
- 10b Dorsal fins barely separated, interdorsal space subequal to eye diameter; 1st dorsal fin 12–16 spines; interpelvic process bifid, much shorter than pelvic-fin rays 11

- 11a Belly with 3–5 prominent, dark longitudinal stripes; GR 53–63; vertebrae 41 *Katsuwonus*
- 11b No dark longitudinal stripes on belly; GR 19–45; vertebrae 37–39 12

- 12a Body naked behind corselet of enlarged and thickened scales; several black spots usually present between pectoral- and pelvic-fin bases; dorsum dark blue-green, with complex striped pattern under dorsal-fin bases; pectoral fins 25–29 rays *Euthynnus*
- 12b Body with very small scales behind corselet; no black spots on body; dorsum dark blue without stripes; pectoral fins 30–36 rays *Thunnus*

GENUS *Acanthocybium* Gill 1862

Snout as long as rest of head; teeth in jaws strong, compressed, almost triangular or knife-like; no gill rakers; corselet of scales obscure; 1 lateral line. One species.

***Acanthocybium solandri* (Cuvier 1832)**

Wahoo

PLATE 76

Cybius solandri Cuvier in Cuv. & Val. 1832: 192 [no locality given]

[based on *Scomber lanceolatus* in manuscript by Solander].

Acanthocybium solandri: Munro 1955*; Smith & Smith 1963*;

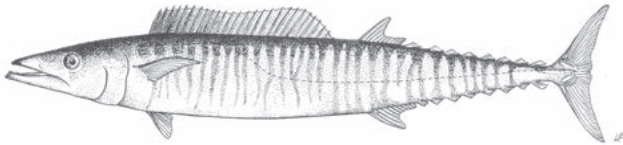
Jones & Silas 1964*; Smith 1964*; Jones & Kumaran 1980*;

Collette & Nauen 1983*; Talwar & Kacker 1984*; Collette & Russo 1985; SSF No. 249.1*; Randall & Anderson 1993; Randall 1995*; Winterbottom & Anderson 1997; Fricke 1999; Collette 2003; Fricke *et al.* 2009.

Diagnosis as for genus. First dorsal fin 23–27 spines; 2nd dorsal fin 11–16 rays + 7–10 finlets; anal fin 11–14 rays + 7–10 finlets; pectoral fins 22–26 rays. Body elongate, fusiform, slightly compressed. Mouth large; teeth strong, triangular, compressed and finely serrate, closely set in 1 row; rear of maxilla completely concealed under preorbital bone. Interpelvic process small and bifid. Peduncle slender, with well-defined median keel and 2 small keels on each side. Lateral line single, abruptly curving downward under 1st dorsal fin. Body covered

with small scales; no anterior corselet developed. Swimbladder present. Vertebrae 30–32 + 31–33 = 62–64.

Body iridescent bluish green dorsally; sides silvery, with 24–30 cobalt-blue vertical bars extending below lateral line, some doubled or Y-shaped (bars dusky grey after death). Attains 200 cm FL, 96 kg.



Acanthocybium solandri. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Almost circumglobal in tropical to subtropical seas, including strays into Mediterranean Sea, but not known from Red Sea. WIO: Arabian Sea to South Africa (Eastern Cape; possibly to Cape Point), Madagascar, Seychelles, Réunion, Mauritius, Maldives, Lakshadweep, India and Sri Lanka.

REMARKS Epipelagic, oceanic; frequently solitary or in small loose aggregations rather than compact schools. Spawning seems to extend over a long period; fish at different stages of maturity frequently caught together. Fecundity relatively high: ~6 million eggs per spawning, estimated for 131-cm female. Feeds on scombrids, porcupinefishes (Diodontidae), flyingfishes (Exocoetidae), herrings and pilchards (Clupeidae), scads (*Decapterus*), lanternfishes (Myctophidae), other pelagic fishes and squids. Few organised fisheries, but highly appreciated when caught, with large catches in WIO reported by Seychelles, India and Sri Lanka; primarily a game fish taken on light to heavy tackle, by surface trolling with spoons, feather lures or strip bait (flying fish or halfbeak). All-tackle gamefish record 83.46 kg, taken off Baja California, in 2005.

GENUS *Allothunnus* Serventy 1948

Body elongate, distance from snout tip to 2nd dorsal-fin origin >60% FL; maxilla length 35–38% HL; teeth in jaws tiny, conical, not compressed; gill rakers fine and numerous; corselet of scales well-developed; 1 lateral line. One species.

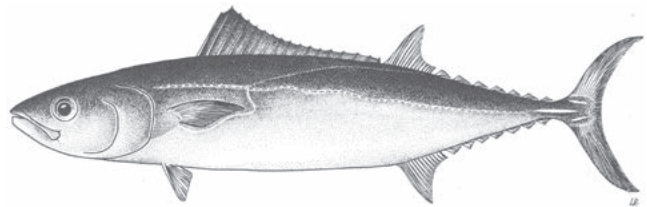
Allothunnus fallai Serventy 1948

Slender tuna

Allothunnus fallai Serventy 1948: 132, Fig. 1 (Timaru, South Island, New Zealand); Talbot 1960, 1964*; Jones & Silas 1964*; Collette & Chao 1975; Collette & Nauen 1983*; SSF No. 249.2*; Collette 2003; Fricke *et al.* 2009.

Diagnosis as for genus. First dorsal fin 15–18 spines; 2nd dorsal fin 12 or 13 rays + 6 or 7 finlets; anal fin 13 or 14 rays + 6 or 7 finlets; pectoral fins 24–26 rays. GR 70–80 (the most of any scombrid). Mouth moderate, upper jaw reaches to below middle of eye; teeth small, conical, 40–55 on each side of both jaws; no teeth on tongue. Dorsal fins close-set. Interpelvic process small, bifid. Peduncle slender, with 2 small keels and well-developed lateral keel. Lateral line slightly undulating. Body covered with small scales above lateral line, with long corselet, but naked ventrally and posteriorly. No swimbladder; liver with 3 subequal lobes. Vertebrae 20 + 19 = 39.

Body plain, without spots or bars. Attains 105 cm FL, ~11.5 kg.



Allothunnus fallai, ~1 m FL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in Southern Hemisphere, between ~20°–50° S, including Réunion to South Africa (Cape Point) in WIO.

REMARKS Epipelagic, oceanic, occasionally schooling. Locally abundant; juveniles mostly encountered between 20°–35° S at surface temperatures of 19–24 °C; with increasing size, fish gradually move into higher latitudes with lower water temperatures. Feeds primarily on krill, but also squids and small fishes. Caught incidentally south of 38° S by longliners fishing for *Thunnus maccoyii*. All-tackle gamefish record 12.24 kg, taken off Chaiten, Chile, in 2017.

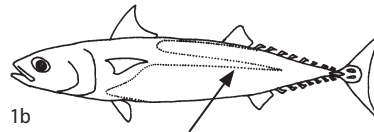
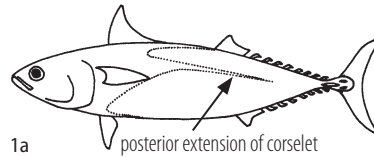
Teeth small and conical, in single series; surface of tongue with 2 longitudinal cartilaginous ridges. Interdorsal space long, at least equal to length of 1st dorsal-fin base. Pectoral fins short; interpelvic process single, large, longer than pelvic fins. Peduncle with strong median keel between 2 smaller keels. Gill rakers present. Body naked except for corselet, which is well-developed posteriorly. No swimbladder. Body bluish, becoming deep purple or almost black on head; belly white, without stripes or spots; pectoral fins and pelvic fins purple, inner sides black.

Epipelagic, neritic and oceanic, in warm waters, with strong schooling behaviour. Spawning likely occurs in several batches of up to 1 million eggs; the most abundant of all tuna larvae. Although larvae tolerate high temperatures (at least 21.6–30.5 °C, the widest range among tuna species studied; optimum range 27–27.9 °C), the species are usually confined to oceanic salinities. Larval records indicate spawning throughout its distribution range, but the spawning season varies with areas, and is correlated with temperature and other environmental factors; in some places it may extend throughout the year. Food primarily selected by size of the fish's gill rakers; feeds on fishes, crustaceans and cephalopods. Preyed upon primarily by large tunas, billfishes, barracudas and various sharks, and cannibalism is widespread. Considered an important element of the food web because of their abundance, particularly as forage for other species of commercial interest. Catches of *Auxis* are usually not identified to species; significant catches in WIO reported by India, Sri Lanka and Maldives. Caught most commonly with rod and line, but other commercial and artisanal gear includes trolling lines, handlines, small-scale longlines, and a wide variety of nets, including traps, drift gillnets, ring nets, beach seines, otter trawls and purse seines. In the purse-seine fisheries for yellowfin and skipjack tunas, *Auxis*, being smaller, become 'gilled' in the webbing and are considered a nuisance. Both species are appreciated as a food fish (canned, flake-dried and smoked), although the quality of the meat deteriorates rapidly after death.

Before 1960, thought to be only one species worldwide — recorded as *Auxis thazard*. Two species, both worldwide in tropical to subtropical seas, including Mediterranean Sea and Black Sea.

KEY TO SPECIES

- 1a Posterior extension of corselet narrow: 1–5 scales wide under 2nd dorsal-fin origin; pectoral fins extend beyond vertical at anterior margin of dorsal scaleless area *A. thazard*
- 1b Posterior extension of corselet much wider: usually 10–15 scales wide under 2nd dorsal-fin origin; pectoral fins do not reach as far as dorsal scaleless area *A. rochei*



Auxis rochei rochei (Risso 1810)

Bullet tuna

PLATE 76

Scomber rochei Risso 1810: 165 (Nice, France, Mediterranean Sea).

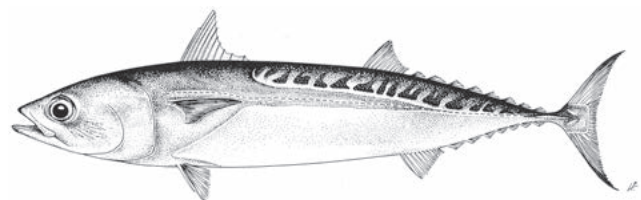
Auxis rochei: Fitch & Roedel 1963; Jones & Kumaran 1980*; Collette & Nauen 1983*; Talwar & Kacker 1984*; SSF No. 249.3*; Randall & Anderson 1993; Randall 1995*.

Auxis thynnoides: Jones & Silas 1964*.

Auxis rochei rochei: Collette & Aadland 1996*; Fricke 1999; Collette 2003.

Diagnosis as for genus. First dorsal fin 10–12 spines; 2nd dorsal fin 10 or 11 rays + 8 finlets; anal fin 13–15 rays + 7 finlets; pectoral fins 23–25 rays. GR 39–49 (usually 41–47). Pectoral fins extend beyond vertical at anterior margin of dorsal scaleless area. Corselet wide posteriorly (10–15 scales wide under 2nd dorsal-fin origin).

Upper body with 15 or more fairly broad, nearly vertical dark bars in scaleless area. Attains 50 cm FL (commonly 15–25 cm FL in Indian Ocean).



Auxis rochei rochei. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate coastal waters, including Mediterranean Sea, except eastern Pacific population recognised as different subspecies. WIO: South Africa (records from Hout Bay, Mossel Bay and KwaZulu-Natal) and India.

REMARKS Fecundity estimates range between 31 000–103 000 eggs per spawning, correlating to size of female. Feeds largely on small fishes, particularly anchovies and other clupeoids. All-tackle gamefish record 1.84 kg, taken off L'Ampolla, Spain, in 2004.

Auxis thazard thazard (Lacepède 1800)

Frigate tuna

PLATE 76

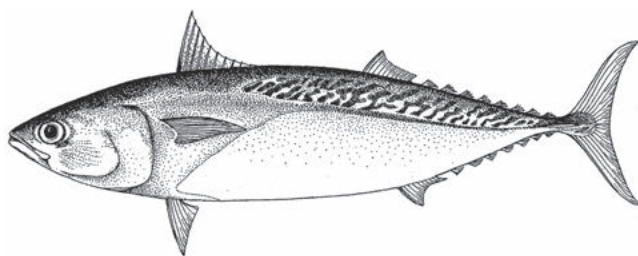
Scomber thazard Lacepède (ex Commerson) 1800: 599 (Moluccas, Indonesia).

Auxis thazard: Fitch & Roedel 1963; Jones & Silas 1964*; Jones & Kumaran 1980*; Collette & Nauen 1983*; Talwar & Kacker 1984*; Randall & Anderson 1993; Randall 1995*.

Auxis thazard thazard: Collette & Aadland 1996*; Fricke 1999; Collette 2003.

Diagnosis as for genus. First dorsal fin 10–12 spines; 2nd dorsal fin 10 or 11 rays + 8 finlets; anal fin 13–15 rays + 7 finlets; pectoral fins 23–25 rays. GR 36–44 (usually 38–42). Pectoral fins short, but reaching past vertical at front margin of scaleless area above corselet, which is well-developed but narrow posteriorly (1–5 scales wide under 2nd dorsal-fin origin).

Upper body with 15 or more narrow, oblique to nearly horizontal, dark wavy lines in the scaleless area above lateral line. Attains ~62 cm FL.



Auxis thazard thazard, ~31 cm FL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate seas, including Mediterranean Sea (but rare), except eastern Pacific population recognised as a different subspecies. WIO: Red Sea, Persian/Arabian Gulf to South Africa (KwaZulu-Natal), Madagascar, Seychelles, Mauritius, Maldives, India and Sri Lanka.

REMARKS Spawning in southern Indian Ocean extends from August to April; north of the equator it is reported from January to April. Matures at 29–35 cm FL. Fecundity of fish in Indian waters was ~200 000 to 1.06 million eggs per spawning, correlating with size of female. All-tackle gamefish record 1.6 kg, taken off Shima Peninsula, Japan, in 2015.

GENUS *Euthynnus* Lütken 1883

Teeth small and conical, in 1 row of ~25–35 on each side of lower jaw, and present on palatines; gill teeth (structures on posterior surface of gill arch) 28–32 on 1st arch. Interdorsal space not wider than eye; anterior spines of 1st dorsal fin much higher than those midway, giving fin a strongly concave outline; 2nd dorsal fin much lower than 1st, and followed by 8–10 finlets. Pectoral fins short, never reaching interdorsal space. Interpelvic process small and bifid. Peduncle slender, with prominent lateral keel between 2 small keels at base of caudal fin. Scales present on interpelvic area and lateral line, body otherwise naked behind corselet of enlarged and thickened scales. No swimbladder. Worldwide in tropical and subtropical, primarily coastal waters. Three species with hardly any geographical overlap; 1 species throughout Indo-Pacific, including WIO.

Euthynnus affinis (Cantor 1849)

Kawakawa

PLATE 76

Thynnus affinis Cantor 1849: 1088 (Strait of Malacca, Indian Ocean).

Euthynnus alletteratus (non Rafinesque): Smith 1965*.

Euthynnus affinis: Munro 1955*; Smith & Smith 1963*; Williams 1963, 1964; Kuronuma & Abe 1972*; Jones & Kumaran 1980*; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; SSF No. 249.4*; Randall & Anderson 1993; Randall 1995*;

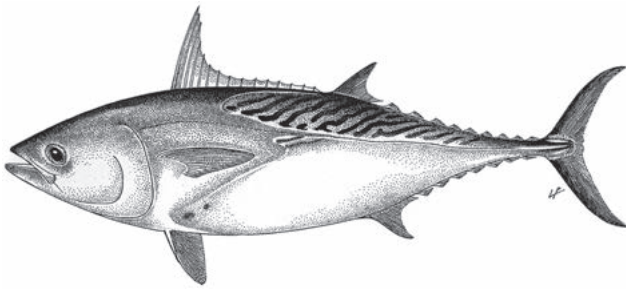
Winterbottom & Anderson 1997; Fricke 1999; Collette 2003.

Euthynnus affinis affinis: Jones & Silas 1964*.

First dorsal fin 15–17 spines; 2nd dorsal fin 12 or 13 rays + 8 finlets; anal fin 13 or 14 rays + 7 finlets; pectoral fins 26–29 rays. GR 6–9/23–26 = 29–35; gill teeth 28–29.

Vomerine with patch of teeth. Vertebrae 20 + 19 = 39; no trace of vertebral protuberances, but bony keels on vertebrae 33 and 34, underlying the external fleshy keels.

Body dark blue or iridescent green dorsally, with complicated striped pattern not extending forward beyond middle of 1st dorsal fin; lower sides and belly silvery white, without dark longitudinal stripes; several characteristic dark spots usually present between pelvic fins and pectoral fins. Attains 100 cm FL (commonly ~60 cm FL), ~15 kg.



Euthynnus affinis. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific, including oceanic islands and archipelagos. WIO: Persian/Arabian Gulf, Red Sea, Arabian Sea to South Africa (Cape St Francis, Eastern Cape), Madagascar, Maldives, Lakshadweep, India and Sri Lanka.

REMARKS Epipelagic and neritic; inhabits waters with temperatures of 18–29 °C. Forms multispecies schools with other scombrids. Sexually mature fish encountered throughout the year. Feeds indiscriminately on fishes (especially clupeoids and atherinids), shrimps and cephalopods; preyed upon by large tunas, marlins and sharks. Large landings in WIO reported by India; taken primarily with gillnets, purse seines and trolling, and occasionally by beach seines and longlines. The meat is of good quality when fresh but deteriorates quickly if not treated adequately. All-tackle gamefish record 15.05 kg, taken at Molokai, Hawaii, in 2014.

GENUS *Gasterochisma* Richardson 1845

Body covered with large cycloid scales; no anterior corselet; pelvic fins huge in juveniles, proportionally smaller at larger sizes, and depressible into groove at all sizes. One species.

Gasterochisma melampus (Richardson 1845)

Butterfly kingfish

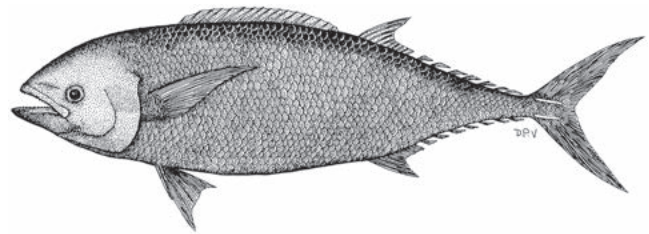
PLATE 76

Gasterochisma melampus Richardson 1845: 346 (Port Nicholson, New Zealand); Barnard 1927; Jones & Silas 1964*; Warashina & Hisada 1972; Collette & Nauen 1983*; Kohno 1984; Ito *et al.* 1994*; Collette 2003.

Diagnosis as for genus. First dorsal fin 17 or 18 spines, 10 or 11 rays + 6 or 7 finlets; anal fin 11 or 12 rays + 6 or 7 finlets; pectoral fins 19–22 rays. GR 25. Mouth moderate, upper jaw

not reaching to below eye. Teeth small, conical, 31–35 on each side of upper jaw, 26–30 on lower jaw; vomer with patch of teeth; palatines with ~11 teeth; no teeth on tongue. Interdorsal space wide in adults. Pelvic fins enormous in juveniles, longer than HL, growth of fins continuing until ~70 cm FL, then remaining approximately constant; pelvic fins fitting into deep ventral groove at all sizes; interpelvic process tiny and bifid. Peduncle slender, with 2 small keels on each side. Swimbladder present. Vertebrae 21 + 23 = 44.

Body deep blue dorsally, silvery grey on sides, silvery ventrally. Attains at least 195 cm FL.



Gasterochisma melampus, 125 cm TL (South Africa). Source: SSF

DISTRIBUTION Circumglobal in Southern Ocean, mostly between ~35°–50° S, but to 26° S in southeastern Indian Ocean.

REMARKS Epipelagic and oceanic; most abundant in waters with sea surface temperatures of 8–10 °C, south of the subtropical convergence zone. Taken as bycatch by longliners fishing for *Thunnus maccoyii*. All-tackle gamefish record 41.35 kg, off Portland, Victoria, Australia, in 2012.

GENUS *Grammatorcynus* Gill 1862

Body elongate, slightly compressed. Mouth relatively small, upper jaw reaching about to middle of eyes; ~20–30 slender conical teeth on both jaws; patches of fine teeth on palatines and vomer; rectangular patch of small sharp teeth on tongue. Interpelvic process single and small. Peduncle slender, with well-developed median keel between 2 smaller keels. Two lateral lines: first line from opercle to lateral caudal keel (the usual position among scombrids); second line branches from first line under 3rd spine of 1st dorsal fin, running below pectoral fin, and joining the upper line again at about level of last dorsal finlet. Body covered with moderately small scales; no prominent anterior corselet. Swimbladder present. Two species, 1 in WIO.

Grammatorcynus bilineatus (Rüppell 1836)

Double-lined mackerel

PLATES 76 & 77

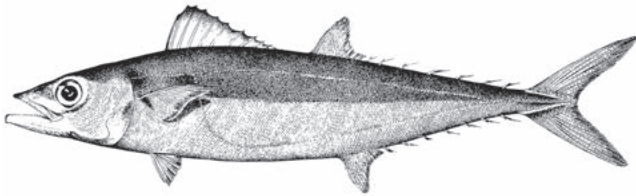
Thynnus bilineatus Rüppell 1836: 39, Pl. 12, Fig. 2 (Massawa, Eritrea, Red Sea).*Grammatorcynus bicarinatus* (non Quoy & Gaimard 1825):

Jones & Silas 1964*; Jones & Kumaran 1980*; Talwar & Kacker 1984.

Grammatorcynus bilineatus: Collette 1983, 2003; Collette & Nauen 1983*; Collette & Gillis 1992*.

First dorsal fin 11–13 spines; 2nd dorsal fin 10–12 rays + 6 or 7 finlets; anal fin 11–13 rays + 5–7 (usually 6) finlets; pectoral fins 22–26 rays. GR 18–24. Eyes large, ~4–6% FL. Vertebrae 12 + 19 = 31.

Upper body metallic blue-green, belly silvery white with golden tinge, and usually lacking spots ventrally. Attains 63 cm FL, ~3.3 kg.

*Grammatorcynus bilineatus*. Source: Collette & Nauen 1983

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea and Gulf of Aden; elsewhere, Andaman Sea, Java Sea, Philippines, Ryukyu Is., Caroline Is., Marshall Is., New Guinea, Solomon Is., northern Australia, New Caledonia and Fiji.

REMARKS Often confused with *G. bicarinatus* (Quoy & Gaimard 1825) from western Pacific in literature before 1983. Epipelagic; found mostly in shallow reef waters where it forms large schools. Probably matures at ~40–43 cm FL. Food includes the larvae and adults of crustaceans and fishes, particularly clupeoids. Caught by hook-and-line in minor artisanal fisheries and incidentally by trolling in some areas. Flesh mild and pleasantly flavoured if the kidney is removed before cooking to avoid an ammonia smell. All-tackle gamefish record 3.3 kg, taken off Willis Island, Queensland, Australia, in 2006.

GENUS *Gymnosarda* Gill 1862

Teeth on jaws large, conical and barely compressed; no longitudinal cartilaginous ridge on surface of tongue; corselet of scales well-developed; interpelvic process single and large. One species.

Gymnosarda unicolor (Rüppell 1836)

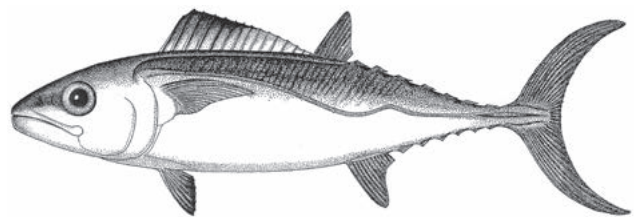
Dogtooth tuna

PLATE 77

Thynnus (Pelamis) unicolor Rüppell 1836: 40, Pl. 12, Fig. 1 (Jeddah, Saudi Arabia, Red Sea).*Pelamis nuda* Günther 1860: 368 [replacement name for *Thynnus unicolor* Rüppell 1836, preoccupied by *Scomber unicolor* Geoffroy-St Hilaire 1817, when both species were placed in *Pelamis*].*Gymnosarda unicolor*: Smith 1957*; Smith & Smith 1963*; Jones & Silas 1964*; Collette & Chao 1975; Jones & Kumaran 1980*; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; SSF No. 249.6*; Randall & Anderson 1993; Randall 1995*; Winterbottom & Anderson 1997; Fricke 1999; Collette 2003.

Diagnosis as for genus. First dorsal fin 13–15 spines; 2nd dorsal fin 12–14 rays + 6–8 finlets; anal fin 12 or 13 rays + 6 finlets; pectoral fins 25–28 rays. GR 11–14. Mouth fairly large, upper jaw reaching to middle of eyes; 14–31 large conical teeth on upper jaw, 10–24 on lower jaw; 2 patches of teeth on tongue; laminae of olfactory rosette 48–56; interorbital width 32–40% HL. Dorsal fins close together, distal margin of 1st dorsal fin almost straight. Lateral line strongly undulating. Body naked behind corselet except for scales on lateral line, dorsal-fin base and caudal keel. Swimbladder large; spleen visible in ventral view on right side of body in front half of visceral cavity; liver with elongate left and right lobes and short middle lobe. Vertebrae 19 + 19 = 38.

Upper sides of body brilliant blue-black, lower sides and belly silvery without lines, spots or other markings; leading edge of 1st dorsal fin dark, other fins greyish. Attains 247 cm FL (commonly 150 cm FL, ~80 kg).

*Gymnosarda unicolor*. Source: Collette & Nauen 1983

DISTRIBUTION Indo-Pacific (disjunct). WIO: Red Sea, Tanzania to South Africa (KwaZulu-Natal), Madagascar, Comoros, Aldabra, Seychelles, Mauritius, Lakshadweep, southern India and Sri Lanka; elsewhere, Philippines, southern Japan, New Guinea, Australia, Great Barrier Reef, and islands of Oceania.

REMARKS Epipelagic, mainly offshore, usually around coral reefs and in water temperatures of 20–28 °C. Generally solitary or in very small groups (up to ~6). Voracious predator on

small schooling fishes (such as scads) and squids. No directed fisheries but regularly caught in artisanal and recreational fisheries in small numbers during certain seasons, usually by handline, pole-and-line or surface trolling. Matures at ~65 cm FL. All-tackle gamefish record 107.5 kg, taken off Dar es Salaam, Tanzania, in 2015.

GENUS *Katsuwonus* Kishinouye 1915

Dorsal fins barely separated; surface of tongue with 2 longitudinal cartilaginous ridges; interpelvic process short and bifid. One species.

Katsuwonus pelamis (Linnaeus 1758)

Skipjack tuna

PLATE 77

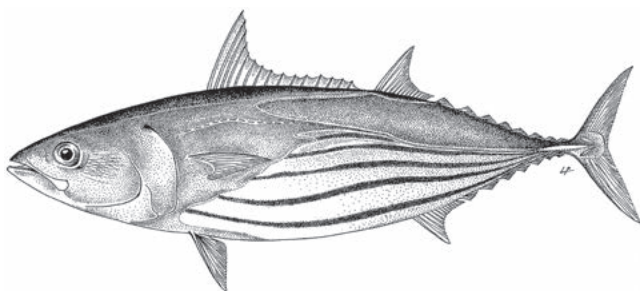
Scomber pelamis Linnaeus 1758: 297 ('Pelagic, between the tropics').

Katsuwonus pelamis: Munro 1955*; Jones & Silas 1964*; Williams 1964; Jones & Kumaran 1980*; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; SSF No. 249.7*; Randall & Anderson 1993; Randall 1995*; Winterbottom & Anderson 1997; Fricke 1999; Collette 2003.

Euthynnus pelamis: Smith 1961*; Smith & Smith 1963*.

Diagnosis as for genus. First dorsal fin 14–16 spines; 2nd dorsal fin 14 or 15 rays + 7–9 finlets; anal fin 14 or 15 + 7 or 8 finlets; pectoral fins 26–28. GR 16–21/34–41 = 53–63. Teeth small and conical. Interdorsal space not larger than eye diameter. Body scaleless except for corselet and lateral line. No swimbladder. Vertebrae 20 + 21 = 41.

Body dark purplish blue dorsally, lower sides and belly silvery, with 4–6 conspicuous dark longitudinal bands (may appear as discontinuous lines of dark blotches in live specimens). Attains 111 cm FL, ~34.5 kg (commonly ~80 cm FL, ~10 kg).



Katsuwonus pelamis. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate seas, including western Mediterranean Sea. Entire WIO region: Oman to South Africa and to India and Sri Lanka, including Red Sea and Persian/Arabian Gulf.

REMARKS Epipelagic and oceanic; adults distributed roughly within the 15 °C isotherm, with overall temperature range ~14.7–30 °C. Aggregations tend to be associated with convergences or boundaries between cold- and warm-water masses (such as polar fronts), upwellings and other hydrographical discontinuities. Occurs from surface to ~330 m deep during daytime, and limited to near surface waters at night. Strong tendency to school in surface waters in association with birds, drifting objects, sharks, whales or other tuna species, and may show characteristic behaviours (jumping, feeding, foaming, etc.). Fast-growing and short-lived. Fecundity increases with size but is highly variable; number of eggs per season in females ~41–87 cm FL ranges from 80 000 to 2 million. In the absence of reliable age-determination methods, estimates of longevity vary from 8–12 years. Feeds on fishes, crustaceans and molluscs; principal predators are billfishes and other tunas. Important in commercial fisheries throughout its range and has come to replace yellowfin tuna *Thunnus albacares* as the dominant tuna species. The target of a major seasonal purse-seine fishery in Chagos waters (Winterbottom & Anderson 1997); taken at the surface, mostly with purse seines and pole-and-line gear but also incidentally by longlines; artisanal gear includes gillnets, traps, harpoons and beach seines. The catch has increased greatly with the introduction of fish aggregating devices (FADs) in recent years.

GENUS *Rastrelliger* Jordan & Starks 1908

Snout pointed; adipose eyelid covers front and hind margins of eyes; teeth on both jaws small and conical, none on vomer or palatines. Interdorsal space wide, at least equal to length of 1st dorsal-fin base; pectoral fins short; anal-fin spine rudimentary. Interpelvic process single and small. Peduncle with 2 small keels on each side at caudal-fin base (no median keel). Gill rakers very long, and plainly visible through open mouth; last branchiostegal ray forms wide plate. Scales behind head and around pectoral fins more conspicuous than those covering rest of body, but no well-developed corselet. Swimbladder present. First interhaemal bone anterior to haemal spine of 14th vertebra. Body blue-green dorsally, with 2 rows of small dark spots at dorsal-fin bases, and sides

and belly silvery, sometimes with several narrow horizontal stripes (but no vertical zigzagged or wavy lines as in *Scomber*). Three species, in Indo-Pacific, only 1 extending into WIO. Records of *R. brachysoma* (Bleeker 1851) in WIO are based on misidentifications of *R. kanagurta*; the deep-bodied *R. brachysoma* (body depth greater than HL) is not known west of the east coast of India.

Rastrelliger kanagurta (Cuvier 1816)

Indian mackerel

PLATE 77

Scomber kanagurta Cuvier 1816: 313 [Visakhapatnam, India].

Scomber chrysozonus Rüppell 1836: 37, Pl. 11, Fig. 1 (Massawa, Eritrea, Red Sea).

Scomber microlepidotus Rüppell 1836: 38, Pl. 11, Fig. 2 (Massawa, Eritrea, Red Sea).

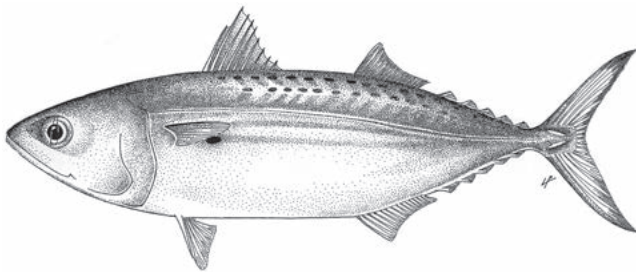
Rastrelliger kanagurta: Munro 1955*; Smith & Smith 1963*; Jones & Silas 1964*; Smith 1965*; Matsui 1967; Kuronuma & Abe 1972*; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; SSF No. 249.8*;

Randall & Anderson 1993; Randall 1995*; Fricke 1999; Collette 2003.

Rastrelliger brachysoma (non Bleeker 1851): Smith 1965.

First dorsal fin 8–10 spines; 2nd dorsal fin 12 rays + 5 finlets; anal fin 1 spine, 12 rays + 5 finlets; pectoral fins 19 or 20 rays. GR 30–46 on lower limb of 1st arch (fish >5 cm FL). Body moderately deep, depth at margin of gill cover 4.3–5.2 in FL; head longer than body depth. Maxilla partly concealed, covered by lachrymal, but extending to near rear margin of eye. Moderate number of bristles on longest gill raker (105 bristles on one side in 12.7-cm specimen, 140 in 16-cm specimen, and 160 in 19-cm-FL specimen). Intestine length 1.4–1.8 in FL. Vertebrae 13 + 18 = 31.

Upper body with narrow dark longitudinal bands (golden in fresh specimens) and black spot on body near lower margin of pectoral fins; dorsal fins pale yellowish, with black tips; caudal fin and pectoral fins yellowish; anal and pelvic fins dusky. Attains 35 cm FL (commonly ~25 cm FL).



Rastrelliger kanagurta. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to South Africa (KwaZulu-Natal) and Seychelles; Lessepsian immigrant in Mediterranean Sea; elsewhere to east coast of India, Indonesia, China, Ryukyu Is., Melanesia, Micronesia, northern Australia and Samoa.

REMARKS Epipelagic and neritic; occurs where surface temperatures exceed 17 °C. Schools by size. Spawning season around India seems to extend from March through September. Juveniles feed on phytoplankton (diatoms) and small zooplankton, such as cladocerans, ostracods and larval polychaetes; adults feed primarily on macroplankton, such as larval shrimps and fishes. Longevity presumably at least 4 years. Commercially important in many parts of its range, but catches are usually recorded as *Rastrelliger* spp. or combined with *R. brachysoma*; caught with purse seines, encircling gillnets, lift nets and bamboo stake traps.

GENUS *Sarda* Cuvier 1829

Mouth moderately large; both jaws with 8–21 large and conical teeth, palatines with 1 row of small conical teeth, no teeth on tongue; laminae of olfactory rosette 21–39. Dorsal fins close together, distal margin of 1st dorsal fin straight; pectoral fins short. Interpelvic process paired and small. Lateral line single, gradually curving down towards peduncle. Body entirely covered with very small scales posterior to corselet. No swimbladder; spleen large and prominent in ventral view, located in rear half of visceral cavity; liver with elongate left and right lobes and short middle lobe. Three allopatric species, 2 in WIO.

KEY TO SPECIES

- | | | |
|----|--|-------------------------|
| 1a | First dorsal fin 20–23 spines; GR 16–23 on 1st arch; vertebrae 50–55 | <i>Sarda sarda</i> |
| 1b | First dorsal fin 17–19 spines; GR 8–13 on 1st arch; vertebrae 44–45 | <i>Sarda orientalis</i> |

Sarda orientalis (Temminck & Schlegel 1844)

Striped bonito

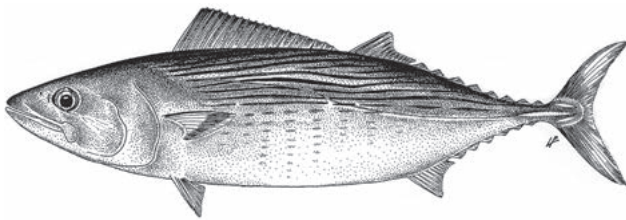
PLATE 77

Pelamys orientalis Temminck & Schlegel 1844: 99, Pl. 52 (Japan).

Sarda orientalis: Smith & Smith 1963*; Jones & Silas 1964*; Silas 1964; Smith 1965*; Collette & Chao 1975; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; SSF No. 249.9*; Randall 1995*; Fricke 1999; Collette 2003.

First dorsal fin 17–19 spines; 2nd dorsal fin 14–17 rays + 7–9 finlets; anal fin 14–16 rays + 6 or 7 finlets; pectoral fins 23–26 rays. GR 8–13. Teeth on jaws conical, moderately large; 12–20 on each side of upper jaw, and 10–17 on each side of lower jaw; no teeth on vomer; supramaxilla narrow. Length of 1st dorsal-fin base 28–33% FL. Vertebrae 23–25 + 20–22 = 44–45.

Dorsum with 5–10 slightly oblique dark stripes running forward and downward. Attains 102 cm FL (commonly 30–50 cm FL).



Sarda orientalis. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (widespread but patchy). WIO: Gulf of Oman, Red Sea and Gulf of Aden to South Africa (Cape St Francis), Madagascar, Comoros, Aldabra, Seychelles, India and Sri Lanka.

REMARKS Epipelagic, neritic; occurs in water temperatures of ~13.5–23 °C, often schooling with small tunas. Biology poorly known: off southwestern India, fully mature individuals are found from May to September, followed by juveniles from October to November; occurs throughout the year off southern and southwestern Sri Lanka, with mature fish prevailing between September and February, and juveniles off western Sri Lanka from June to August. Feeds on clupeoids and other fishes, cephalopods and decapod crustaceans. Fisheries not well-developed, but mainly artisanal and caught with various gears, as well as on hook-and-line recreationally. All-tackle gamefish record 10.65 kg, caught at Mahé, Seychelles, in 1975.

Sarda sarda (Bloch 1793)

Atlantic bonito

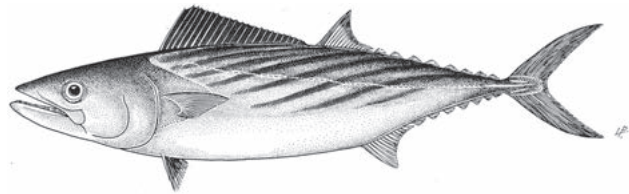
PLATE 77

Scomber sarda Bloch 1793: 44, Pl. 334 ('Europe').

Sarda sarda: Barnard 1927; Moltano 1948; Smith 1965*; Collette & Chao 1975; Yoshida 1980; Collette & Nauen 1983*; SSF No. 249.10*; Collette 2003.

First dorsal fin 20–23 spines; 2nd dorsal fin 14–17 rays + 7–9 finlets; anal fin 14–17 rays + 6–8 finlets; pectoral fins 23–26 rays. GR 16–23. Teeth on jaws conical, moderately large; 16–26 on each side of upper jaw, and 12–24 on each side of lower jaw; a few small teeth often on middle of expanded part of vomer; supramaxilla intermediate in width. Length of 1st dorsal-fin base 29–33% FL. Vertebrae 26–28 + 23–27 = 50–55 (the most among *Sarda* species).

Dorsum with 5–10 oblique dark stripes running forward and downward. Attains 85 cm FL (commonly ~50 cm FL, ~2 kg).



Sarda sarda. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Mediterranean Sea, Black Sea, Atlantic and southwestern Indian oceans; eastern Atlantic distribution extends from Norway to the Cape Peninsula, South Africa, and to the Eastern Cape in WIO.

REMARKS Epipelagic and neritic; occurs in water temperatures of ~12–27 °C, schooling with small tunas. Fast-growing and abundant in many areas. Preys on small fishes, especially clupeoids, and cephalopods and decapod crustaceans. Important food fish, caught with purse seines, trolling lines, set nets, trap nets, trammel nets and beach seines, as well as on hook-and-line in recreational fisheries. All-tackle gamefish record 8.3 kg, caught at Azores, in 1953.

GENUS *Scomber* Linnaeus 1758

Snout pointed; adipose eyelid covers front and hind margins of eyes; teeth small and conical on both jaws, and present on vomer and palatines. Dorsal fins widely separated; pectoral fins short, interpelvic process single and small; peduncle

with 2 small keels on each side at caudal-fin base (no median keel). Gill rakers shorter than gill filaments and barely visible through open mouth; last branchiostegal ray slightly flattened but not forming wide plate. Body entirely covered with small scales; scales behind head and around pectoral fins larger and more conspicuous, but no well-developed corselet. Vertebrae 31. Plankton-feeders that filter copepods and other crustaceans, but adults also prey on small fishes and squids. Commonly caught with purse seines but also with lampara nets, set nets, gillnets, trolling lines, longlines, handlines, midwater trawls and beach seines; marketed fresh, frozen, canned, smoked and salted. Four species (Collette *et al.* 2001), 3 in WIO.

KEY TO SPECIES

- | | | |
|----|---|-------------------------|
| 1a | Dorsal-fin spines 10–13; distance from last spine to 2nd dorsal-fin origin greater than distance between first and last dorsal-fin spines; 15–20 interneural bones under 1st dorsal fin | <i>S. australasicus</i> |
| 1b | Dorsal-fin spines 9 or 10; distance from last dorsal-fin spine to 2nd dorsal-fin origin less than distance between first and last dorsal-fin spines; 12–15 interneural bones under 1st dorsal fin | 2 |
| 2a | Belly usually with clear pattern of spots or broken wavy lines, but occasionally unmarked; teeth strongly crenulate | <i>S. colias</i> |
| 2b | Belly usually unmarked or only lightly marked; teeth weakly crenulate | <i>S. japonicus</i> |

Scomber australasicus Cuvier 1832

Blue chub mackerel

PLATE 78

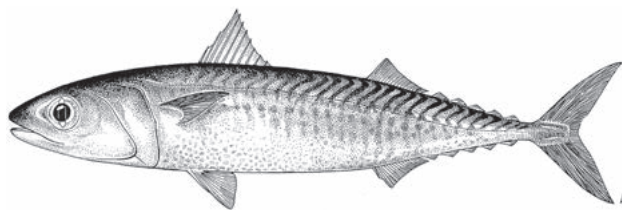
Scomber australasicus Cuvier in Cuv. & Val. 1832: 49 (King George Sound, Western Australia); Collette & Nauen 1983*; Baker & Collette 1998; Scoles *et al.* 1998; Collette *et al.* 2001; Collette 2003.

Scomber japonicus (*non* Houttuyn 1782): Dor 1984; Randall 1995*.

First dorsal fin 10–13 spines; 2nd dorsal fin 12 rays + 5 finlets; anal fin 1 spine, 12 rays + 5 finlets; pectoral fins 18–21 rays. GR 25–35 on lower limb of 1st arch. Palatine narrow, palatine teeth in single or double row; when double, rows are close-set and running into each other. Space between 1st dorsal-fin groove and 2nd dorsal fin about equal to length of groove; distance from 10th spine to 2nd dorsal-fin origin greater than distance between 1st and 10th spine. Anal-fin origin clearly more posterior than 2nd dorsal-fin origin (about opposite 4th ray of 2nd dorsal fin); anal-fin spine separate from fin. First haemal spine behind first interneural process; 15–20 interneural bones under 1st dorsal fin, and 30–33 total

interneural bones under 1st plus 2nd dorsal fins. Swimbladder present. Vertebrae 14 + 17 = 31.

Dorsum blue, with oblique zigzags and undulations; belly pearly white, marked with thin wavy broken lines that appear as speckling in places. Attains 40 cm FL (commonly ~30 cm FL).



Scomber australasicus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (isolated populations; see Remarks). WIO: Red Sea and Gulf of Aden to southern Persian/Arabian Gulf.

REMARKS Epipelagic, neritic, and also oceanic, to ~300 m deep; relatively rare in tropical waters. Schools by size, sometimes with mackerels and sardines. Populations in the Red Sea and northern Indian Ocean formerly considered *S. japonicus* have been re-identified as this species. Four isolated populations are known: Red Sea to Persian/Arabian Gulf in WIO; Australia and New Zealand in western Pacific; China and Japan to Hawaii in western and central Pacific; and Socorro I. off Mexico in eastern Pacific Ocean. The Red Sea–WIO population differs genetically from the Pacific populations (Scoles *et al.* 1998). All-tackle gamefish record 2.14 kg, caught off Hibiscus Coast, New Zealand, in 2011.

Scomber colias Gmelin 1789

Atlantic chub mackerel

PLATE 78

Scomber colias Gmelin 1789: 1329 (Sardinia, Italy, Mediterranean Sea).

Scomber capensis Cuvier in Cuv. & Val. 1832: 56 (Cape of Good Hope, South Africa).

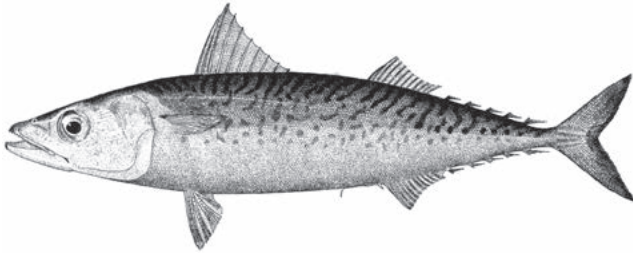
Scomber gigas Fowler 1935: 378, Fig. 16 (Durban, KwaZulu-Natal, South Africa).

Scomber japonicus (*non* Houttuyn 1782): SSF No. 249.11*; Baker & Collette 1998.

Dorsal fin 9 or 10 spines, 9–13 rays + 5 finlets; anal fin 1 spine, 9–11 rays + 5 finlets; pectoral fins 17–21 rays. GR 25–35 on lower limb of 1st arch. Palatine narrow, palatine teeth in single or double row; mandibular and premaxillary teeth strongly crenulated. Distance from last dorsal spine to 2nd dorsal-fin origin less than distance between first and last spine. Anal-fin origin opposite 2nd dorsal-fin origin or

somewhat more posterior; anal-fin spine conspicuous, clearly separate from anal-fin rays but joined to them by membrane. First haemal spine behind first interneural process; 12–15 interneural bones under 1st dorsal fin, 26–29 total interneural bones under 1st plus 2nd dorsal fins. Swimbladder present. Vertebrae 14 + 17 = 31.

Back with oblique zigzags and undulations; belly pearly white and usually marked by broken wavy lines or several fairly large spots. Attains 65 cm FL (commonly ~30 cm FL).



Scomber colias. Source: Collette 2002

DISTRIBUTION Widespread but discontinuous: western and eastern Atlantic (common), extending to South Africa in WIO (from Cape of Good Hope [fairly common] to Thukela Bank, KwaZulu-Natal [scarcer]), Mediterranean Sea and Black Sea, but replaced by *S. japonicus* elsewhere in Indo-Pacific.

REMARKS Previous records of *S. japonicus* in WIO are re-identified as *S. colias* based on recent DNA barcoding. Coastal pelagic, from surface to ~300 m deep; schools by size. Important to commercial fisheries, and abundant in many parts of its range. IUCN Red List conservation status Near Threatened in Mediterranean Sea.

Scomber japonicus Houttuyn 1782

Pacific chub mackerel

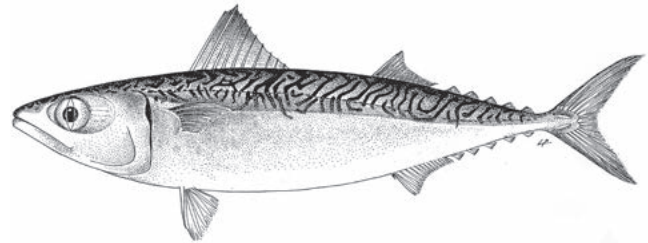
PLATE 78

Scomber japonicus Houttuyn 1782: 331 (Nagasaki, Japan); Collette & Nauen 1983*; SSF No. 249.11*; Baker & Collette 1998; Scoles *et al.* 1998; Collette *et al.* 2001; Collette 2003.

First dorsal fin 9 or 10 spines; 2nd dorsal fin 12 rays + 5 finlets; anal fin 1 spine, 12 rays + 5 finlets; pectoral fins 19–21 rays. GR 25–35 on lower limb of 1st arch. Palatine narrow, palatine teeth in single or double row; mandibular and premaxillary teeth weakly crenulated. Distance from last dorsal-fin spine to origin of 2nd dorsal fin less than distance between first and last spines. Anal-fin origin opposite 2nd dorsal-fin origin

or somewhat more posterior; anal-fin spine conspicuous, separate from anal-fin rays but joined to rays by membrane. Swimbladder present. First haemal spine behind first interneural process; 13–16 interneural bones under 1st dorsal fin, 26–29 total interneural bones under 1st plus 2nd dorsal fins. Vertebrae 14 + 17 = 31.

Dorsum with oblique zigzags and undulations; belly pearly white, usually unmarked or only lightly marked with lines. Attains 50 cm FL (commonly ~30 cm FL).



Scomber japonicus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Antitropical: separate populations in southwestern Indian Ocean, and in northwestern, northeastern and southeastern Pacific, but replaced in Atlantic by *S. colias*. WIO: South Africa, Mozambique, Madagascar and India; elsewhere, Philippines, Taiwan, Korea and Japan.

REMARKS Mostly coastal pelagic, from surface to ~300 m deep. Caught in small-scale driftnet operations off southwestern India. All-tackle gamefish record 2.17 kg, taken at Guadalupe I., Mexico, in 1986.

GENUS *Scomberomorus* Lacepède 1801

Body elongate, strongly compressed; snout much shorter than rest of head; rear part of maxilla exposed, reaching to vertical from rear margin of eye. Teeth strong, compressed, almost triangular or knife-like; 5–38 teeth on both jaws; patches of fine teeth on palatines and vomer; no teeth on tongue. Interpelvic process small and bifid. Gill rakers present. Lateral line single, gradually curving downwards to peduncle or abruptly bent down under 1st or 2nd dorsal fin. Body entirely covered with small scales (no anterior corselet of enlarged scales). No swimbladder (except in *S. sinensis* [Lacepède 1800] from western Pacific). Total vertebrae 41–56. Coastal, within the 20 °C isotherm in both hemispheres; 18 species, 5 in WIO.

KEY TO SPECIES

- 1a Lateral line with deep slope below 2nd dorsal fin; GR 1–8; vertebrae 42–46 *S. commerson*
- 1b Lateral line straight or descending gradually backwards; GR 7–15; vertebrae 44–56 2
- 2a Lateral line with many small auxiliary branches anteriorly; sides with several rows of small dark spots 3
- 2b Lateral line without auxiliary branches or with only few anteriorly; sides with short straight lines or wavy markings, and with or without small spots 4
- 3a Dorsal fin 15–18 spines (usually ≥ 16); intestine with 2 folds and 3 limbs; vertebrae 47–52; HL 20–22% FL; body depth 23–25% FL *S. guttatus*
- 3b Dorsal fin 14–17 spines (usually 14 or 15); intestine with 4 folds and 5 limbs; vertebrae 46–47; HL 19.7–20.4% FL; body depth 24–27% FL *S. koreanus*
- 4a Sides of body with series of short straight stripes and few, if any, spots; GR usually ≤ 11 ; 2nd dorsal fin 15–22 rays (rarely 21 or 22; usually ≤ 18) *S. lineolatus*
- 4b Sides of body with series of short wavy markings and many small spots; GR usually ≥ 12 ; 2nd dorsal fin 19–21 rays (usually ≥ 20) *S. plurilineatus*

Scomberomorus commerson (Lacepède 1800)Narrow-barred Spanish mackerel PLATE 78*Scomber commerson* Lacepède 1800: 598, Pl. 20, Fig. 1 [no locality given].*Scomber commersonii*: Shaw 1803*.*Scomber maculosus* Shaw 1803: 592 (Visakhapatnam, India).*Cybiom commersoni*: Munro 1955*.*Scomberomorus commerson*: Smith & Smith 1963*; Jones & Silas 1964*; Williams 1964; Smith 1965*; Collette & Nauen 1983*; Dor 1984; Talwar & Kacker 1984*; Collette & Russo 1985*; SSF No. 249.12*; Randall & Anderson 1993; Randall 1995*; Winterbottom & Anderson 1997; Fricke 1999; Collette 2003.*Scomberomorus commersoni*: Kuronuma & Abe 1972*.

First dorsal fin 15–18 spines; 2nd dorsal fin 15–20 rays + 8–11 finlets; anal fin 16–21 rays + 7–12 finlets; pectoral fins 21–24 rays. GR 0–2/1–8 = 1–8. Lateral line abruptly bent downwards below rear of 2nd dorsal fin. Intestine with 2 folds and 3 limbs. Vertebrae 42–46.

Sides silvery grey, with darker grey transverse bars; bars narrow and slightly wavy, sometimes breaking up into spots ventrally: 40–50 bars in adults, usually < 20 in juveniles (fish < 45 cm FL); cheeks and lower jaw silvery white; 1st dorsal

fin bright blue (rapidly fading to blackish blue after death); pectoral fins pale grey (turning to blackish blue); 2nd dorsal fin, caudal-fin lobes, anal fin and all finlets pale greyish white (turning to dark grey); juveniles with anterior membranes of 1st dorsal fin jet black, and pure white posteriorly. Attains 230 cm FL (commonly ~ 90 cm FL).

*Scomberomorus commerson*, 25 cm FL, juvenile (Philippines).

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

*Scomberomorus commerson*, 97 cm FL, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (widespread) and Lessepsian migrant to Mediterranean Sea. WIO: Madagascar, Comoros, South Africa (False Bay) to Red Sea, Oman, Persian/Arabian Gulf, Pakistan, India and Sri Lanka; elsewhere to Andaman Sea, Indonesia, Philippines, China, Japan, New Guinea, Solomon Is., Australia, Tasmania and Fiji.

REMARKS Epipelagic, neritic; solitary or found in small schools, and known to undertake lengthy longshore migrations, but permanently resident populations probably exist. Spawning season extends from October to July off coast of East Africa, from December to February off Madagascar, and from May to July off Tamil Nadu, India. Feeds primarily on small fishes, particularly anchovies and clupeids, but also small carangids, ponyfish, squids and penaeid shrimps; probably feeds during both day and night. Targeted in commercial, artisanal and recreational fisheries throughout its range. An important drift gillnet fishery exists in India; other gear includes shore seines in India, and trolling lines in East Africa (where it is a high-priced market fish), as well as handlines baited with mackerel or squids. All-tackle gamefish record 44.9 kg, caught at Scottburgh, KwaZulu-Natal, South Africa, in 2009. IUCN Red List conservation status Near Threatened.

Scomberomorus guttatus (Bloch & Schneider 1801)

Indo-Pacific king mackerel

PLATE 78

Scomber guttatus Bloch & Schneider 1801: 23, Pl. 5
(Tharangambadi, India).

Scomber leopardus Shaw 1803: 591 (Coromandel coast, India).

Cybiium interruptum Cuvier in Cuv. & Val. 1832: 172 (Puducherry, India).

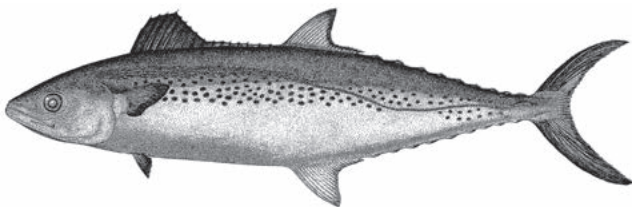
Indocybium guttatum: Munro 1955*.

Scomberomorus guttatus guttatus: Jones & Silas 1964*; Silas 1964.

Scomberomorus guttatus: Kuronuma & Abe 1972*; Devaraj 1976;
Collette & Nauen 1983*; Talwar & Kacker 1984*; Collette & Russo 1985*;
Randall 1995*; Collette 2003.

First dorsal fin 15–18 spines; 2nd dorsal fin 18–24 rays + 7–10 finlets; anal fin 19–23 rays + 7–10 finlets; pectoral fins 20–23 rays. GR 1 or 2/7–12 = 8–14. Body depth 23–25% FL (cf. 24–27% FL in *S. koreanus*); HL 20–22% FL (cf. ~20% FL in *S. koreanus*). Lateral line with many fine auxiliary branches extending dorsally and ventrally in anterior third, curving downwards to peduncle. Intestine with 2 folds and 3 limbs. Vertebrae 19–22 + 28–31 = 47–52.

Sides silvery white with several longitudinal rows of dark brownish spots (smaller than eye diameter) scattered in ~3 irregular rows along lateral line; 1st dorsal-fin membrane black (up to 8th spine), then white posteriorly, with black distal margin; pectoral fins, 2nd dorsal fin, and caudal fin dark brown; pelvic fins and anal fin silvery white. Attains 76 cm FL.



Scomberomorus guttatus, 46 cm FL (Thailand). Source: Collette & Nauen 1983

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Arabian Sea to India and Sri Lanka; elsewhere to Bay of Bengal, Gulf of Thailand, Hong Kong and Sea of Japan.

REMARKS Epipelagic, neritic; presumed less migratory than *S. commerson*, which may be encountered in turbid brackish waters. Matures at 48–52 cm TL in southern India. Based on the occurrence of ripe females and the size of maturing eggs, spawning probably occurs from April to July around Rameswaram I. between India and Sri Lanka. Feeds primarily on fishes: in India, juveniles feed mainly on bony fishes, particularly anchovies, and adults also prey mainly on fishes but also on small quantities of crustaceans and squids. Major fisheries exist in India (Lower Sundarbans, off Chennai, and

Gulf of Mannar–Palk Bay area); the primary gear in most areas appears to be drift gillnets, but also trolling and hook-and-line. Less abundant than Indian mackerels (*Rastrelliger* spp.), yet highly esteemed for food and commands a higher price.

Scomberomorus koreanus (Kishinouye 1915)

Korean seerfish

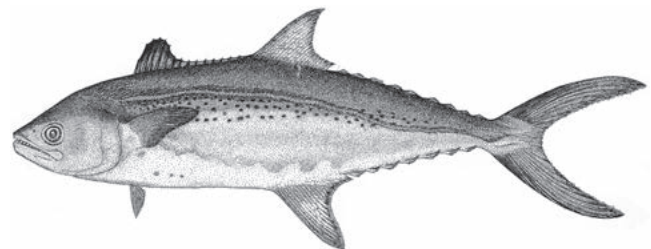
Cybiium koreanum Kishinouye 1915: 11, Pl. 1, Fig. 6 (Yojiro Wakiya, Korea).

Scomberomorus guttatus koreanus: Silas 1964.

Scomberomorus koreanus: Devaraj 1976* [distinguished from *S. guttatus*],
1977; Collette & Nauen 1983*; Talwar & Kacker 1984*;
Collette & Russo 1985*; Collette 2003.

First dorsal fin 14–17 spines; 2nd dorsal fin 20–24 rays + 7–9 finlets; anal fin 20–24 rays + 7–9 finlets; pectoral fins 20–24 rays. GR 1 or 2/9–12 = 11–15. Body depth 24–27% FL (cf. 23–25% FL in *S. guttatus*); HL 19–20% FL (cf. 20–22% FL in *S. guttatus*). Lateral line with many fine auxiliary branches extending dorsally and ventrally in anterior third, and gradually curving downwards to peduncle. Intestine with 4 folds and 5 limbs. Vertebrae 20 + 26–27 = 46–47.

Sides silvery white, with several longitudinal rows of round, dark brownish spots (smaller than eye diameter) sparsely scattered along lateral median line; 1st dorsal-fin membrane black; pectoral fins, 2nd dorsal fin and caudal fins dark brown; pelvic fins and anal fins silvery white. Attains 150 cm FL (commonly ~60 cm FL), 15 kg.



Scomberomorus koreanus, 53 cm FL (China). Source: Collette & Nauen 1983

DISTRIBUTION Indo-Pacific. WIO: India (Mumbai) to Sri Lanka; elsewhere to Singapore, Indonesia (Sumatra), Korea, Taiwan, China and Sea of Japan.

REMARKS Often confused with *S. lineolatus* in India before 1976. Continental, epipelagic, neritic, to at least 100 m deep. Matures at ~75 cm FL and ~2.25 kg. Feeds on sardines, anchovies and shrimps. Not abundant and usually not distinguished from other seerfish species, yet an important component of the driftnet fishery in the Gulf of Mannar and Palk Bay region.

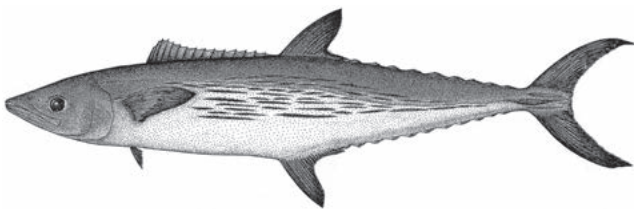
Scomberomorus lineolatus (Cuvier 1829)

Streaked seerfish

Cybiium lineolatum Cuvier 1829: 200 (Visakhapatnam, India).*Indocybiium lineolatum*: Munro 1955*.*Scomberomorus lineolatus*: Jones & Silas 1964*; Collette & Nauen 1983*; Talwar & Kacker 1984*; Collette & Russo 1985*; Collette 2003.

First dorsal fin 15–18 spines; 2nd dorsal fin 15–22 rays + 7–10 finlets; anal fin 17–22 rays + 7–10 finlets; pectoral fins 20–24 rays. GR 1 or 2/6–11 = 7–13. Pectoral fins covered with scales. Lateral line without auxiliary branches anteriorly, running almost straight below 2nd dorsal finlet, then slightly bent downwards to keel of wide peduncle. Intestine with 2 folds and 3 limbs. Vertebrae 18–20 + 25–28 = 44–46.

Sides silvery, with series of irregular, horizontal, narrow black lines and few if any spots; 1st dorsal fin black anteriorly, white posteriorly. Attains 80 cm FL.

*Scomberomorus lineolatus*, 59 cm FL (W India). Source: Collette & Nauen 1983

DISTRIBUTION Indian Ocean. WIO: India to Sri Lanka; elsewhere to Bay of Bengal, Gulf of Thailand and Indonesia (Java).

REMARKS Continental, epipelagic; not found in very turbid or brackish waters (unlike *S. commerson* and *S. guttatus*). Reproductive season likely in autumn (including October) off southern India, and in winter (including January) in southeastern Gulf of Bengal. Juveniles feed on bony fishes. In India an important coastal fishery exists for the three species of seerfish that are much in demand, but *S. lineolatus* may be the least common of these; small individuals (<50 cm FL) are taken together with *S. commerson* and *S. guttatus* from May to September in gillnets in Gulf of Mannar; other important gear types are hook-and-line and trolling.

Scomberomorus plurilineatus Fourmanoir 1966

Queen mackerel

PLATES 78 & 79

Cybiium lineolatum (*non* Cuvier 1829) Gilchrist & Thompson 1911 (KwaZulu-Natal, South Africa).*Scomberomorus lineolatum* (*non* Cuvier 1829): Gilchrist & Thompson 1917.*Scomberomorus lineolatus* (*non* Cuvier 1829): Williams 1960*, 1964.*Scomberomorus guttatus* (*non* Bloch & Schneider 1801): Smith & Smith 1963*.*Scomberomorus leopardus* (*non* Shaw 1803): Smith 1965*.*Scomberomorus plurilineatus* Fourmanoir 1966: 223, Fig. 1 (Nosy Be, Madagascar); Collette & Nauen 1983*; Van der Elst & Collette 1984*; Collette & Russo 1985*; SSF No. 249.13*; Collette 2003.

First dorsal fin 15–17 spines; 2nd dorsal fin 19–21 rays + 8–10 finlets; anal fin 19–22 rays + 7–10 finlets; pectoral fins 21–26 rays. GR 2 or 3/9–13 = 12–15. Lateral line without auxiliary branches anteriorly, gradually curving downwards to peduncle. Intestine with 2 folds and 3 limbs. Vertebrae 19–20 + 25–27 = 45–46.

Sides silvery, with ~6–8 interrupted horizontal black lines, much narrower than interspaces (anteriorly, usually only one line is above the lateral line, replaced posteriorly by a number of short, oblique, disordered black lines, with only 2 or 3 lines continuing to peduncle); the horizontal black lines are interrupted to varying degrees in adults (almost intact in places but broken up into series of small rectangular spots in others), while juveniles have mostly spots until >40 cm FL; 1st dorsal fin black, except lower posterior portion of membrane may be pale; 2nd dorsal fin silver to pale, and leading edge and tips of rays dusky; dorsal finlets dusky with silver area at centre; anal fin silvery but leading edges and tips of rays dusky; anal finlets white with dusky area at centre; pectoral fins and axil black inside, dusky outside, with black edges; pelvic fins pale whitish, with outside of mid-rays dusky, and groove on body slightly dusky; upper areas of peduncle and median keel black, lower areas dusky. Attains 120 cm FL, 12.5 kg.

*Scomberomorus plurilineatus*, 78 cm FL (South Africa).

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION WIO: Kenya and Tanzania (Zanzibar) to South Africa (Tsitsikamma), west coast of Madagascar and Seychelles.

REMARKS Epipelagic, neritic; found in large schools off Tanzania (Zanzibar) from March/April until August/September (average weight 3.2–3.5 kg) and a staple food fish in Tanzania during this season; angling statistics in KwaZulu-Natal (South Africa) point to peak abundance during May. Matures at ~80 cm FL. Spawning probably takes place in August and September. Feeds mainly on anchovies, clupeids and other small fishes, squids and mantis shrimps. Caught commercially mostly in set gillnets, but also on handlines baited with live sardines and by trolling, and a popular sport fish of ski boat and spearfishers in KwaZulu-Natal, South Africa. All-tackle gamefish record 5.56 kg in 2008, from Benguerra I., Mozambique.

GENUS *Thunnus* South 1845

Body fusiform, elongate and slightly compressed. Teeth small and conical, in 1 row; surface of tongue with 2 longitudinal cartilaginous ridges. Dorsal fins barely separated; anterior spines of 1st dorsal fin much higher than posterior spines, giving fin strongly concave outline; 2nd dorsal-fin base shorter than 1st dorsal-fin base, and fin as high as, or higher than, 1st dorsal fin; anal fin about as high as 2nd dorsal fin; pectoral fins with more rays than in any other scombrids. Interpelvic process small and bifid. Body covered with very small scales; corselet of larger scales developed but not very distinct. Total vertebrae 39. Body dark metallic blue dorsally, lower sides and belly whitish; no dark stripes or spots on sides; finlets bright yellow, edged with black in several species.

Mostly oceanic, with an epipelagic to midwater (>50 m) depth distribution, depending on species and size. Tunas are unique among bony fishes for their high metabolic rate (resulting in extraordinary growth) and their vascular heat exchange system (rete mirabile), which permits them to maintain a body temperature several degrees above the ambient water temperature. Since muscles are more powerful when warm, this guarantees steady swimming, which is required to maintain sufficient gas exchange via the gills, which in turn is indispensable to sustain their high metabolism. Juveniles may swim up to 50 km per day and are capable of remarkable bursts of speed. Agile, opportunistic predators feeding on a great variety of suitably sized fishes, crustaceans and squids. Because of their size, adult tunas have few predators, mainly billfishes, sharks and toothed whales. Eight species, 6 in WIO.

KEY TO SPECIES

- 1a Caudal fin with narrow white rear margin; pectoral fins very long, reaching past 2nd dorsal-fin base; greatest body depth at or slightly before level of 2nd dorsal fin *T. alalunga*
 - 1b Caudal fin without white rear margin; pectoral fins short or moderate in length, not reaching end of 2nd dorsal-fin base (except in small individuals); greatest body depth at midbody, near middle of 1st dorsal fin 2
 - 2a Ventral surface of liver with prominent striations; centre lobe of liver equal to or longer than left or right lobes 3
 - 2b Ventral surface of liver without striations; right lobe of liver much longer than left or centre lobes 4
-
- 3a GR 23–31; pectoral fins of moderate length, >80% HL *T. obesus*
 - 3b GR 31–42; pectoral fins short, <80% HL 5
 - 4a GR 25–35 (usually ≥27); 2nd dorsal fin and anal fin of larger specimens elongate (each fin >20% FL in fish ≥120 cm FL); swimbladder well-developed; maximum size >200 cm FL *T. albacares*
 - 4b GR 19–28 (usually ≤26); 2nd dorsal fin and anal fin never greatly elongate (each fin <20% FL at all sizes); swimbladder absent or rudimentary; maximum size <100 cm FL ... *T. tonggol*
 - 5a Pectoral fins 20–23% FL; caudal keels yellow in life ... *T. maccoyii*
 - 5b Pectoral fins 17–22% FL; caudal keels dark in life *T. thynnus*

Thunnus alalunga (Bonnerterre 1788)

Albacore tuna

PLATE 79

Scomber alalunga Bonnerterre (ex Cetti) 1788: 139 (Sardinia, Italy, Mediterranean Sea).

Thunnus germo: Yoshida & Otsu 1963.

Thunnus (Thunnus) alalunga: Jones & Silas 1964.

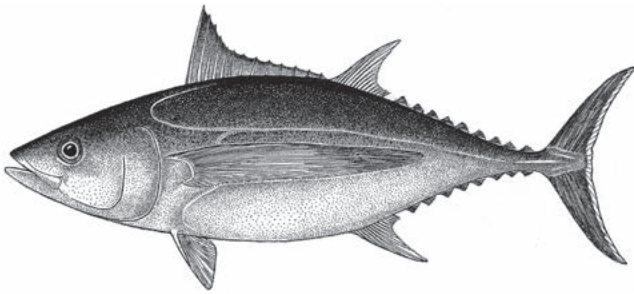
Germo alalunga: Smith 1965*.

Thunnus alalunga: Williams 1964; Gibbs & Collette 1967; Collette & Nauen 1983*; Talwar & Kacker 1984*; SSF No. 249.14*; Winterbottom & Anderson 1997; Anderson *et al.* 1998; Fricke 1999; Collette 2003.

First dorsal fin 12–14 spines; 2nd dorsal fin 13–16 + 7–9 finlets; anal fin 13–15 rays + 7–9 finlets; pectoral fins 31–36 rays. GR 25–31. Body deepest more posteriorly than other tunas (at, or only slightly anterior to, 2nd dorsal-fin

origin rather than near middle of 1st dorsal-fin base). Second dorsal fin clearly lower than 1st; pectoral fins remarkably long (usually >30% FL in fish >50 cm), reaching well beyond 2nd dorsal-fin origin (and usually up to 2nd dorsal finlet), and with pointed tips. Swimbladder present (but poorly developed and not evident in fish <50 cm FL); ventral surface of liver striated. Vertebrae 18 + 21 = 39.

Sides with faint, lateral, iridescent blue band (live fish); 1st dorsal fin deep yellow, 2nd dorsal fin and anal fin pale yellow; anal finlets dark; rear margin of caudal fin white. Attains 140 cm FL (commonly 40–100 cm FL in Indian Ocean).



Thunnus alalunga. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical and temperate seas, between ~45°–50° N and ~30°–40° S, but not at surface between ~10° N and ~10° S; includes Mediterranean Sea and Black Sea, but not known from Red Sea, Arabian Sea or Bay of Bengal.

REMARKS Often confused with juvenile *T. obesus* (also with long pectoral fins, but with rounded tips). Epipelagic and mesopelagic; abundant in oceanic near-surface waters of ~15.6–19.4 °C; deeper-swimming, large individuals found in water temperatures of ~13.5–25.2 °C; and temperatures as low as 9.5 °C may be tolerated for short periods. Highly migratory and forms mixed-species schools with other tunas. Known to concentrate along thermal discontinuities (oceanic fronts) where large catches are made; the transition zones are preferred to cooler upwellings, which are richer in food organisms but poorer in oxygen content. Fecundity generally increases with size; a 20-kg female may produce 2–3 million eggs per season, releasing them in at least two batches. Spawning occurs at surface temperatures of 24 °C or higher. Feeds on fishes, crustaceans and squids, plus paralepidids and cephalopods in the Mediterranean Sea. Large-scale target fisheries exist in the Atlantic and Pacific, but are less developed in the Indian Ocean. Albacore fisheries involve four basic types of operations: longlining, live-bait, trolling and purse-seining; surface methods (trolling, purse-seining and live-bait) tend to take smaller-sized individuals than longlining. All-tackle

gamefish record 40 kg, 123 cm FL, caught at Canary Is., in 1977. IUCN Red List conservation status Near Threatened.

Thunnus albacares (Bonnaterre 1788)

Yellowfin tuna

PLATE 79

Scomber albacares Bonnaterre (ex Sloane) 1788: 140 (Jamaica [Caribbean Sea]).

Thynnus albacora Lowe 1839: 77 (Madeira).

Neothunnus macropterus: Munro 1955*; Mimura *et al.* 1963.

Neothunnus itosibi: Jones & Silas 1961*.

Thunnus albacora: Smith & Smith 1963*.

Thunnus (*Neothunnus*) *albacares macropterus*: Jones & Silas 1964*.

Thunnus (*Neothunnus*) *itosibi*: Jones & Silas 1964*.

Thunnus albacares: Williams 1964; Gibbs & Collette 1967;

Jones & Kumaran 1980*; Collette & Nauen 1983*; Dor 1984;

Talwar & Kacker 1984*; SSF No. 249.15*; Randall & Anderson 1993;

Randall 1995*; Winterbottom & Anderson 1997; Fricke 1999;

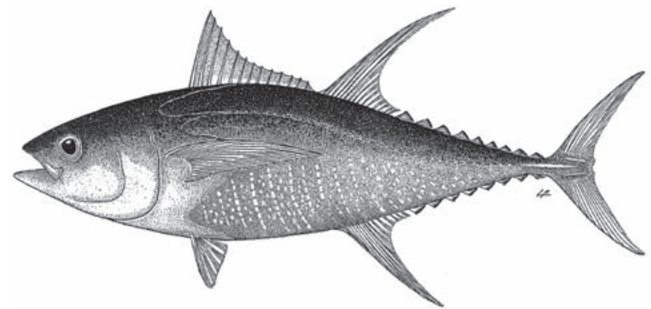
Collette 2003.

Germo albacora: Smith 1965*.

Germo itosibi: Smith 1965*.

First dorsal fin 12–14 spines; 2nd dorsal fin 13–16 rays + 7–9 finlets; anal fin 13–15 + 8–10 finlets; pectoral fins 33–36 rays. GR 25–35. Body deepest near middle of 1st dorsal-fin base; some large specimens with long 2nd dorsal fin and anal fin (>20% FL); pectoral fins moderately long (~22–31% FL), usually reaching beyond 2nd dorsal-fin origin, but not beyond end of its base. Swimbladder present; no striations on ventral surface of liver. Vertebrae 18 + 21 = 39.

Body dark metallic blue dorsally, becoming yellow to silvery on belly; belly frequently crossed by ~20 broken, nearly vertical lines; dorsal fins, anal fin, and dorsal and anal finlets bright yellow, and finlets with narrow black border. Large-sized, attains 200+ cm FL (commonly ~150 cm FL).



Thunnus albacares. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to subtropical seas, including Indian Ocean north of ~35° S, but not known from Persian/Arabian Gulf, Red Sea or Mediterranean Sea.

REMARKS Epipelagic, oceanic. Occurs above and below the thermocline, to at least 400 m deep, but essentially confined to the upper 100 m of water column in areas with marked oxyclines; the thermal boundaries of occurrence are roughly 18–31 °C. Highly migratory; schools primarily by size and more commonly near surface, in single- or multi-species groups. In some areas, larger fish (>85 cm FL) frequently school with porpoises or dolphins, and some seem to associate with floating debris and other objects. All fish >120 cm FL are sexually mature. Spawning occurs year-round in the core distribution areas, but peaks in the respective northern and southern summer months, and almost entirely at night. Feeds on fishes, crustaceans and squids. Important commercial target fisheries exist throughout the world, including a major seasonal purse-seine fishery in Chagos waters (Winterbottom & Anderson 1997). Captured mainly with purse seines, longlines and by pole-and-line. All-tackle gamefish record 193.68 kg, caught at Cabo San Lucas, Baja Sur, Mexico, in 2012. IUCN Red List conservation status Near Threatened.

Thunnus maccoyii Castelnau 1872

Southern bluefin tuna

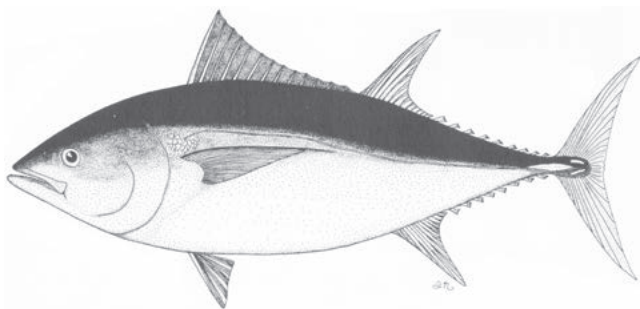
PLATE 79

Thunnus maccoyii Castelnau 1872: 104 (Melbourne market, Australia); Gibbs & Collette 1967; Talbot & Penrith 1968; Collette & Nauen 1983*; Collette 2003; Collette *et al.* 2011.

Thunnus thynnus maccoyii: Serventy 1956.

First dorsal fin 13 or 14 spines; 2nd dorsal fin 14–16 rays + 8–10 finlets; anal fin 11–15 rays + 7–10 finlets; pectoral fins 31–35 rays. GR 7–9/18–20 = 31–40. Body deepest near middle of 1st dorsal-fin base; pectoral fins very short (<80% HL; 20–23% FL), never reaching interdorsal space. Swimbladder present; ventral surface of liver striated. Vertebrae 18 + 21 = 39.

Lower sides and belly silvery white, with colourless transverse lines alternating with rows of colourless dots (the latter dominate in older fish) (visible only in fresh specimens); 1st dorsal fin yellow or bluish; anal fin and finlets dusky yellow, edged with black; median caudal keel yellow in adults. Very large-sized, attains 225 cm FL (commonly 160–200 cm FL).



Thunnus maccoyii, 117 cm FL (Southern Ocean). Source: Nakamura 1990

DISTRIBUTION Probably occurs throughout Southern Ocean south of 30° S. WIO: South Africa to southern Madagascar.

REMARKS Previously considered a subspecies of *T. orientalis* or *T. thynnus*. Epipelagic and oceanic in cold-temperate waters, mainly between 30° S and 50° S, and confined to water temperatures of 5–20 °C for much of its lifespan. Spawning fish and larvae, however, are encountered in waters with surface temperatures of 20–30 °C. Probably matures at ~130 cm FL or ~40 kg; longevity at least 12 years. Fecundity of 158-cm female with gonads weighing ~1.7 kg each was estimated at ~14–15 million eggs. Spawning appears to be restricted to a relatively small area off northwestern Australia, in eastern tropical Indian Ocean, extending through summer from about September/October to March; the spawning frequency of mature fish is unknown. Feeds on a wide variety of fishes, crustaceans, cephalopods and salps. Main predators are large billfishes, sharks, seals and toothed whales. Intensively fished since early 1950s, primarily with longlines, especially off Australia, Tasmania, New Zealand and South Africa, with a critical decline in the spawning stock biomass. The meat is highly prized for the sashimi market in Japan. All-tackle gamefish record 167.5 kg, caught off Tatra, Australia, in 2009. IUCN Red List conservation status Critically Endangered.

Thunnus obesus (Lowe 1839)

Bigeye tuna

PLATE 79

Thynnus obesus Lowe 1839: 78 (Madeira).

Thynnus sibi Temminck & Schlegel 1844: 97, Pl. 50 (Japan).

Parathunnus obesus mebachii: Jones & Silas 1961.

Thunnus obesus sibi: Jones & Silas 1963.

Thunnus sibi: Smith & Smith 1963*.

Parathunnus mebachii: Mimura *et al.* 1963.

Thunnus (Parathunnus) obesus mebachii: Jones & Silas 1964*.

Thunnus obesus: Gibbs & Collette 1967; Jones & Kumaran 1980*;

Collette & Nauen 1983*; Talwar & Kacker 1984*; SSF No. 249.17*;

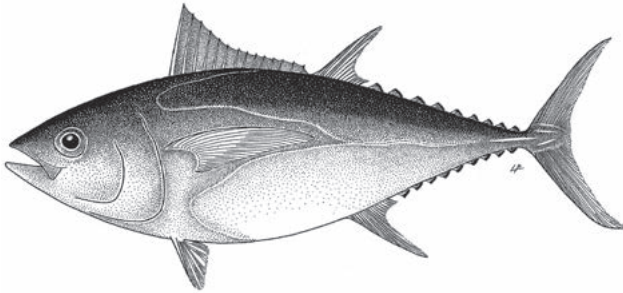
Randall & Anderson 1993; Randall 1995*; Winterbottom & Anderson

1997; Fricke 1999; Collette 2003.

First dorsal fin 13–14 spines; 2nd dorsal fin 14–16 rays + 8–10 finlets; anal fin 11–15 rays + 7–10 finlets; pectoral fins 31–35 rays. GR 24–31. Body deepest near middle of 1st dorsal-fin base; pectoral fins moderately long (22–31% FL) in large individuals (>110 cm FL), but very long (similar to *T. alalunga*) in smaller individuals (though pectoral fins may be very short in fish <40 cm FL), with rounded tips (cf. pointed tips in *T. alalunga*). Swimbladder present; ventral surface of liver striated (in fish >30 cm FL). Vertebrae 18 + 21 = 39.

Lower sides of body and belly whitish; lateral iridescent blue band along sides in live specimens; 1st dorsal fin deep yellow, 2nd dorsal fin and anal fin pale yellow; finlets bright yellow,

edged with black. Large-sized, attains 200+ cm FL (commonly ~180 cm FL at age ~3 years).



Thunnus obesus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to subtropical seas, including Indian Ocean north of ~40° S, but not known from Persian/Arabian Gulf, Red Sea or Mediterranean Sea.

REMARKS Epipelagic and mesopelagic; oceanic waters, from surface to ~500 m deep, but can dive deeper. Vertical and horizontal distribution appear determined by seasonal water temperature and thermocline depth: occurs in water temperatures of 13–29 °C, but the optimum range is 17–22 °C, coinciding with temperature of permanent thermocline. Likely matures at ~100–130 cm FL in Indian Ocean. Spawns at least twice a year; eggs per spawning estimated at 2.9–6.3 million. Feeds during daytime as well as at night on a wide variety of fishes, cephalopods and crustaceans. Main predators are large billfish and toothed whales. Important in commercial fisheries around the world, especially for sashimi market; caught mostly with longlines and purse seines. All-tackle gamefish record for Indo-Pacific 197.3 kg, caught off Peru, in 1957. IUCN Red List conservation status Vulnerable.

Thunnus thynnus (Linnaeus 1758)

Atlantic bluefin tuna

PLATE 79

Scomber thynnus Linnaeus 1758: 297 ('Pelagic, between the tropics').

Thynnus vulgaris Cuvier in Cuv. & Val. 1832: 58, Pl. 210 ('Europe').

Thynnus secundodorsalis Storer 1853: 143, Pl. 12, Fig. 4 (Provincetown, Massachusetts, USA).

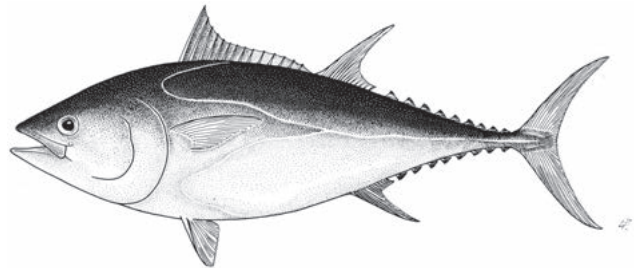
Thunnus thynnus: Jordan & Evermann 1896; Collette 1999, 2003; Collette *et al.* 2011.

Thunnus thynnus thynnus: Serventy 1956; Gibbs & Collette 1967; Collette & Nauen 1983.

First dorsal fin 12–14 spines; 2nd dorsal fin 12–14 rays + 8–10 finlets; anal fin 13–16 rays + 7–9 finlets; pectoral fins 30–36 rays. GR 34–43. Body deepest near middle of 1st dorsal-

fin base; 2nd dorsal fin higher than 1st; pectoral fins very short (<80% HL; 16.8–21.7% FL), never reaching interdorsal space. Swimbladder present; ventral surface of liver striated. Vertebrae 18 + 21 = 39.

Lower sides and belly silvery white, with colourless transverse lines alternating with rows of colourless dots (the latter dominant in older fish) and visible only in fresh specimens; 1st dorsal fin yellow or bluish, 2nd dorsal fin reddish brown; anal fin and finlets dusky yellow, edged with black; median caudal keel black in adults. Very large-sized, attains 300+ cm FL (commonly ~200 cm FL).



Thunnus thynnus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Western Atlantic (Canada to Gulf of Mexico, Caribbean Sea, Venezuela, and formerly off Brazil), eastern Atlantic (Norway to Canary Is. and Mauritania), southern Black Sea (now rare), and throughout Mediterranean Sea. Single record off Cape Town.

REMARKS Epipelagic, oceanic, but seasonally found close to shore; tolerates a wide range of temperatures. Schools by size, sometimes together with albacore, yellowfin, bigeye, skipjack, frigate tuna and/or yellowtail amberjack (*Seriola lalandi* Valenciennes 1833). Matures and spawns at age 3–5 years in Mediterranean Sea, and at age 8–10 years in Gulf of Mexico. Females weighing 270–300 kg may produce 10 million eggs per spawning season. Longevity at least 35 years (possibly 50). Variations in food spectrum are attributed to behavioural differences in feeding; vigorous pursuit is required to prey on small schooling fishes (anchovies, sauries and hakes) or squids, while modified filter-feeding is used to feed on red crabs and other less agile organisms. Preyed upon by the killer whale *Orcinus orca*, pilot whales and blackfish; however, the large size of adults drastically reduces the number of potential predator species. Now rare due to massive overfishing; caught mainly with purse seines, longlines and traps. Some of the oldest fisheries documented are Mediterranean trap fisheries, and the species is now used for commercial fish farming there. The species also formed the basis of ancient specialised fisheries off the eastern USA and Canada, and is still avidly sought there by big-game anglers on hook-and-line. All 3 species of bluefin

tuna are marketed deep-frozen or fresh, especially in Japan, where the belly portion fetches high prices for sashimi. All-tackle gamefish record 678.58 kg, 304 cm FL, caught off Nova Scotia, Canada, in 1979. IUCN Red List conservation status Endangered.

Thunnus tonggol (Bleeker 1851)

Longtail tuna

PLATE 79

Thynnus tonggol Bleeker 1851: 356 (Jakarta, Java, Indonesia).

Kishinoella tonggol: Munro 1955*; Serventy 1956; Jones 1963.

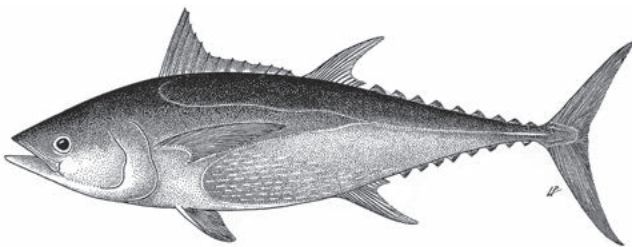
Thunnus (Kishinoella) tonggol: Jones & Silas 1964*.

Thunnus tonggol: Gibbs & Collette 1967; Collette & Nauen 1983*;

Dor 1984; Talwar & Kacker 1984*; Randall 1995*; Anderson *et al.* 1998; Collette 2003.

First dorsal fin 11–14 spines; 2nd dorsal fin 14 rays + 9 finlets; anal fin 14 rays + 8 finlets; pectoral fins 30–35 rays. GR 19–28. Body deepest near middle of 1st dorsal-fin base; 2nd dorsal fin higher than 1st; pectoral fins short to moderately long (22–31% FL in smaller specimens <60 cm FL; 16–22% FL in larger individuals). Swimbladder absent or rudimentary; ventral surface of liver not striated. Vertebrae 18 + 21 = 39.

Lower sides of body and belly silvery white, with colourless elongate oval spots in horizontal rows; dorsal, pectoral and pelvic fins blackish, and anal fin silvery; tips of 2nd dorsal fin and anal fin yellowish; dorsal and anal finlets yellow with greyish margins; caudal fin blackish, with streaks of yellowish green. Attains 130 cm FL (commonly 40–70 cm FL in Indian Ocean), ~36 kg.



Thunnus tonggol. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific (discontinuous population).

WIO: southern Red Sea, Oman, Yemen, Somalia and Socotra, Mozambique, Maldives, Lakshadweep, India and Sri Lanka; elsewhere to Indonesia, Philippines, Taiwan, Japan, New Guinea and Australia.

REMARKS Epipelagic, predominantly neritic; seems to avoid turbid and brackish waters such as estuaries. Possibly spawns twice per year; larvae collected at surface water temperatures of 28 °C. Estimates of longevity 5–18 years. Relatively slow-growing compared to other tunas. Feeds on crustaceans, cephalopods and fishes. Major commercial catches in WIO taken by Iran, Oman, Yemen and Pakistan; fishing gear includes trolling, driftnets and longlines.

GLOSSARY

allopatric – populations or species occupying mutually exclusive geographic areas.

antitropical – the distribution pattern where a group is found north and south of, but not in, the tropics (also anti-equatorial).

crenulate – having a margin with small, rounded scallops.

ethmoid – the bone that separates the nasal cavity from the brain cavity.

fish aggregating device (FAD) – a man-made device used to attract pelagic fish species and used for fishing.

frontoparietal fenestra – a space between the frontal and parietal bones of the cranium through which a major nerve and blood vessel passes.

hypurals – the fan-shaped series of bones (sometimes fused to one or two plates) to which the caudal-fin rays are attached.

interhaemal bone – the bones between the haemal (ventral) spines of the vertebrae and the spines or rays of the anal fin.

interneural bone – the bones between the neural (dorsal) spines of the vertebrae and the spines and rays of the dorsal fin.

interpelvic process – a narrow, pointed area between the pelvic fins.

preural vertebra – the second-last vertebra of the spine.

rete mirabile – a network of small veins and arteries that lie very close together, where heat is transferred from outgoing venous blood to incoming arterial blood.

supramaxilla – a small bone along the upper rear edge of the maxilla.

thermocline – the distinct interface between warmer surface waters and cooler deeper waters.

SUBORDER XIPHIOIDEI

Bruce B Collette

Perciform fishes distinguished by the prolongation of the upper jaw, extending well beyond the lower jaw into a long rostrum or 'bill,' which is flattened in the swordfish (*Xiphiidae*) and rounded in cross-section in the *Istiophoridae*; no gill rakers; vertebrae 24 or 26. Two families are recognised, both in WIO: the monotypic *Xiphiidae* and the *Istiophoridae*, with 5 genera.

The exact relationships among billfishes, tunas and other scombroids has been debated in the morphological literature (Collette *et al.* 1984; Johnson 1986; Carpenter *et al.* 1995). Billfishes have frequently been included in the Scombroidei, yet show distinct autapomorphies such as the prominent 'bill' and the distinctive vertebrae, indicating that they are phylogenetically distant from the Scombroidei.

KEY TO FAMILIES

- 1a Bill flattened and sword-like; no pelvic fins; 1st dorsal fin with short base; single large median keel on each side of caudal peduncle; vertebrae 26 **XIPHIIDAE**
- 1b Bill rounded in cross-section, spear-like; pelvic fins long and narrow; 1st dorsal fin with long base; pair of moderate-sized keels on each side of caudal peduncle; vertebrae 24 **ISTIOPHORIDAE**

FAMILY XIPHIIDAE

Swordfish

Bruce B Collette

Body robust, slightly compressed; upper jaw and snout greatly elongated, forming a flat and sharp-edged bony sword. First dorsal-fin height greater than length of fin base (fish >1 m), and fin well-separated from small 2nd dorsal fin; anal fin divided into 2 fins; no pelvic fins; peduncle with large median

keel and deep notch on dorsal and ventral surfaces; caudal fin large and lunate. No teeth or scales in adults. Swimbladder a large, single structure. Monotypic.

Xiphias gladius Linnaeus 1758

Swordfish

PLATE 81

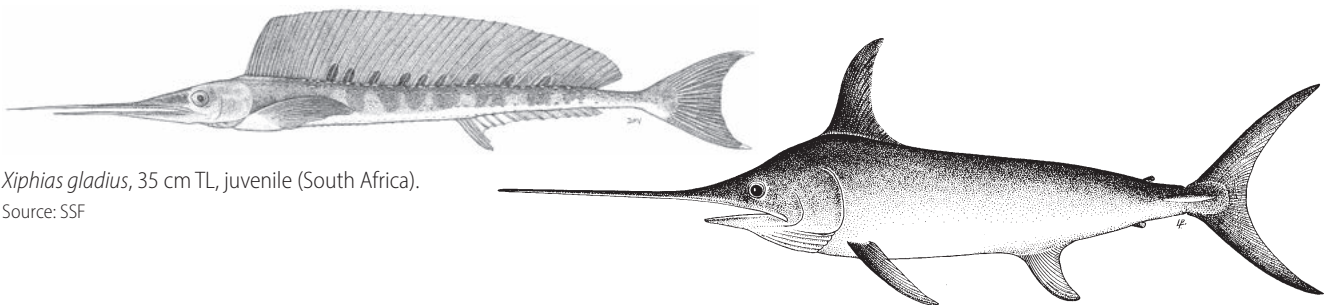
Xiphias gladius Linnaeus 1758: 248 ('European ocean'); Arata 1954*; Palko *et al.* 1981; Potthoff & Kelley 1982; Nakamura 1985*; SSF No. 251.1*; Govoni *et al.* 2004; Heemstra & Heemstra 2004*; Richards 2005.

Diagnosis as for family. Dorsal fins 34–49 + 4–6 rays; anal fins 13 or 14 + 3 or 4 rays. Length of bony sword (from tip to front of eye) ~½ distance from tip of lower jaw to fork of caudal fin (LJFL); in small juveniles, both jaws equally prolonged and body covered with small spiny scales (which become embedded in adults). Vertebrae 15 or 16 + 11 or 12 = 26.

Body blackish brown, dark grey, or bronzy to purplish black dorsally, whitish below. Attains ~4.5 m TL, ~540 kg (females attain larger sizes than males).

DISTRIBUTION Circumglobal in all tropical to temperate seas (generally above the thermocline), including Mediterranean Sea and Indian Ocean, usually from 25° N to 45° S.

REMARKS Epipelagic and mesopelagic in open ocean, and sometimes in coastal areas; usually in surface waters, but to ~650 m deep. Prefers temperatures of 18–22 °C, and larvae frequently found in waters >24 °C. Highly migratory, moving towards cooler waters in summer for feeding, and back to warmer waters in summer for spawning and overwintering. Longevity 9+ years. In the Pacific, females first spawn at age 5–6 years; in the Atlantic, males mature at ~100 cm TL, and females at ~70 cm TL. Most individuals >210 cm LJFL or 140 kg are females. Batch spawners; fecundity ~2–5 million eggs; egg diameter 1.6–1.8 mm. By ~7 mm TL, the jaws start



Xiphias gladius, 35 cm TL, juvenile (South Africa).
Source: SSF

Xiphias gladius, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

to elongate and distinct highly modified prickle-like scales begin to form; juvenile swordfish lack the strong pterotic and preopercular spines characteristic of juvenile billfishes. Adults appear scaleless although the scales persist but become more deeply embedded as the skin increases in thickness above the scales. Voracious predator when young, and an opportunistic predator as adults, using its bill to kill prey. Feeds mainly on fishes but also squids and crustaceans. A highly important food and game fish, and an especially formidable challenge for big-game fishing. Large individuals may accumulate high concentrations of mercury in the flesh.

FAMILY ISTIOPHORIDAE

Billfishes (sailfish, marlins and spearfishes)

Bruce B Collette

Upper jaw and snout greatly produced, forming very long bony bill, rounded in cross-section. Base of 1st dorsal-fin longer than its height; pelvic fins very long and narrow, folding into groove on belly; peduncle with 1 or 2 small keels on each side. Scales small, elongate and partially embedded. Swimbladder large, with many small separate chambers.

Epipelagic and oceanic, billfishes are at or near the apex of pelagic food webs; they have broad diets and grow rapidly, have high fecundity, and in some cases show long-distance migrations (synopses on the biology of the species can be found in Shomura & Williams 1975). Females usually attain larger sizes than males; longevity is 9–12+ years. All species are oviparous; eggs are buoyant and larvae pelagic. Spawning takes place in warm months; fecundity is ~0.75–19 million eggs, increasing with size of the female. All but the smallest, young billfishes are easily identified to family because the snout starts to elongate by ~3 mm notochord length, although it does not take on the adult spear shape until ~50 mm (identification of larvae and juveniles to species is extremely difficult). All species are important game fish and many are also taken in commercial longline fisheries. Several species are under intense fishing pressure; size limitations, encouragement of catch-and-release sport fishing, and recommendations for using circle hooks instead of J-hooks are measures designed to increase survival in catch-and-release sport fishing.

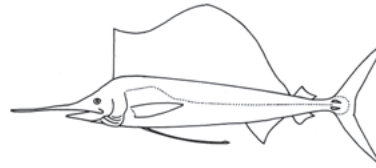
Most researchers recognise the generic distinctiveness of the sailfish *Istiophorus*, but there are problems with the common names ‘marlin’ and ‘spearfish.’ Historically, the two large species — the black marlin *Makaira indica* and blue marlin *M. nigricans* — have been frequently grouped in the ‘marlin’ genus *Makaira* along with 2 smaller species — the Atlantic white marlin *Tetrapturus albidus* and Indo-Pacific striped marlin *T. audax*. Recently, however, both small marlin

species were placed in the ‘spearfish’ genus *Tetrapturus* along with 4 or 5 other species. Even so, analyses of molecular data (Collette *et al.* 2006) indicate very different relationships, wherein *Makaira* does not appear to be monophyletic, blue marlin clusters with sailfish, and black marlin clusters either with white marlin and striped marlin or outside the group of blue marlin + sailfish + spearfishes. Although there is little morphological data to support this conclusion, the available data do not support the current arrangement of genera very well either. If we accept the molecular picture of phylogeny, then two possible taxonomic arrangements could result. One could recognise 2 genera for the 2 major branches: blue marlin + sailfish as *Istiophorus*, and all the rest as *Tetrapturus*. Alternatively (as here), one could recognise 5 genera: in the first branch, blue marlin *Makaira* are separated from sailfish *Istiophorus*, and in the second branch there are 3 groups, namely black marlin (*Istiompax*), striped marlin and white marlin (*Kajikia*), and 4 species of spearfishes (*Tetrapturus*).

Nine species in 5 genera: *Istiompax* (monotypic), *Istiophorus* (monotypic), *Makaira* (monotypic), *Kajikia* (2 species) and *Tetrapturus* (4 species); all genera and 5 species in WIO.

KEY TO GENERA

- 1a Height of dorsal fin over midbody high and sail-like, much greater than body depth; pelvic fins very long, nearly reaching anal-fin origin *Istiophorus*



- 1b Height of dorsal fin over midbody not greater than body depth; pelvic fins shorter, reaching $\leq 2/3$ distance to anal-fin origin 2

- 2a Greatest height of 1st dorsal fin subequal to body depth; head profile beyond level of eyes not steeply elevated; body compressed 3

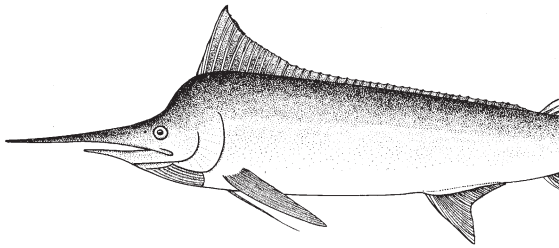
- 2b Greatest height of 1st dorsal fin distinctly less than body depth; head profile becomes steeply elevated at level of eyes; body wide or not very compressed 4

- 3a Anus close to 1st anal-fin origin *Kajikia*

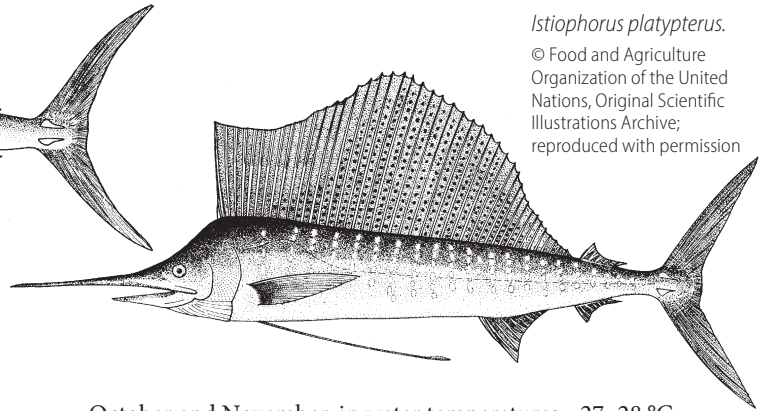
- 3b Anus far anterior to 1st anal-fin origin *Tetrapturus*

- 4a Pectoral fins rigid, cannot be folded flat against body; body barely compressed *Istiompax*

- 4b Pectoral fins moveable, easily folded flat against body; body wide, oval in cross-section *Makaira*



Istiompax indica. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission



Istiophorus platypterus.
© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

GENUS *Istiompax* Whitley 1931

Body elongate, robust, not very compressed; head profile steeply elevated at nape; bill rounded in cross-section. Distinguished by rigid pectoral fins, which cannot be folded flat against the body (pectoral fins flexible in blue marlin *Makaira*). One species.

Istiompax indica (Cuvier 1832)

Black marlin

PLATE 80

Tetrapturus indicus Cuvier in Cuv. & Val. 1832: 286 (Sumatra, Indonesia).

Istiompax indicus: Morrow 1964; Collette *et al.* 2006.

Makaira indica: Nakamura 1975, 1985*; SSF No. 252.2*; Heemstra & Heemstra 2004*; Richards & Luthy 2005*; Matsumoto & Bayliff 2008.

Diagnosis as for genus. Dorsal fins 34–43 + 5–7 rays; anal fin 10–14 + 6 or 7 rays; pectoral fins 12–20 rays, fins falcate and rigid; pelvic fins only slightly shorter than pectoral fins. Two fleshy keels on each side of peduncle. Lateral line single, indistinct in adults. Vertebrae 11 + 13.

Body generally dark blue (blue-grey to blue-brown) dorsally, usually without stripes or blotches, and silvery white below (colour changes to white after death); 1st dorsal fin similar to body colour. Attains 4.5 m TL, 700+ kg (females attain much larger sizes than males).

DISTRIBUTION Throughout tropical and subtropical waters of Indo-Pacific (usually above the thermocline), including the southern Red Sea and Oman to South Africa in WIO, sometimes straying into temperate waters of southeastern Atlantic (off Cape of Good Hope, South Africa).

REMARKS Previously included in the genus *Makaira*. Epipelagic, in open ocean to ~100 m deep, often close to land masses and off islands or reefs, usually at temperatures of 15–30 °C. Males mature at ~140 cm FL, females at ~230 cm FL; sex ratio varies with area and season. Fecundity up to ~40 million eggs. Spawns in pairs: intensive spawning occurs in the Coral Sea of the western Pacific region, especially during

October and November, in water temperatures ~27–28 °C, but no spawning areas have been identified in the Indian Ocean. Feeds on cephalopods and pelagic and demersal fishes, using its bill to strike prey, which are swallowed whole. An important commercial species, caught mainly by longlines, trolling, harpoons, and sometimes with gillnets and set nets, and also a formidable game fish.

GENUS *Istiophorus* Lacepède 1802

Some authors (e.g., Nakamura 1985) recognise separate species of sailfish in the Atlantic (*Istiophorus albicans*) and Indo-Pacific (*I. platypterus*), based on relative lengths of the pectoral fins and caudal fin as well as differences in scale shape and growth, but genetic studies (Collette *et al.* 2006) indicate a single species worldwide.

Istiophorus platypterus (Shaw 1792)

Sailfish

PLATE 80

Xiphias platypterus Shaw in Shaw & Nodder 1792: Pl. 88 (Indian Ocean).

Istiophorus americanus: Gehringer 1956*.

Istiophorus gladius: SFSA No. 874*; Morrow 1964.

Istiophorus platypterus: Morrow & Harbo 1969; Gehringer 1970*;

Beardsley *et al.* 1975; Nakamura 1985*; SSF No. 252.1*; McDowell 2002;

Heemstra & Heemstra 2004*; Richards & Luthy 2005*;

Chiang *et al.* 2006; Collette *et al.* 2006.

Istiophorus albicans: Nakamura 1985*.

Body elongate, compressed; bill rounded in cross-section, and robust but not very long. Dorsal fins 42–46 + 6 or 7 rays; 1st dorsal fin sail-like, large and high, with middle rays longest, ~½ body depth at anus; anal fins 11–14 + 6 or 7 rays; pectoral fins 17–20 rays; pelvic fins 1 spine, 2 rays, fins longer than pectoral fins, and fin membrane well-developed. Two short keels on each side of peduncle. Lateral line conspicuous; body covered with small embedded scales. Abdominal cavity extends to middle of 2nd anal-fin base. Vertebrae 12 + 12.

Body dark blue dorsally and pale blue laterally, with ~20 bluish broken vertical stripes, and silvery white below; 1st dorsal-fin membrane dark blue, with scattered small black spots. Attains ~3.4 m TL, ~100 kg (females attain larger sizes than males).

DISTRIBUTION Circumglobal in all tropical to temperate seas (usually above the thermocline), including Red Sea and Mediterranean Sea (via Suez Canal).

REMARKS Epipelagic and oceanic, to ~40 m deep. Highly migratory and likely schools by size. Fast-growing; year-old fish mature at ~1.8 m FL. Indo-Pacific fish attain greater maximum sizes (~100 kg) than Atlantic fish (~60 kg). Longevity 11+ years. Females mature at 162–166 cm FL; fecundity 1–19.5 million eggs, sharply increasing with size of female; egg diameter ~1.3 mm, with one oil globule. Oocyte development is asynchronous, resulting in fractional or multiple spawning. Spawning occurs throughout the year in tropical waters, with males and females swimming in pairs or else two or three males chasing a single female. Feeds on a wide variety of epipelagic fishes and cephalopods. Taken mainly as bycatch in longline tuna fisheries, but also targeted and caught with surface driftnets and by trolling and harpooning, but most important as a valued game fish.

GENUS *Kajikia* Hirasaka & Nakamura 1947

Distinguished by anus close to anal-fin origin (cf. anus far anterior to anal-fin origin in *Tetrapturus*). Two closely related species: the white marlin *Kajikia albida* in the Atlantic, and the striped marlin *K. audax* in the Indo-Pacific.

Kajikia audax (Philippi 1887)

Striped marlin

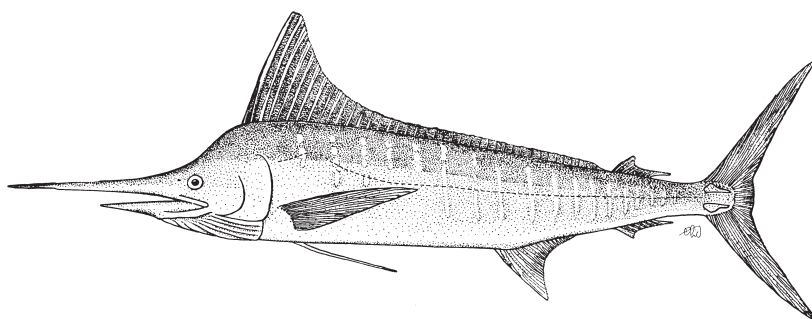
Histiophorus audax Philippi 1887: 35, Pl. 8 (Iquique, Chile).

Tetrapturus audax: Morrow 1964; Ueyanagi & Wares 1975;

Nakamura 1985*; SSF No. 252.6*; Hyde *et al.* 2006.

Kajikia audax: Collette *et al.* 2006; McDowell & Graves 2008.

PLATE 80



Kajikia audax.

© Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

Body compressed, its depth 6–8 in LJFL; dorsal fins 37–42 + 5–7 rays; anal fin 13–18 + 5 or 6 rays; pectoral fins 18–23 rays, fin tips pointed. Vertebrae 12 + 12.

Body blue-black dorsally, with ~15–20 rows of bluish stripes, each consisting of round dots and/or narrow bands; belly silvery white; 1st dorsal fin dark blue, other fins dark brown and sometimes with tinge of dark blue. Attains 4.2 m TL, 220+ kg (little size difference between males and females).

DISTRIBUTION Throughout tropical to temperate waters of Indo-Pacific (usually above the thermocline) including the Red Sea, but not known from Persian/Arabian Gulf.

REMARKS Previously included in the genus *Tetrapturus*. Pelagic, to ~290 m deep, and strongly oceanic, with its abundance increasing with distance from the continental shelf. Highly migratory and the most widely distributed of billfishes by latitude. Mostly solitary, but may form small schools by size during spawning. Matures at ~1.4–1.6 m FL. Longevity 12+ years. Fecundity ~11–29 million eggs. Larvae primarily found at temperatures above 24 °C and in spatially discrete regions, suggesting spawning-site fidelity. Feeds on a variety of fishes, crustaceans and squids. An important commercial and recreational fisheries resource throughout its range, but taken mostly as bycatch in pelagic longline tuna fisheries. IUCN Red List conservation status Near Threatened.

GENUS *Makaira* Lacepède 1802

Body elongate, robust; bill rounded in cross-section; 2 fleshy keels on each side of peduncle; caudal fin large and lunate. Distinguished by moveable pectoral fins easily folded against the body (pectoral fins rigid and at right angles to body in black marlin *Istiompax*). Some authors (e.g., Nakamura 1985; Heemstra & Heemstra 2004) recognise separate species of Atlantic blue marlin (*Makaira nigricans*) and Indo-Pacific blue marlin (*M. mazara*), based on differences in lateral-line morphology, but genetic data (Collette *et al.* 2006) indicate one species worldwide in tropical to temperate seas.

Makaira nigricans Lacepède 1802

Blue marlin

PLATE 80

Makaira nigricans Lacepède 1802: 688, Pl. 13, Fig. 3 (Bay of Biscay, France);
Morrow 1964; Rivas 1975; Nakamura 1985*; SSF No. 252.3*;
Richards & Luthy 2005*; Collette *et al.* 2006.

Makaira mazara: Nakamura 1985*; Heemstra & Heemstra 2004*.

Tetrapturus herschelii Gray 1838: 313, Pl. 10 (Table Bay, South Africa);
SFSa No. 875*.

Diagnosis as for genus. Dorsal fins 39–46 + 6 or 7 rays; anal fins 12–17 + 6 or 7 rays; pectoral fins 19–23 rays; pelvic fins shorter than pectoral fins. Lateral line complex, forming reticulate pattern over most of lateral body surface, but obscure in adults (visible only when a patch of skin is removed and dried). Vertebrae 11 + 13.

Body blue-black dorsally, with ~15 rows of pale cobalt blue vertical stripes consisting of round dots and/or narrow bars, and silvery white below; fins dusky to black. Attains 4.3 m TL, 900+ kg (females attain much larger sizes than males).

DISTRIBUTION Circumglobal in all tropical to subtropical seas, but generally not found off the Cape south coast of South Africa, and not known from the Persian/Arabian Gulf, Red Sea and Mediterranean Sea. Latitude range varies seasonally (expands in warmer months, contracts towards equator in colder months), from approximately 48° N to 48° S in Indo-Pacific, and 45° N to 35° S in the Atlantic.

REMARKS Epipelagic and strongly oceanic, to ~1 000 m deep but spends most of its time at shallower depths (usually <40 m); offshore and rarely seen close to land masses or islands. Highly migratory; large adults tend to be solitary, but smaller fish may form small aggregations. Longevity 17–20 years. The bill begins to lengthen beyond the lower jaw only after ~1 m TL (in black marlin *Istiompax* the bill is well-

formed and extended by that size). Opportunistic predator, feeding on a wide range of epipelagic and sometimes demersal fishes and also squids. Caught incidentally by offshore longline fisheries and in major directed recreational fisheries. IUCN Red List conservation status Vulnerable.

GENUS *Tetrapturus* Rafinesque 1810

Distinguished by anus far anterior to 1st anal fin (cf. anus close to anal-fin origin in *Kajikia*). Four species: 3 restricted to the Atlantic, and 1 in Indo-Pacific.

Tetrapturus angustirostris Tanaka 1915

Shortbill spearfish

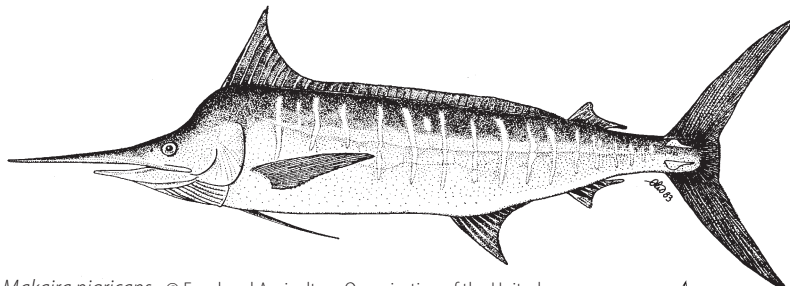
PLATE 81

Tetrapturus angustirostris Tanaka 1915: 324, Pl. 88, Fig. 285 (Funakata, Sagami Sea, Japan); Morrow 1964; Kikawa 1975; Nakamura 1985*; SSF No. 252.5*; Collette *et al.* 2006.

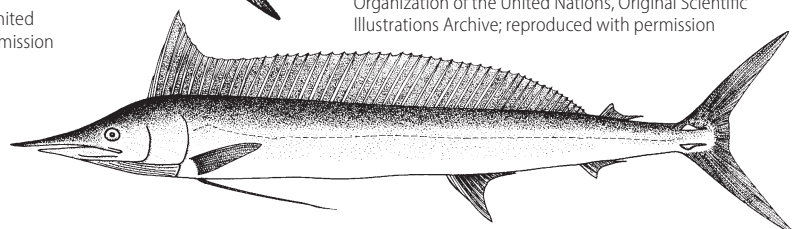
Dorsal fins 45–50 + 6 or 7 rays; anal fins 12–15 + 6–8 rays; pectoral fins 17–19 rays. Bill relatively short, usually <15% LJFL; body depth 8–10 in LJFL; 2nd anal-fin origin in front of 2nd dorsal fin. Vertebrae 12 + 12.

Body dark blue dorsally, without dots or stripes, silvery white ventrally. Attains ~2.3 m TL, ~52 kg (females average slightly larger than males).

DISTRIBUTION Throughout tropical to temperate waters of Indo-Pacific (widespread but rare), but infrequently to Cape south coast of South Africa; not known from Persian/Arabian Gulf and Red Sea; a few records from the eastern Mediterranean Sea are likely misidentifications of *T. belone* (a Red Sea endemic).



Makaira nigricans. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission



Tetrapturus angustirostris. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

REMARKS Little life-history information; probably oceanic and rarely entering coastal areas. Spawning probably occurs during winter months, especially in warm offshore currents with surface temperatures of ~25 °C. Caught incidentally in longlines and purse seines, and rarely by trolling or sport fishing.

GLOSSARY

apex of pelagic food web – the predators that no other species tend to kill for food.

monophyletic – a group of organisms (a clade) comprising the most recent common ancestor and all its descendants.

pteroic – a bone on the side of the cranium.

spawning-site fidelity – returning to the same site to spawn each season.

thermocline – the distinct interface between warmer surface waters and cooler deeper waters.

SUBORDER STROMATEOIDEI

M Eric Anderson

This suborder comprises a diverse group generally called butterfishes, pomfrets and driftfishes, occurring mostly in tropical to warm-temperate seas, although a few species are found in cold-temperate areas of both hemispheres. The juveniles of many, if not most species, undergo major morphological transformation to the adult stage and usually do not occupy the same habitat. Many juveniles associate with drifting flotsam or jellyfishes, and several species are known to nibble on the poisonous stinging tentacles of their hosts (young of *Nomeus gronovii* are known to do this regularly and are able to tolerate 10 times the toxin level that kills other fishes).

The chief diagnostic character of stromateoids is accessory digestive organs, the pharyngeal sacs (except absent in the Amarsipidae). These sacs differ in shape between each family and are studded with characteristic bony papillae used for shredding the various soft jellyfishes that constitute a major portion of the diet of many (especially young) stromateoids; the sacs are located off the oesophagus behind the last gill arch and cannot be seen without deep dissection. Other characters include the almost complete inclusion of the upper jaw by an expanded 1st suborbital bone (the lachrymal), eyes rimmed with adipose tissue, small jaw teeth in a single row, and usually weak, deciduous scales. Some stromateoids are commercially fished and are excellent eating. Adult size range ~15–140 cm SL.

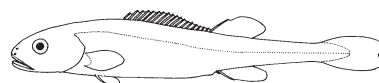
As a few genera contain some species of variable appearance, the keys here incorporate features found only

among species occurring in WIO. Given that morphological transformation is striking in those known stromateoids, the keys refer only to transformed individuals. The stromateoid classification of Haedrich (1967, 1969) is followed here and by most authors. Parin & Piotrovsky (2004) reviewed the suborder in the Indian Ocean, with comments on biology and fisheries. Phylogenetic analyses were performed by Horn (1984) and Doiuchi *et al.* (2004), the latter using more characters than the former. Springer & Johnson (2004) suggested excluding the Amarsipidae from Stromateoidei on the basis of a lack of pharyngeal sacs, but Doiuchi *et al.* (2004) showed this to be a reversal to the earlier condition. Centrolophidae has been shown to be questionably constructed (polytomous) (Horn 1984; Doiuchi *et al.* 2004), thus that family requires revision. Six families, all represented in WIO.

KEY TO FAMILIES

- 1a Two dorsal fins, usually barely separated by membrane between spinous and soft-rayed portions; dorsal fin usually 10–21 spines, if <10 spines, longest spine subequal to longest ray; pelvic fins present 2
- 1b One continuous dorsal fin (although the low membrane connecting spinous and soft-rayed portions is often torn in *Hyperoglyphe* and *Seriolella*); dorsal fin ≤9 spines, longest spine (when present) <½ length of longest dorsal-fin ray; pelvic fins present or absent 5

- 2a Base of 2nd dorsal fin shorter than that of 1st; peduncle with 2 distinct longitudinal keels; body scales thick, spinoid, rough to touch, with strong ridges ending in sharp point **TETRAGONURIDAE**



- 2b Base of 2nd dorsal fin longer than that of 1st; peduncle without keels or with very weak ones; scales thin, ctenoid or cycloid, often deciduous 3

- 3a Vomer and palatines edentate **ARIOMMATIDAE**



- 3b Teeth present on vomer and palatines (except no palatine teeth in juvenile amarsipids) 4

Continued ...

KEY TO FAMILIES

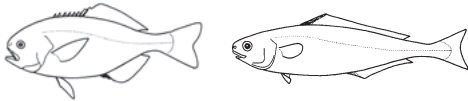
- 4a GR 14–29; lateral line on dorsum at midbody; vertebrae 30–42; pharyngeal sacs present **NOMEIDAE**



- 4b GR 19–22; lateral line midlateral at midbody; vertebrae 45–48; no pharyngeal sacs **AMARSIPIDAE**



- 5a Pelvic fins present; anal fin 15–30 rays; teeth on jaws simple, conical; branchiostegal rays 7; dorsal fin with either 0–5 weak, flexible spines or 5–9 stout spines; dorsal and anal fins never falcate **CENTROLOPHIDAE**



- 5b Pelvic fins absent in adults, rarely present in young; anal fin 30–50 rays; teeth on jaws laterally compressed, with 3 cusps; branchiostegal rays 5 or 6; dorsal fin without stout spines, but in some species 5–10 small knife-like spines in front of fin; dorsal and anal fins often falcate **STROMATEIDAE**



GLOSSARY

edentate – without teeth.

phylogenetic analysis – determining the evolutionary relationships of taxa.

FAMILY **AMARSIPIDAE**

Amarsipa

M Eric Anderson

Body elongate (adults more so than juveniles) and laterally compressed. Two dorsal fins (more widely separated in adults than in juveniles); spinous 1st dorsal fin very low, barely projecting in juveniles; 2nd dorsal-fin base subequal to anal-fin base. Pelvic fins with 1 short spine, 5 rays; fins jugular (inserted under preopercle) in juveniles, and thoracic (inserted under pectoral-fin base) in adults. Caudal fin deeply forked, peduncle

compressed. Teeth weak, in 1 row on jaws and vomer in adults, absent in juveniles; no toothed pharyngeal sac, but teeth on pharyngeal bones fang-like. Branchiostegal rays 6; gill rakers stout in adults, long and pointed in juveniles. Scales on body and gill cover small, cycloid, deciduous. Lateral line midlateral.

The metamorphosis of this fish is striking, with the body elongating, the positions of the pelvic fins and anal fin moving backwards, and the 1st dorsal fin elevating and further separating from the 2nd dorsal fin. Specimens previously rare, but now known from larvae through mature adult stage. Occurs in open ocean. Monotypic.

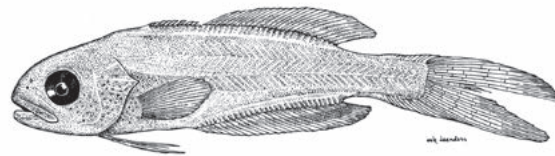
Amarsipus carlsbergi Haedrich 1969

Amarsipa

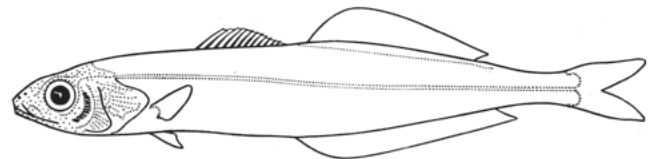
Amarsipus carlsbergi Haedrich 1969: 8, Figs. 2–8 (off Mombasa, Kenya); Ahlstrom *et al.* 1976*; SSF No. 253.1; Konovalenko & Piotrovsky 1988*; Last 2001*; Parin & Piotrovsky 2004.

Diagnosis as for family. Dorsal fin 9–12 spines, 22–27 rays; anal fin 1 spine, 27–32 rays; pectoral fins 16–20 rays; LL scales 82–100; GR 5 or 6 + 12–15. Percentage SL in juveniles (~8–70 mm SL): body depth 21–29%, HL 24–32%, snout length 21–32%, eye diameter 27–43%, pectoral-fin length 15–27%, and pelvic-fin length 17–30%. Percentage SL in adults (~160–215 mm SL): body depth 14–20%, HL 28–31%, snout length 8–9%, eye diameter 6–7%, pectoral-fin length 4–10%, and pelvic-fin length 4–7%. Vertebrae 16–18 + 28–31 = 45–48.

Adults uniformly dark brown or black, with heavily pigmented branchial cavity; juveniles translucent. Attains 22 cm SL.



Amarsipus carlsbergi, 6 cm TL, holotype (Indian Ocean). Source: Haedrich 1969



Amarsipus carlsbergi, 21 cm SL, adult. Drawn from Konovalenko & Piotrovsky 1988

DISTRIBUTION Tropical Indo-Pacific (rare). WIO: Mozambique Channel and Seychelles.

REMARKS Usually epipelagic, but large adults probably stray or migrate into upper mesopelagic zone during daytime; available records from pelagic trawls at 30–130 m. Larvae described by Ahlstrom *et al.* (1976).

FAMILY STROMATEIDAE

Pomfrets and butterfishes

M Eric Anderson

Body oval, compressed, very deep (depth ~31–55% SL). Eyes small to moderate; snout length usually longer than eye diameter; eyes with adipose tissue reaching over snout. Mouth small; teeth in jaws minute, blade-like, uniserial; no teeth on vomer or palatines. Dorsal fin continuous or partly divided, with 5–7 slender flexible spines embedded in flesh, total fin elements 42–57. Anal fin with 2 or 3 spines, total fin elements 33–48. Pectoral fins fan-like or wedge-shaped, with 18–27 rays. No pelvic fins (except in young of *Stromateus fiatola*). Caudal skeleton with 4 hypurals and 2 or 3 epurals. Scales minute, cycloid, deciduous; top of head and nape usually scaleless, and head may be covered with small pores. Branchiostegal rays 5 or 6; GR 12–24, slender and close-set. Vertebrae 30–48.

Adults demersal and pelagic over continental shelf, to ~100 m deep, occurring in small schools; juveniles epipelagic and associate with jellyfish. Of commercial importance in some areas and excellent to eat. Maximum size 40–60 cm TL. Three genera and ~13 species; 2 genera and 3 species in WIO.

KEY TO GENERA

- 1a Total anal-fin elements 39–50; total GR 10–14; branchiostegal rays 5; vertebrae 33–41 *Pampus*
 1b Total anal-fin elements 33–38; total GR 14–19; branchiostegal rays 6; vertebrae 42–45 *Stromateus*

GENUS *Pampus* Bonaparte 1837

Body subcircular, very deep; dorsal-fin origin opposite anal-fin origin; no pelvic fins. Eyes small; gill slit short, extends to lower margin of pectoral-fin base or just below it. Lateral line high, following dorsal contour and curving onto peduncle. Benthopelagic over continental shelf; young may frequent estuaries. In WIO, *Pampus argenteus* is of major commercial importance, and *P. chinensis* less so. Reviewed by Pati (1978). Five species, 2 in WIO.

KEY TO SPECIES

- 1a Dorsal fin and anal fin falcate (fin margins deeply notched anteriorly, and posterior rays of each fin subequal in length), and 5–10 knife-like spines embedded in skin in front of each of these fins; caudal fin deeply forked *P. argenteus*
 1b Dorsal fin and anal fin not falcate, and no embedded spines in front of these fins; caudal fin indented but not strongly forked *P. chinensis*

Pampus argenteus (Euphrasen 1788)

Silver pomfret

PLATE 81

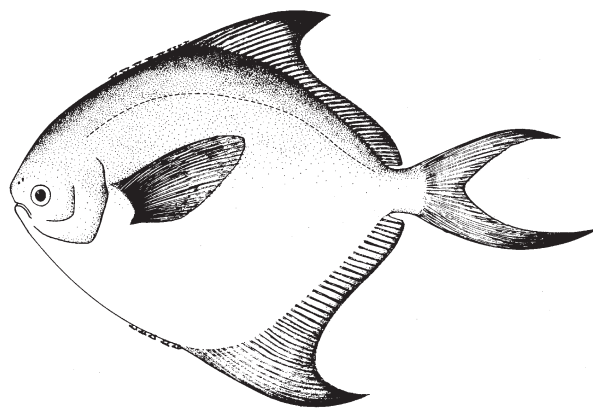
Stromateus argenteus Euphrasen 1788: 53, Pl. 9 (Pearl River mouth, Guangdong Province, China).

Stromateus candidus Cuvier 1829: 213 ('Indian seas').

Pampus argenteus: Haedrich 1967; Kuronuma & Abe 1972*; Lindberg & Krasnyukova 1975; Masuda *et al.* 1984*; Randall 1995*; Carpenter *et al.* 1997; Last 2001*; Manilo & Bogorodsky 2003; Parin & Piotrovsky 2004.

Body firm, compressed; wide ridge-like skin patch on top of head and extending along lateral line above pectoral fins. Dorsal fin and anal fin falcate; caudal fin deeply forked, lower lobe longest. Dorsal fin 5–10 embedded spines, 37–43 rays; anal fin 3–7 embedded spines (scarcely visible in adults), 34–43 rays; pectoral fins 24–27 rays. Percentage SL: body depth 53–75%, HL 18–28%, predorsal length 37–46%, preanal length 38–55%, pectoral-fin length 29–42%, snout length 3–6%, and eye diameter 4–7%. Scales minute, cycloid, deciduous. GR 1–4/8–10 = 10–14; gill membranes broadly attached to throat; gill slit short, extending to lower edge of pectoral-fin base. Vertebrae 14–16 + 20–25 = 34–39.

Body bluish or greyish dorsally, silvery white at sides and belly, and covered with small black spots, densest on top of head; all fins (except dorsal fin) may be faintly yellow with dark margins. Attains 60 cm TL.



Pampus argenteus, 14 cm SL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to India; elsewhere to Bay of Bengal, Indonesia, South China Sea and northern Japan; records from Mediterranean Sea, North Sea and Hawaii are probably erroneous.

REMARKS Benthopelagic, over muddy bottoms, at 5–80 m.

Pampus chinensis (Euphrasen 1788)

Chinese pomfret

PLATE 81

Stromateus chinensis Euphrasen 1788: 54 (Pearl River mouth, Guangdong Province, China).

Stromateus sinensis Forster 1795: 14 (India) [name only].

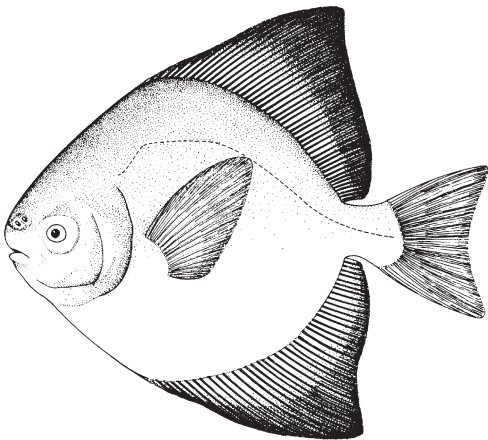
Stromateus albus Cuvier 1829: 213 ('Indian seas' [Visakhapatnam, India]).

Stromateus atous Cuvier in Cuv. & Val. 1833: 389 [no types known].

Pampus chinensis: Haedrich 1967; Lindberg & Krasnyukova 1975*; Masuda *et al.* 1984*; Last 2001*; Manilo & Bogorodsky 2003; Parin & Piotrovsky 2004.

Body firm, compressed; snout blunt, rounded. Dorsal fin and anal fin not falcate, but rays gradually diminishing in length posterior to longest ray, and no embedded spines preceding rays; caudal fin indented but not strongly forked. Dorsal fin 40–50 rays; anal fin 39–43 rays; pectoral fins 24–27 rays. Percentage SL: body depth 63–82%, HL 21–31%, predorsal length 29–45%, preanal length 33–45%, pectoral-fin length 29–39%, snout length 4–7%, and eye diameter 4–6%. Scales minute, cycloid, deciduous; naked patch on top of head and nape; well-defined sensory canals on head, not reaching vertical through pectoral-fin bases. GR 2 or 3/8–11 = 11–14; gill membranes broadly attached to throat; gill slit extending ventrally to just below lower edge of pectoral-fin base. Vertebrae 14 + 19.

Body greyish or greenish brown dorsally, and sides silvery white; fins silvery to greyish, with darker or blue margins (except not on anal fin). Attains 40 cm SL.



Pampus chinensis, 12 cm SL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Arabian Sea and Persian/Arabian Gulf to India; elsewhere to Indonesia, Taiwan, China, Japan and northwestern Australia.

REMARKS Benthopelagic, to ~100 m deep; sometimes enters estuaries.

GENUS *Stromateus* Linnaeus 1758

Body ovoid; eyes moderate. Dorsal-fin origin slightly in front of anal-fin origin; pelvic fins usually present in juveniles only. Lateral line high on body, following dorsal contour and curving onto peduncle. Pelagic and nearshore during summer spawning runs, moving offshore and to lower latitudes in winter. Genus revised by Horn (1973). Three species, 1 in WIO.

Stromateus fiatola Linnaeus 1758

Blue butterfish

PLATE 82

Stromateus fiatola Linnaeus 1758: 248 (Mediterranean Sea; Red Sea) [no types known; based on multiple species]; Barnard 1927*; Smith 1949*; Haedrich 1967, 1986*; Blache *et al.* 1970*; Horn 1973*; SSF No. 254.10*.

Stromateus capensis Pappe 1853: 20 (Cape of Good Hope, South Africa); Gilchrist & Von Bonde 1923.

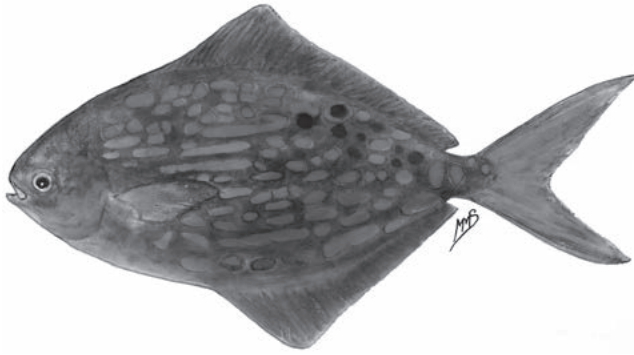
Stromateus fasciatus: Smith 1949*.

Dorsal-fin origin above or slightly behind pectoral-fin bases; anal-fin origin anterior to midbody in young, at midbody in adults; caudal fin deeply forked in adults. Dorsal fin 40–51 rays; anal fin 33–38 rays; pectoral fins 21–25 rays; LL scales ~120; GR 14–19. Percentage SL: body depth 36–56%, HL 23–36%, predorsal length 29–44%, preanal length 42–60%, pectoral-fin length 18–27%, snout length 6–10%, and eye diameter 3–9%. Vertebrae 18 or 19 + 24–26 = 42–45.

Adults bluish to brownish dorsally, brown to silvery below, with greenish gold stripes and brown and indigo spots; fins brown or black. Juveniles (<10 cm SL) silvery white, with 10 or 11 dark vertical bars, and fins indigo (pelvic fins may be lost by this size). Attains 50 cm SL.



Stromateus fiatola, 11 cm TL, juvenile (South Africa). Source: SSF



Stromateus fiatola, 26 cm TL, adult (South Africa). Source: SSF

DISTRIBUTION Mediterranean Sea, eastern Atlantic (Portugal to Cape of Good Hope, South Africa) and Indian Ocean. WIO: South Africa (Cape Peninsula) to southern Mozambique.

REMARKS Occurs on inner continental shelf. Once reported from the Red Sea through Suez Canal (Gruvel & Chabanaud 1937).

GLOSSARY

benthopelagic – occurring near or just above the bottom of the sea.
elements – the spines or rays of a fin.
epural – an elongate detached bone above the urostyle and behind the last neural spine supporting caudal-fin rays.
hypurals – the fan-shaped series of bones (sometimes fused to one or two plates) to which the caudal-fin rays are attached.

FAMILY NOMEIDAE

Cigarfishes and driftfishes

M Eric Anderson

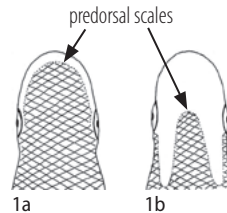
Body fusiform to moderately deep, with 2 distinct dorsal fins, 1st dorsal fin with 9–12 spines that fold into groove, and 2nd dorsal fin with 1 or 2 spines, 15–31 rays. Pectoral fins canted forward, with fin origin well in front of insertion

(except not in *Nomeus gronovii*). Pelvic fins thoracic in adults. Anal fin 1–3 spines, 14–31 rays. Caudal fin moderately to deeply forked (except in metamorphosing young). Mouth terminal; teeth present on vomer and palatines. Branchiostegal rays 6. Scales small to large, deciduous, cycloid or with minute ctenii. Lateral line high on back, curved. Swimbladder present. Vertebrae 30–42.

Shallow-water to moderately deep-pelagic, coastal or oceanic, in tropical to temperate seas. Of little commercial interest. Most species attain <30 cm SL, but members of *Cubiceps* may attain >100 cm SL. Juveniles associate with jellyfish or flotsam. Ahlstrom *et al.* (1976) described the early life-history stages of 11 species. Three genera and 15 species; all 3 genera and 12 species in WIO.

KEY TO GENERA

- 1a Scales on top of head reach to or beyond front edge of eyes; 1st dorsal-fin origin behind or (in young) directly above pectoral-fin origins 2
- 1b Scales on top of head do not extend in front of eyes (except in adults of *Psenes cyanophrys*) and snout naked; 1st dorsal-fin origin before or above pectoral-fin origins *Psenes*



- 2a No teeth on tongue; vertebrae 41 *Nomeus*
- 2b Teeth present on tongue; vertebrae 30–33 *Cubiceps*

GENUS *Cubiceps* Lowe 1843

Body fusiform, colour generally brownish; caudal fin deeply forked. Eyes large. Teeth minute, usually uniserial, and teeth present on tongue. Predorsal scales extend to front of edge of eyes or to snout tip. Generally epipelagic, but large adults may become benthopelagic in coastal waters. Reviewed by Butler (1979) and Agafonova (1988, 1994). Ten species, 7 in WIO.

KEY TO SPECIES

- 1a Vomerine teeth in broad patch 2
- 1b Vomerine teeth in single row 3

Continued...

KEY TO SPECIES

- 2a Second dorsal fin 15–17 rays; anal fin 14–17 rays; pelvic-fin origins behind 1st dorsal-fin origin and pectoral-fin insertions; sensory pores on top of head not extending in front of eyes *C. pauciradiatus*
- 2b Second dorsal fin 23–27 rays; anal fin 21–24 rays; pelvic-fin origins under 1st dorsal-fin origin and pectoral-fin insertions; sensory pores on top of head extend to snout tip ... *C. caeruleus*
- 3a LL scales 52–71 4
- 3b LL scales 44–49 *C. macrolepis*
- 4a Pectoral fins 18–21 rays 5
- 4b Pectoral fins 21–24 rays 6
- 5a Scales on top of head with distinct boundary between large and small scales at line through rear edge of eyes; 12–14 oblique scale rows from lateral line to anal-fin origin *C. whiteleggii*
- 5b Scales on top of head grading gradually from large to small at interorbital area; 15–19 oblique scale rows from lateral line to anal-fin origin *C. nanus*
- 6a Caudal fin 7–10 upper procurrent rays; scales on top of head extend onto snout, almost to nostrils; LL scales 52–66 *C. baxteri*
- 6b Caudal fin 11 or 12 upper procurrent rays; scales on top of head extend to just in front of eyes; LL scales 62–71 *C. capensis*

Cubiceps baxteri McCulloch 1923

Black cigarfish

PLATE 82

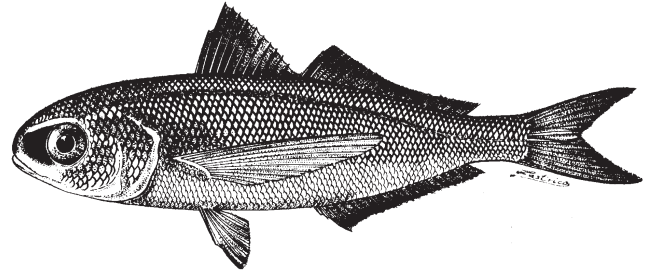
Cubiceps baxteri McCulloch 1923: 15, Pl. 1, Fig. 4 (on beach at Lord Howe I., Australia); Butler 1979*; SSF No. 255.3*; Agafonova 1994*; Last 2001*; Parin & Piotrovsky 2004.

Cubiceps gracilis (non Lowe 1843): Smith 1966*.

Cubiceps caeruleus (non Regan 1914): Haedrich 1967, 1972*; Trunov 1975*; Ahlstrom *et al.* 1976*.

First dorsal fin 11 spines; 2nd dorsal fin 1 spine, 20–24 rays; anal fin 3 spines, 19–22 rays; pectoral fins 21–23 rays. Percentage SL: HL 30–36%, body depth 26–35%, predorsal length 32–44%, preanal length 59–72%, pectoral-fin length 31–43%, and pelvic-fin length 11–16%. Percentage HL: snout length 23–31%, eye diameter 25–30%, and upper jaw 24–31%. LL scales 52–66 (but 52–58 in eastern Pacific populations); 6 or 7 scales between lateral line and dorsal-fin origin; 19 or 20 scales between lateral line and anal-fin origin. GR 6–10/16–18. Vertebrae 31.

Body blackish brown (younger fish paler brown); eyes blue. Attains 100+ cm SL.



Cubiceps baxteri. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal, anti-equatorial, between approximately 40° N and 40° S.

REMARKS Ahlstrom *et al.* (1976) described the early life-history stages of this species (as *C. caeruleus*).

Cubiceps caeruleus Regan 1914

Blue cigarfish

PLATE 82

Cubiceps caeruleus Regan 1914: 15 (Three Kings Is., New Zealand); Haedrich 1967 [in part]; Trunov 1975*; Astakhov 1978*; Butler 1979*; SSF No. 255.4*; Agafonova 1988, 1994*; Parin & Piotrovsky 2004.

Cubiceps capensis (non Smith 1845): Haedrich 1967 [in part], 1972*; Ahlstrom *et al.* 1976*.

First dorsal fin 11 spines; 2nd dorsal fin 1 spine, 23–27 rays; anal fin 2 spines, 21–24 rays; pectoral fins 19–22 rays. Percentage SL: HL 26–37%, body depth 24–34%, predorsal length 20–41%, preanal length 58–68%, pectoral-fin length 19–35%, and pelvic-fin length 10–15%. Percentage HL: snout length 23–30%, eye diameter 23–32%, and upper jaw 26–23%. LL scales 50–56; 4 scales between lateral line and dorsal-fin origin; 14 or 15 scales between lateral line and anal-fin origin. GR 8–10/16–21. Vertebrae 31.

Body dark bluish grey, darkest dorsally; unscaled region of snout blue. Attains at least 29 cm SL, probably much more.

DISTRIBUTION Circumglobal in temperate waters of Southern Hemisphere. WIO: South Africa (Cape of Good Hope to off East London, Eastern Cape), Walters Shoals and Southwest Indian Ridge.

REMARKS Ahlstrom *et al.* (1976) described the early life-history stages of this species (as *C. capensis*).

Cubiceps capensis (Smith 1845)

Cape cigarfish

PLATE 82

Atimostoma capensis Smith 1845: Pl. 24 (north of Cape Town, South Africa).

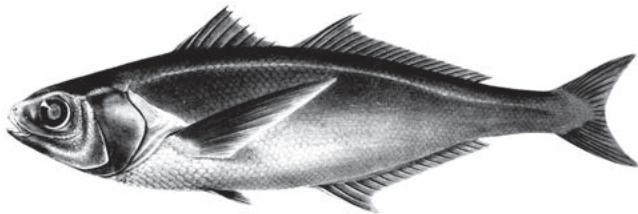
Cubiceps capensis: Barnard 1948*; Haedrich 1967; Astakhov 1978*; Butler 1979*; SSF No. 255.5*; Agafonova 1988, 1994*; Last 2001*; Parin & Piotrovsky 2004.

Cubiceps gracilis (non Lowe 1843): Smith 1949*.

Cubiceps sp. A: Ahlstrom *et al.* 1976*.

First dorsal fin 11 spines; 2nd dorsal fin 1 spine, 20–23 rays; anal fin 3 spines, 19–22 rays; pectoral fins 20–24 rays. Percentage SL: HL 26–32%, body depth 24–29%, predorsal length 32–41%, preanal length 55–62%, and pectoral-fin length 27–40%. Percentage HL: snout length 27–30%, eye diameter 22–25%, and upper jaw 28–35%. LL scales 62–71; 6 or 7 scales between lateral line and dorsal-fin origin; 19–21 scales between lateral line and anal-fin origin. GR 7–9/16–19. Vertebrae 31.

Body dark brown, deep purple dorsally (small fish paler). Attains 100 cm SL.



Cubiceps capensis, holotype (South Africa). Source: Smith 1845

DISTRIBUTION Circumglobal in tropical to temperate seas.

REMARKS Ahlstrom *et al.* (1976) described the early life-history stages of this species (as *Cubiceps* sp. A).

Cubiceps macrolepis Agafonova 1988

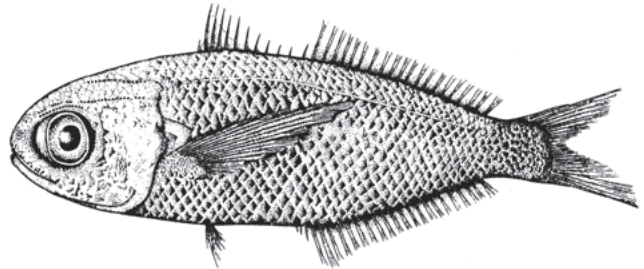
Bigscale cigarfish

Cubiceps macrolepis Agafonova 1988: 543 [48], Fig. 1 (Arabian Sea); Agafonova 1994*; Parin & Piotrovsky 2004.

First dorsal fin 11 spines; 2nd dorsal fin 1 spine, 21 or 22 rays; anal fin 3 spines, 20–23 rays; pectoral fins 19–21 rays. Percentage SL: HL 31–33%, body depth 23–34%, predorsal length 39–42%, preanal length 58–62%, and pectoral-fin length 37–41%. Percentage HL: snout length 25–33%, eye diameter 26–34%, and upper jaw 26–33%. Scales on top of head extend to snout tip. LL scales 44–49; 5 scales between lateral line and

dorsal-fin origin; 13–15 scales between lateral line and anal-fin origin. GR 9 or 10/15–17. Vertebrae 31.

Body brownish, belly and fin membranes greyish brown. Attains 20 cm SL.



Cubiceps macrolepis, holotype (Arabian Sea). Source: Agafonova 1988

DISTRIBUTION WIO: Arabian Sea, Mascarene Ridge and Carlsberg Rise.

REMARKS Epipelagic; known from midwater trawls at ~100–150 m over deeper water (>3 000 m). Feeds mainly on salps.

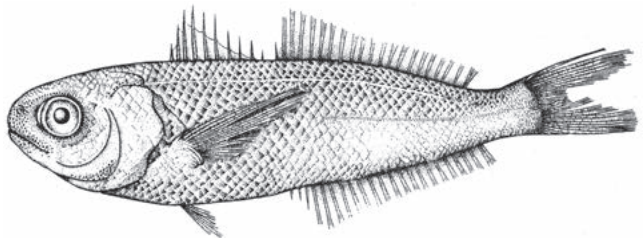
Cubiceps nanus Agafonova 1988

Dwarf cigarfish

Cubiceps nanus Agafonova 1988: 547 [53], Fig. 4 (Arabian Sea); Agafonova 1994*; Manilo & Bogorodsky 2003; Parin & Piotrovsky 2004.

First dorsal fin 10 spines; 2nd dorsal fin 1 spine, 18–20 rays; anal fin 3 spines, 17–20 rays; pectoral fins 18–20 rays. Percentage SL: HL 29–35%, body depth 26–33%, predorsal length 33–37%, preanal length 53–58%, and pectoral-fin length 28–36%. Percentage HL: snout length 24–28%, eye diameter 23–29%, and upper jaw 26–35%. Scales on top of head extend to snout tip; LL scales 52–60; 5 or 6 scales between lateral line and dorsal-fin origin; 15–19 scales between lateral line and anal-fin origin. GR 8–10/15 or 16. Vertebrae 31.

Body purplish brown, bases of fins darker, and fin rays grey. Attains at least 12 cm SL.



Cubiceps nanus, holotype (Arabian Sea). Source: Agafonova 1988

DISTRIBUTION WIO: Northern Arabian Sea (Oman) and Madagascar.

REMARKS Epipelagic; the largest specimens collected are adults.

Cubiceps pauciradiatus Günther 1872

Bigeye cigarfish

PLATES 82 & 83

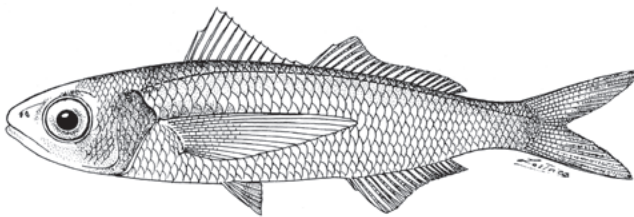
Cubiceps pauciradiatus Günther 1872: 423 (Misol I. [Pulau Misool, Raja Ampat Is., Indonesia]); Haedrich 1967, 1972*; Trunov 1975*; Ahlstrom *et al.* 1976*; Astakhov 1978*; Butler 1979*; SSF No. 255.6*; Agafonova 1988, 1994*; Piotrovsky 1994; Last 2001*; Manilo & Bogorodsky 2003; Parin & Piotrovsky 2004.

Cubiceps longimanus Fowler 1934: 442, Fig. 23 (Durban, KwaZulu-Natal, South Africa).

Cubiceps brevimanus (*non* Klunzinger 1884): Smith 1949*.

First dorsal fin 10 or 11 spines; 2nd dorsal fin 1 spine, 15–17 rays; anal fin 2 spines, 14–17 rays; pectoral fins 17–20 rays. Percentage SL: HL 28–35%, body depth 21–28%, predorsal length 35–42%, preanal length 64–73%, pectoral-fin length 28–39%, and pelvic-fin length 11–14%. Percentage HL: snout length 25–34%, eye diameter 25–36%, and upper jaw 25–33%. Scales on top of head in bifurcating pattern and not extending to snout tip; LL scales 49–53; 4 or 5 scales between lateral line and dorsal-fin origin; 13 or 14 scales between lateral line and anal-fin origin. GR 7–11/15–19. Vertebrae 30 or 31.

Body greyish or grey-brown, fin bases darker, and fin membranes grey. Attains at least 14 cm SL (probably <20 cm SL).



Cubiceps pauciradiatus. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate seas, between approximately 40° N and 40° S. WIO: Arabian Sea, Gulf of Aden to South Africa (False Bay, Western Cape).

REMARKS Found at 58–1 000 m; feeds near the surface at night.

Cubiceps whiteleggii (Waite 1894)

Shadow cigarfish

PLATE 83

Psenes whiteleggii Waite 1894: 218, Pl. 17, Fig. 1 (Maroubra Bay, New South Wales, Australia); Smith 1949*; Haedrich 1967; Nellen 1973*; SSF No. 255.12* [fig. not *C. whiteleggii*].

Mulichthys squamiceps Lloyd 1909: 158 (Arabian Sea).

Cubiceps natalensis Gilchrist & Von Bonde 1923: 7, Pl. 17, Fig. 2 (KwaZulu-Natal, South Africa); Smith 1949*.

Psenes guttatus Fowler 1934: 442, Fig. 24 (KwaZulu-Natal, South Africa).

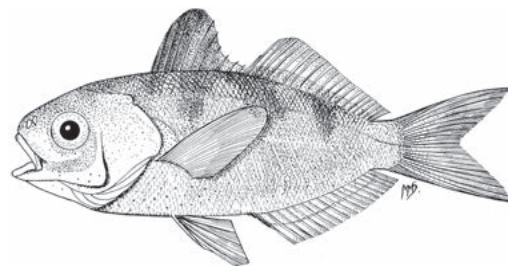
Psenes stigmatopleuron Fowler 1939: 1 (KwaZulu-Natal, South Africa).

Cubiceps squamiceps: Haedrich 1967; Talwar 1973; Butler 1979*; Agafonova 1988*, 1994*; Manilo & Bogorodsky 2003.

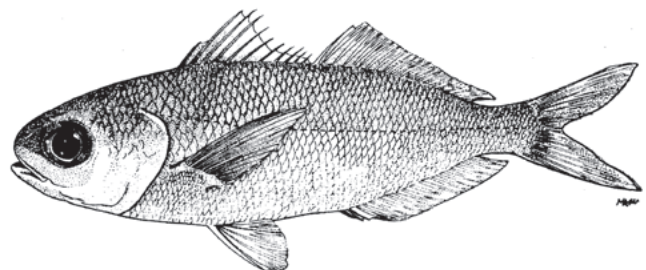
Cubiceps whiteleggii: Allen & Swainston 1988; Allen 1997*; Last 2001*; Parin & Piotrovsky 2004.

First dorsal fin 9–11 spines; 2nd dorsal fin 1 or 2 spines, 17–21 rays; anal fin 2 or 3 spines, 16–20 rays; pectoral fins 18–21 rays. Percentage SL: HL 30–38%, body depth 25–38%, predorsal length 33–40%, preanal length 58–65%, pectoral-fin length 25–38%, and pelvic-fin length 15–19%. Percentage HL: snout length 21–29%, eye diameter 25–31%, and upper jaw 27–39%. Scales on top of head extend well onto preorbital area but do not reach snout tip; LL scales 55–66; 5–8 scales between lateral line and dorsal-fin origin; 15–17 scales between lateral line and anal-fin origin. GR 6–12/15–19. Vertebrae 31–32.

Body silvery white, becoming pale or reddish brown after death; fin membranes grey; inside of mouth and gill cavity black. Attains 21 cm SL.



Cubiceps whiteleggii, 5 cm TL, juvenile (South Africa). Source: SSF



Cubiceps whiteleggii, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (False Bay), Mascarenes, Arabian Sea and India; elsewhere to Philippines, China, Japan and Australia.

REMARKS Adults benthopelagic, at 180–800 m; young epipelagic. Feeds mainly on salps. Of minor commercial importance in Mozambique, India and Philippines.

GENUS *Nomeus* Cuvier 1816

Body fusiform; caudal fin deeply forked. Eyes moderate in adults, proportionally large in juveniles. No teeth on tongue. Predorsal scales extend in front of eyes but not to snout tip. Adults benthopelagic over upper slope; juveniles epipelagic and associate with flotsam and jellyfish. One species.

Nomeus gronovii (Gmelin 1789)

Bluebottlefish

PLATE 83

Gobius gronovii Gmelin 1789: 1205 (Brazil).

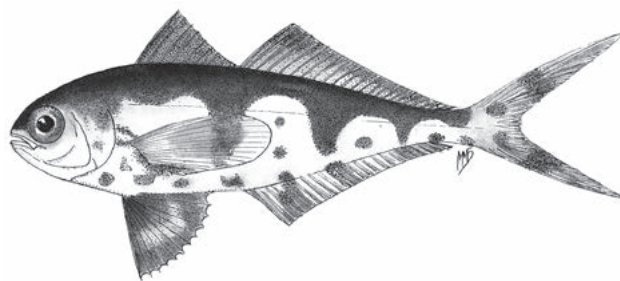
Nomeus maculatus Valenciennes 1840: Pl. 56, Fig. 2 (Indian Ocean).

Nomeus albula [unavailable name of Meuschen 1781]: Fowler 1936; Smith 1949*.

Nomeus gronovii: Haedrich 1967; Ahlstrom *et al.* 1976*; Parin & Fedoryako 1981*; SSF No. 255.7*; Suda *et al.* 1986*; Heemstra & Heemstra 2004*; Parin & Piotrovsky 2004*.

First dorsal fin 9–12 spines; 2nd dorsal fin 1 spine, 24–28 rays; anal fin 1 or 2 spines, 24–29 rays; pectoral fins 19–24 rays. Proportions (after Parin & Fedoryako 1981) as % SL of juveniles (25–106 mm SL) given first, followed in parentheses by % SL of adults (250–328 mm SL): HL 30–36 (27–28), body depth 24–36 (21–24), predorsal length 34–43 (33–35), preanal length 57–63 (53–57), pectoral-fin length 27–32 (37–41), pelvic-fin length 21–38 (9–11), snout length 6–8 (7–8), eye diameter 8–12 (6), and upper jaw 6–10 (6). Scales in preorbital region not extending as far as snout tip; naked U-shaped area above eyes extending posteriorly to upper edge of gill opening; LL scales 57–65; 5 scales between lateral line and dorsal-fin origin; 18–20 scales between lateral line and ventral midline. No teeth on tongue. Branchiostegal rays 6; GR 4–8/10–19 = 14–27. Vertebrae 14 + 27 = 41.

Adults dark brown (dark remnants of bars and blotches observed in a specimen 24 cm SL); juveniles (<18 cm SL) silvery with striking iridescent indigo bars and blotches, and long pelvic fins mostly black. Attains ~40 cm TL.



Nomeus gronovii, 9 cm TL, juvenile (South Africa). Source: SSF

DISTRIBUTION Circumglobal in tropical to warm-temperate seas; widespread in Indo-Pacific, but not known from Mediterranean Sea.

REMARKS Their main host is the siphonophore *Physalia* (Portuguese man-of-war or bluebottle) and they are known to feed on its stinging tentacles and other parts.

GENUS *Psenes* Valenciennes 1833

Body fusiform to ovoid, as young fish are deeper bodied than adults; caudal fin moderately to deeply forked. Eyes large. Predorsal scales do not extend in front of eyes (except in adult *P. cyanophrys*). Oceanic and epipelagic, although adults of *P. pellucidus* may become deep-demersal. Six species, with 1 of these from eastern Indian Ocean undescribed; 4 species in WIO. Larval development of 3 species in WIO described by Ahlstrom *et al.* (1976).

KEY TO SPECIES

- 1a Teeth in upper and lower jaws differently shaped: upper teeth needle-like, recurved; lower teeth blade-like (compressed) and close-set 2
- 1b Teeth in both jaws mostly similarly shaped: mostly needle-like and recurved, but lower rear teeth somewhat blade-like *P. cyanophrys*
- 2a Second dorsal fin 18–24 rays; anal fin 20–23 rays; LL scales 44–80; vertebrae 31–38 3
- 2b Second dorsal fin 26–32 rays; anal fin 26–31 rays; LL scales 109–125; vertebrae 40–44 *P. pellucidus*
- 3a LL scales 66–80 *P. maculatus*
- 3b LL scales 44–60 *P. arafurensis*

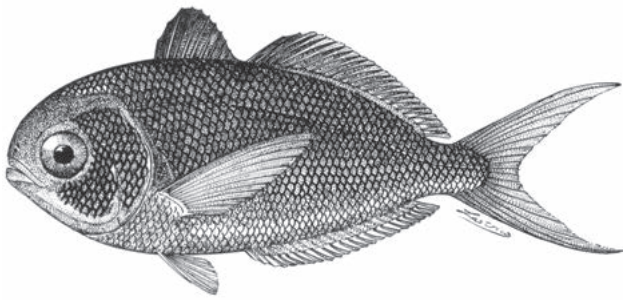
Psenes arafurensis Günther 1889

Banded driftfish

Psenes arafurensis Günther 1889: 13, Pl. 2, Fig. G (Arafura Sea);
Haedrich 1967; Ahlstrom *et al.* 1976*; Masuda *et al.* 1984*;
SSF No. 255.8*; Last 2001*; Parin & Piotrovsky 2004.

First dorsal fin 10 or 11 spines; 2nd dorsal fin 1 or 2 spines, 18–22 rays; anal fin 3 spines, 20–23 rays; pectoral fins 18–20 rays, and fin length subequal to HL in adults. Percentage SL: HL 32–34%, body depth 40–46%, peduncle depth 8–10%, predorsal length 32–35%, and preanal length 56–57%. Percentage HL: snout length 21–27%, eye diameter 9–11%. LL scales 44–60; 8 or 9 scales between lateral line and dorsal-fin origin. Teeth in lower jaw twice as long as teeth in upper jaw. Branchiostegal rays 6; total GR 24–26. Vertebrae 31.

Adults uniformly dark, almost black; juveniles with 3 or 4 vertical bands, which may be mottled. Attains 23 cm SL.



Psenes arafurensis. Source: Last 2001 © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical and subtropical seas. WIO: Somalia to South Africa (KwaZulu-Natal) and Seychelles.

REMARKS Poorly known; oceanic and caught near surface.

Psenes cyanophrys Valenciennes 1833

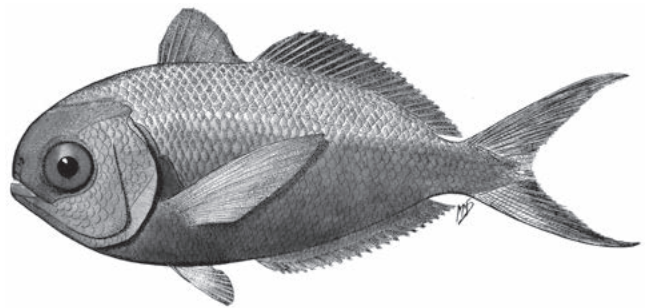
Freckled driftfish

PLATE 83

Psenes cyanophrys Valenciennes *in* Cuv. & Val. 1833: 260, Pl. 265
(New Ireland, Bismarck Archipelago, Papua New Guinea);
Smith 1949; Legaspi 1956*; Blache *et al.* 1970*; Haedrich & Horn 1972;
Ahlstrom *et al.* 1976*; Haedrich 1986; SSF No. 255.9* [in part];
Last 2001*; Parin & Piotrovsky 2004.
Psenes fuscus Guichenot 1866: 138 (Madagascar).
Psenes rotundus Smith 1949: 307, Fig. 854a (off Dassen I., South Africa).
Parapsenes rotundus: Smith 1949; Agafanova & Piotrovsky 1990*;
Manilo & Bogorodsky 2003.
Psenes arafurensis (*non* Günther 1889): Haedrich 1967 [in part];
SSF No. 255.8* [in part].

Body firm, deep and strongly compressed. Percentage SL (fish >10 cm SL): HL 28–42%, body depth 42–56%, predorsal length 34–38%, preanal length 50–56%, and pectoral-fin length 32–37%. Percentage HL: snout length 24–37%, eye diameter 22–28%, and upper jaw 29–34%. First dorsal fin 9–11 spines; 2nd dorsal fin 1 spine, 22–28 rays; anal fin 3 spines, 22–28 rays; pectoral fins 17–20 rays. Scales on top of head not reaching as far as front edge of eyes; LL scales 60–70 (not 43–44 as reported by Smith 1949); 6–8 scales between lateral line and dorsal-fin origin; 22–27 scales between lateral line and ventral midline. Teeth on tongue and vomer minute (not absent as given by Smith [1949]), palatine teeth larger. Branchiostegal rays 6; GR 7 or 8/17–21. Vertebrae 12 or 13 + 18 or 19 = 31.

Early juveniles silvery yellow, with numerous black stripes; metamorphosed juveniles through adults yellowish brown dorsally, dark purplish brown to black ventrally, or uniformly dark purplish with lateral line in pale band, and pectoral fins grey. Attains 23 cm SL.



Psenes cyanophrys, 23 cm TL, holotype of *P. rotundus* (South Africa).
Source: SFSA

DISTRIBUTION Circumglobal in tropical to subtropical seas; WIO: reaches south to South Africa.

REMARKS Epipelagic in open ocean, associating with jellyfish, weed mats (including *Sargassum*) and flotsam. Early life history described by Legaspi (1956).

Psenes maculatus Lütken 1880

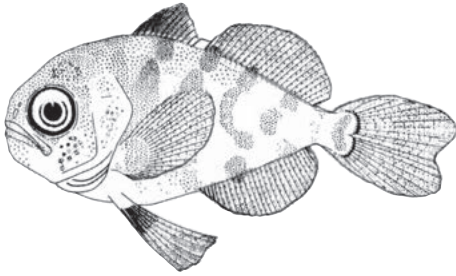
Silver driftfish

Psenes maculatus Lütken 1880: 518 [110], Pl. 5, Fig. 2 (northeastern Atlantic [north and south of Azores]); Haedrich 1967, 1986*, 1991;
Blache *et al.* 1970*; Haedrich & Horn 1972; Ahlstrom *et al.* 1976*;
SSF No. 255.10*; Parin & Piotrovsky 2004.

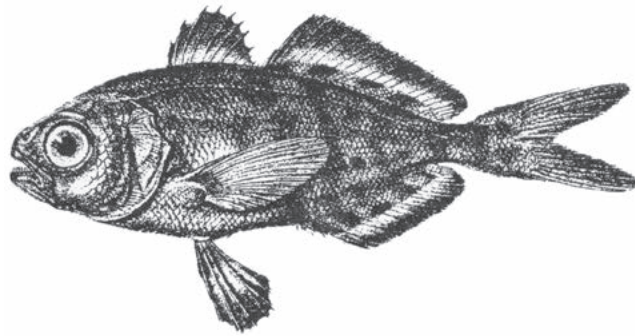
Body firm, moderately deep, compressed; HL 34–42% SL; body depth 29–42% SL. First dorsal fin 9–11 spines; 2nd dorsal fin 1 spine, 22–24 rays; anal fin 3 spines, 21–23 rays; pectoral

fins 20–22 rays. Scales on top of head not reaching front edge of eyes; LL scales 66–80; 7 scales between lateral line and dorsal-fin origin; 23–26 scales between lateral line and ventral midline. Branchiostegal rays 6; GR 8–10/16–19. Vertebrae 33–38.

Metamorphosed juveniles (>20 mm SL) with various blotches and spots, some of these becoming bands in larger juveniles, and bases of 2nd dorsal fin and anal fin dark, with 4 or 5 large spots. Attains 30 cm SL.



Psenes maculatus, 22 mm TL, early juvenile. Source: Ahlstrom *et al.* 1976



Psenes maculatus. Source: Haedrich 1986; © UNESCO

DISTRIBUTION Circumglobal (but rare) in temperate seas, antitropical, between approximately 40° N and 40° S; WIO: records from South Africa and Mozambique Ridge.

REMARKS Epipelagic. All recorded specimens are immature fish (<11 cm SL).

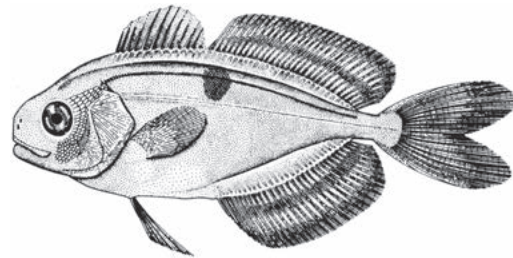
Psenes pellucidus Lütken 1880

Dark driftfish

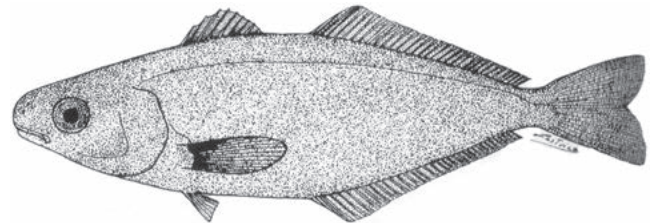
Psenes pellucidus Lütken 1880: 516 [108], 610, Fig. (Surabaya Strait, Java, Indonesia); Haedrich 1967*, 1972, 1986*, 1991; Blache *et al.* 1970*; Haedrich & Horn 1972*; Trunov 1975*; Ahlstrom *et al.* 1976*; SSF No. 255.11*; Last 2001*; Parin & Piotrovsky 2004.
Papyrichthys pellucidus: Smith 1934*, 1949a*, 1949.

Body flabby, fusiform. Percentage SL (fish >10 cm SL): HL 15–36%, body depth 17–63%. Percentage HL: snout length 26–33%, eye diameter 20–25%. First dorsal fin 9–12 spines; 2nd dorsal fin 1 or 2 spines, 26–32 rays; anal fin 2 or 3 spines, 26–31 rays; pectoral fins 18–20 rays. Predorsal scales on nape only, not on head; LL scales 109–125; 13 or 14 scales between lateral line and dorsal-fin origin; ~50 scales between lateral line and ventral midline. Branchiostegal rays 6; GR 8/14–16. Vertebrae 40–44.

Adults uniformly dark brown to indigo, and eyes dark blue; young translucent yellowish brown, with brown blotches and spots, and dark 1st dorsal fin. Attains 80 cm TL.



Psenes pellucidus, juvenile. Source: Haedrich 1986; © UNESCO



Psenes pellucidus, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to warm-temperate seas; WIO: Gulf of Aden to South Africa.

REMARKS Probably should be removed from *Psenes*, with *Icticus* Jordan & Thompson being the next available genus. Young associate with floating mats of seaweed, and less so with jellyfish; late juveniles and subadults epipelagic and mesopelagic; largest adults apparently benthopelagic on upper slope, but routinely migrating into water column at night. Feeds on zooplankton and small pelagic fishes.

FAMILY TETRAGONURIDAE

Squaretails

M Eric Anderson

Moderate-sized with rounded fusiform body; peduncle long and square in cross-section, each side with 2 lateral keels of modified scales. Scales cover body and head except snout; body scales spinoid in oblique rows, with multiple ridges; scales on top of head with minute denticles. First dorsal fin long, with 10–21 small spines that fold into groove; 2nd dorsal fin short, with 10–17 rays; anal fin short and similar to 2nd dorsal fin, and with 1 spine, 9–15 rays; pectoral fins wedge-shaped, with 14–21 rays. Eyes moderate to large. Mouth peculiar and box-like; teeth on jaws uniserial, those in upper jaw curved inward, lower-jaw teeth flattened and blade-like. Branchiostegal rays 5 or 6; GR 3–9/8–14. No swimbladder. Vertebrae 39–58.

Found worldwide in tropical and temperate seas; epipelagic and mesopelagic. Not a food fish, and of no commercial importance. Feed on soft-bodied invertebrates; young associate with jellyfish and salps. One genus and 3 species, all in WIO.

GENUS *Tetragonurus* Risso 1810

Three species, all in WIO. However, *Tetragonurus cuvieri*, a temperate species, is probably rare in WIO north of South Africa. Reviewed by Grey (1955).

KEY TO SPECIES

- | | | |
|----|--|----------------------|
| 1a | LL scales 73–95 to keels on peduncle; pelvic-fin origin beneath front third of pectoral fin; vertebrae 39–51 | 2 |
| 1b | LL scales 97–114 to keels on peduncle; pelvic-fin origin beneath middle of pectoral fin; vertebrae 52–58 | <i>T. cuvieri</i> |
| 2a | Dorsal fin 9–12 spines; LL scales 72–80; vertebrae 39–43; snout longer than eye diameter (in adults) | <i>T. pacificus</i> |
| 2b | Dorsal fin 13–17 spines; LL scales 83–95; vertebrae 44–51; snout subequal to eye diameter | <i>T. atlanticus</i> |

Tetragonurus atlanticus Lowe 1839

Bigeye squaretail

PLATE 84

Tetragonurus atlanticus Lowe 1839: 79 (Madeira); Grey 1955*; Haedrich 1967*; Haedrich & Horn 1972; Ahlstrom *et al.* 1976*; SSF No. 256.1*; Last 2001*; Parin & Piotrovsky 2004.

Tetragonurus cuvieri (non Risso 1810): Goode & Bean 1896* [in part]; Smith 1953*.

First dorsal fin 13–17 spines; 2nd dorsal fin 10–13 rays; anal fin 1 spine, 9–12 rays; pectoral fins 14–18 rays. Head ovoid, snout blunt; eye diameter subequal to snout length at all sizes. First dorsal fin-origin above anterior third of pectoral fins in early juveniles, moving to above their posterior third in late juveniles. Caudal fin deeply forked in adults, less so in juveniles; caudal keels evident by ~2–3 cm TL. Percentage SL (fish >10 cm SL): HL 24–30%, body depth 14–21%, predorsal length 31–38%, preanal length 61–68%, and pectoral-fin length 9–17%. Percentage HL: snout length 28–33%, eye diameter 24–30%, and least interorbital width 20–28%. LL scales 83–95 to keels on peduncle. Branchiostegal rays 5 or 6; GR 5–8/10–14 = 15–22. Vertebrae 44–51.

Adults uniformly blackish brown, eyes blue; young pale brown. Attains 50 cm TL.



Tetragonurus atlanticus, 21 cm TL (South Africa). Source: SSF

DISTRIBUTION Circumglobal, generally where surface temperatures exceed 20 °C. WIO: off central Mozambique to South Africa (East London, Eastern Cape).

REMARKS Oceanic, usually in upper 90 m, but adults probably deeper, to possibly ~800 m; may also stray close to shore. Young known to be inquiline in pelagic tunicates of *Salpa* and *Pyrosoma*. Feeds on jellyfish, salps and plankton. Poisonous to eat.

Tetragonurus cuvieri Risso 1810

Smalleye squaretail

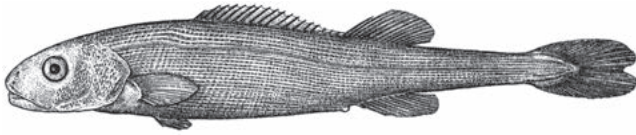
PLATE 84

Tetragonurus cuvieri Risso 1810: 347, Pl. 10, Fig. 37 (Nice, France, Mediterranean Sea); Goode & Bean 1896 [in part]; Fitch 1951*, 1952; Grey 1955*; Haedrich 1967*; Haedrich & Horn 1972; Ahlstrom *et al.* 1976*; SSF No. 256.2*; Parin & Piotrovsky 2004.

First dorsal fin 15–21 spines; 2nd dorsal fin 10–17 rays; anal fin 1 spine, 10–15 rays; pectoral fins 14–21 rays. Head ovoid, snout blunt; eyes shorter than snout at all sizes. First dorsal-fin origin over middle of pectoral fins in early juveniles, moving to above their posterior quarter in late juveniles. Caudal fin shallowly forked; caudal keels evident by ~4 cm TL. Percentage SL (fish >10 cm SL): HL 18–25%, body depth 14–19%, predorsal length 32–40%, preanal length 61–70%, and pectoral-fin length 7–14%. Percentage HL: snout length 29–46%, eye diameter 17–26%, and least interorbital width

26–32% HL. LL scales 97–114 to keels on peduncle (100–126 total scales). Branchiostegal rays 5 (usually) or 6; GR 5–8/9–14 = 14–20. Vertebrae 52–58.

Adults uniformly black; young dusky grey. Attains 70 cm TL.



Tetragonurus cuvieri, 15 cm TL, juvenile. Source: Grey 1955

DISTRIBUTION Circumglobal, anti-equatorial, generally in surface temperatures <20 °C, including south coast of South Africa, well offshore, and western Mediterranean Sea.

REMARKS Oceanic; often near the surface. Young inquiline in jellyfish or large salps. Feeds on jellyfish, salps, ctenophores and plankton. Possibly poisonous to eat due to ciguatera (Halstead *et al.* 1990). Smith's (1953) record from KwaZulu-Natal is of *T. atlanticus*.

Tetragonurus pacificus Abe 1953

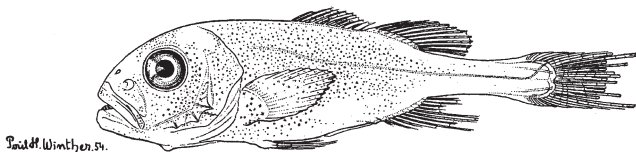
Pacific squaretail

PLATE 84

Tetragonurus pacificus Abe 1953: 45, Figs. 5–6 (west of Solomon Is. [stomach contents]); Grey 1955*; Haedrich 1967; Haedrich & Horn 1972; SSF No. 256.3; Ahlstrom *et al.* 1976*; Last 2001*; Parin & Piotrovsky 2004.

First dorsal fin 9–12 spines; 2nd dorsal fin 10 or 11 rays; anal fin 1 spine, 10 or 11 rays; pectoral fins 15–18 rays. Holotype: HL 21% SL; body depth 12% SL; pectoral-fin length 12% SL; snout length 30% HL; eye diameter 28% HL; least interorbital width 25% HL. LL scales 72–80 to keels on peduncle. Branchiostegal rays 5 or 6; GR 6 or 7/13 or 14 (holotype). Vertebrae 39–43.

Adult (holotype) pale grey-brown. Maximum size unknown.



Paul H. Wintchen, Jr.

Tetragonurus pacificus, 1.7 cm SL (off Sri Lanka). Source: Grey 1955

DISTRIBUTION Indo-Pacific. WIO: Mascarene Ridge (Seychelles to Mauritius) and Sri Lanka; elsewhere, Taiwan, Hawaii and Solomon Is.

REMARKS Known from the 12-cm-SL holotype (taken from tuna stomach contents) and 17 metamorphosing young (9–21 mm SL).

FAMILY ARIOMMATIDAE

Ariommas

M Eric Anderson

Either deep-bodied or slender-bodied, with 2 dorsal fins, deeply forked caudal fin, and 2 low fleshy keels on rear of peduncle (sometimes difficult to discern). First dorsal fin 10–13 slender spines; 2nd dorsal fin 1 small spine, 13–16 rays; anal fin 1–3 spines, 13–18 rays; pectoral fins wedge-shaped, short to long, with 20–25 rays. Eyes large, located centrally, with adipose membrane extending to mouth. Teeth in jaws minute, uniserial; no teeth on vomer or palatines. Lateral line on dorsum, arched to peduncle. Branchiostegal rays 6; GR 21–31, slender. Mostly silvery, with brown or bluish tinges dorsally and sometimes laterally. Vertebrae 29–32.

Both deep- and slender-body ariommas are represented in WIO. Also commonly known as driftfishes, they superficially resemble certain driftfishes of family Nomeidae (especially *Cubiceps*), and are sometimes included in that family. Doiuchi *et al.* (2004) discussed the characters separating *Ariomma* from nomeids. Distribution and biology were discussed by Parin & Piotrovsky (2004). Occur worldwide in tropical to subtropical seas, from near shore to the upper continental slope. One genus, *Ariomma* Jordan & Snyder 1904, with 7 species, 4 in WIO.

KEY TO SPECIES

- | | | |
|----|---|----------------------|
| 1a | Greatest body depth <32% SL; GR 27–31 | 2 |
| 1b | Greatest body depth 35–56% SL; GR 21–25 | <i>A. indicum</i> |
| 2a | Pectoral fins subequal to HL or only slightly shorter, and 21–27% SL, with 18–23 rays; predorsal scales extend to or in front of eyes | 3 |
| 2b | Pectoral fins much shorter than HL, 12–13% SL, and with 22–25 rays; predorsal scales extend to rear edge of eyes | <i>A. brevimanum</i> |
| 3a | LSS 56–60; pectoral fins 21–23 rays; GR 28–31 | <i>A. luridum</i> |
| 3b | LSS 47–53; pectoral fins 18–20 rays; GR 25–29 | <i>A. parini</i> |

Ariomma brevimanum (Klunzinger 1884)

Short-fin ariomma

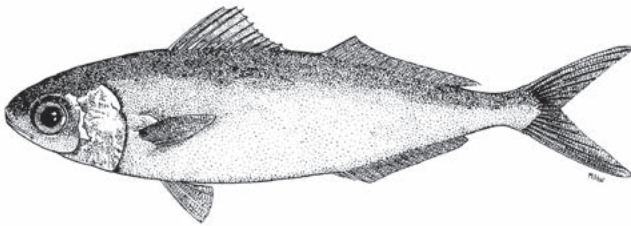
PLATE 84

Cubiceps brevimanus Klunzinger 1884: 116, Pl. 12, Fig. 3
(Al-Qusayr, Egypt, Red Sea).

Ariomma brevimanus: Haedrich 1967; Tabeta & Ishida 1975*;
Gloerfelt-Tarp & Kailola 1984*; Masuda *et al.* 1984*; Ajiad &
Mahasneh 1986*; Baranes & Golani 1993*; Parin & Piotrovsky 2004.
Ariomma brevimanum: Karrer 1984; Last 2001*.

Slender-bodied; upper jaw not reaching eyes in juveniles, but reaching to front edge of eyes in adults. First dorsal fin 10 or 11 spines; 2nd dorsal fin 1 spine, 13–15 rays; anal fin 2 or 3 spines, 13–15 rays; pectoral fins 22–25 rays; GR 27–31. Percentage SL: body depth 25–28%, HL 25–26%, predorsal length 31–32%, preanal length 62–64%, and pectoral-fin length 12–13%. Percentage HL: snout length 26–34%, eye diameter 19–23%, and upper jaw 19–20%. Scales on nape extend to rear edge of eyes (not in juveniles); no scales on snout; LSS 45–53. Vertebrae 13–15 + 16–18 = 31.

Body silvery, dark dorsally (brown in Red Sea, dark blue in western Pacific); 1st dorsal-fin membrane solid black in adults, and other fins pale pinkish yellow to greenish grey, with black margins or swathes. Attains 80 cm TL.



Ariomma brevimanum. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Comoros and Mascarene Ridge; elsewhere to Indonesia, Taiwan, Japan, Mariana Is. and Hawaii.

Ariomma indicum (Day 1871)

Indian ariomma

PLATE 84

Cubiceps indicus Day 1871: 690 [14] (Chennai, India); Smith 1949*.
Psenes africanus Gilchrist & Von Bonde 1923: 8, Pl. 18, Fig. 1
(KwaZulu-Natal, South Africa).

?*Cubiceps dollfusi* Chabanaud 1930: 519 (Gulf of Suez, Egypt, Red Sea).

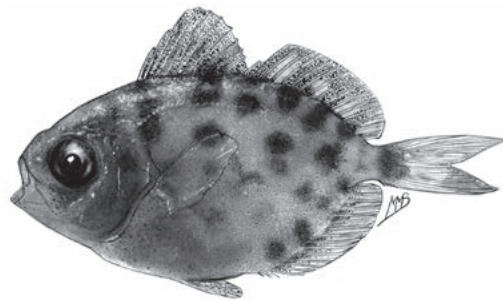
Psenes regulus (non Poey 1868): Smith 1961*.

Ariomma indica: Haedrich 1967; SSF No. 255.1*; Allen 1997*;
Carpenter *et al.* 1997*; Manilo & Bogorodsky 2003;
Parin & Piotrovsky 2004.

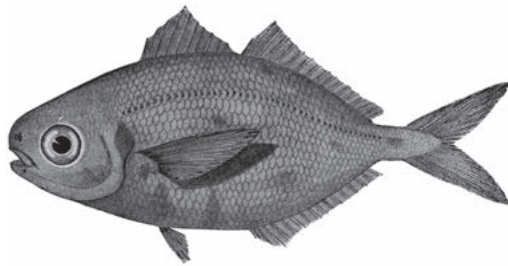
Ariomma indicum: Gloerfelt-Tarp & Kailola 1984*; Last 2001*.

First dorsal fin 10–12 spines; 2nd dorsal fin 1 spine, 13–16 rays; anal fin 3 spines, 14–16 rays; pectoral fins 21–24 rays; GR 21–25; LSS 39–49. Percentage SL: body depth 35–56%, HL 32–40%, predorsal length 27–36%, preanal length 61–67%, and pectoral-fin length 27–34%. Percentage HL: snout length 24–28%, eye diameter 27–38%, and upper jaw 19–23%. Vertebrae 30 or 31.

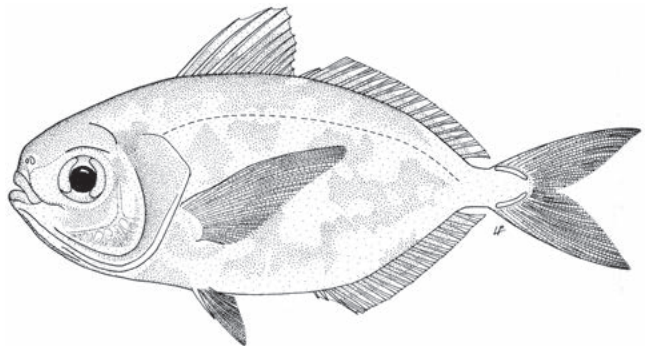
Body silvery with pale brownish tinge, fins darker brown, and areas of head iridescent bluish; metamorphosing young with large dark blotches on body (except for abdomen). Attains 25 cm SL.



Ariomma indicum, 4 cm TL, juvenile (South Africa). Source: SSF



Ariomma indicum, 15 cm TL, juvenile syntype of *Psenes africanus* (South Africa). Source: Gilchrist & Von Bonde 1923



Ariomma indicum, adult. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to South Africa (Mossel Bay, Western Cape); not known from Red Sea; elsewhere to Bay of Bengal, Malaysia, Indonesia and Japan.

REMARKS Haedrich (1967) placed *Cubiceps dollfusi* in *Ariomma* stating it is a form intermediate between the deep-bodied and elongate species (maximum body depth 32% SL); it was described from 7 specimens, only one of which survives (Karrer 1984), and no other records are known with this identification. However, except for body depth, this form is indistinguishable from *Ariomma indicum*, which some workers have believed it to be; thus more research is needed. Found in small schools over muddy bottoms of continental shelf and upper slope, at 20–300 m; may migrate seasonally. Feeds mainly on zooplankton.

Ariomma luridum (Jordan & Snyder 1904)

Slope ariomma

Ariomma lurida Jordan & Snyder 1904: 943 (Oahu I., Hawaii); Okamura *et al.* 1982*; Masuda *et al.* 1984*; Parin & Piotrovsky 2004. ?*Ariomma helena* Trunov 1976: 269 [235], Figs. 6–7 (near St Helena I., SE Atlantic). *Ariomma luridum*: Last 2001*.

First dorsal fin 11 or 12 spines; 2nd dorsal fin 1 spine, 15–17 rays; anal fin 3 spines, 14 or 15 rays; pectoral fins 21–23 rays; GR 28–31. Percentage SL: body depth 28–34%, HL 25–30%. Percentage HL: eye diameter 33–36%, snout length 23–30%, and peduncle depth 13–18%. Upper jaw not reaching vertical at front edge of eyes. Scales on nape extend to front edge of eyes; LSS 56–60.

Body metallic blue, gill covers darker, and belly silvery blue. Attains 43 cm TL.



Ariomma luridum. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Tropical waters of Atlantic, Indo-Pacific and eastern Pacific. WIO: known only from St Brandon Shoals; elsewhere to northern Australia, Japan (common), Hawaii and Sala y Gómez Ridge.

REMARKS Karrer (1984) synonymised *Ariomma helena* Trunov 1976 from the southeastern Atlantic with *A. luridum*, but verification requires more work. Adults demersal on the upper continental slope, to ~450 m deep. Feeds mainly on zooplankton. Not commercially fished.

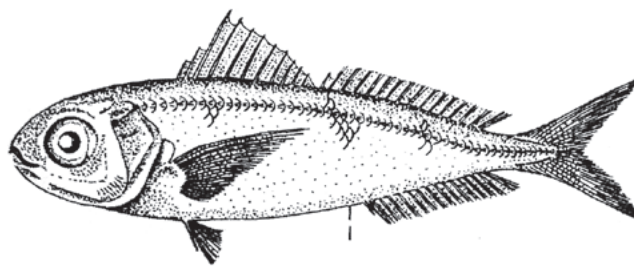
Ariomma parini Piotrovsky 1987

Parin's ariomma

Ariomma parini Piotrovsky 1987: 507, Fig. 2 (Saya de Malha Bank, Mascarene Ridge); Parin & Piotrovsky 2004.

Slender-bodied; upper jaw not reaching vertical at front edge of eyes. First dorsal fin 10 or 11 spines; 2nd dorsal fin 1 spine, 15 rays; anal fin 2 spines, 14 or 15 rays; pectoral fins 18–21 rays; GR 25–30. Percentage SL: body depth 28–31%, HL 31–36%, predorsal length 30–38%, preanal length 66–70%, pectoral-fin length 21–25%, snout length 7–10%, eye diameter 9–12%, and upper jaw 6–8%. Scales on nape extend to front of eyes; snout scaleless; LSS 52–56.

Body generally silvery, back dusky, and fins with black swathes; pectoral fins pale; pelvic fins and caudal fin yellowish. Attains at least 22 cm SL (likely more).



Ariomma parini, 16 cm SL, holotype (Saya de Malha Bank). Source: Piotrovsky 1987 (by AN Kotlyar)

DISTRIBUTION WIO: Gulf of Oman, Tanzania, Mozambique and Saya de Malha Bank.

REMARKS Found on outer continental shelf, at ~205–300 m. Caught in bottom trawls.

FAMILY CENTROLOPHIDAE

Ruffs, butterfishes and driftfishes

M Eric Anderson

Stout-bodied, muscular or flabby; head usually rounded, snout blunt; dorsal fin and anal fin sometimes thickly embedded in scaly skin; caudal fin deeply or shallowly forked. Dorsal fin continuous, with 5–8 short (sometimes flexible) spines and 19–39 longer rays (membrane between spinous and soft portions often torn); anal fin 3 spines, 15–35 rays; pectoral fins 18–23 rays; pelvic fins 1 spine, 5 rays, often folding into ventromedial groove. Eyes large. Mouth terminal; teeth on jaws small, uniserial; no teeth on vomer or palatines. Scales small to moderate, deciduous, and cycloid or weakly ctenoid; no scales

on head. Pharyngeal sacs present. Branchiostegal rays usually 7; GR 18–25. Vertebrae 24–60. Size range ~20–140 cm FL.

Coastal or deepwater, oceanic. Juveniles typically associate with jellyfish or flotsam near the surface, and adults are found deeper. Some species have commercial importance. An ill-defined family with a confusing array of characters that needs redefining (Doiuchi *et al.* 2004). Seven genera and ~28 species; 4 genera and 9 species in WIO.

KEY TO GENERA

- 1a First few elements of dorsal fin appear as slender, weak, flexible spines, all grading in length to soft rays 2
- 1b First 5–8 elements of dorsal fin appear as short, thick, subequal spines 3
- 2a Dorsal-fin origin behind pectoral-fin insertions (except in metamorphosing young); weak denticles on preopercle margin; LSS 160–220 *Centrolophus*
- 2b Dorsal-fin origin in front of pectoral-fin insertions; 9–15 small spines on preopercle margin; LSS 90–130 *Schedophilus*
- 3a No spines on opercle, and opercle only gently incised below its rearmost point; supramaxilla present; dorsal fin 19–25 rays; anal fin 15–19 rays *Hyperoglyphe*
- 3b Two spines on opercle, and opercle deeply incised below lowermost spine; no supramaxilla; dorsal fin 25–29 rays; anal fin 21–28 rays *Psenopsis*

GENUS *Centrolophus* Lacepède 1802

First few elements of dorsal fin appear as slender, weak, flexible spines, all grading in length to soft rays; preopercle margin with weak denticles. Found mostly in deep, cool waters, but juveniles associate with jellyfish near the surface. Detailed description and synonymy in Haedrich (1967). One species, occurring throughout temperate North Atlantic and with a separate population throughout Southern Hemisphere.

Centrolophus niger (Gmelin 1789)

Black ruff

PLATE 85

Perca nigra Gmelin 1789: 1321 ('Rivers of Cornwall,' England).

Centrolophodes irvini Gilchrist & Von Bonde 1923: 3, Pl. 17, Fig. 1 (off Paternoster Point, South Africa).

Centrolophus niger: Barnard 1927*; SFSA No. 850*; Haedrich 1967*, 1986*; Krefft 1969*; McDowall 1982*; SSF No. 254.1*; Parin & Piotrovsky 2004.

Mupus bifasciatus Smith 1961: 158, Fig. (among large salps, off Namibia).

Dorsal fin 3–5 spines, 32–37 rays; anal fin 3 spines, 20–25 rays; pectoral fins 19–23 rays. Young deep-bodied, adults elongate: body depth 35–42% SL in young ~5–15 cm SL, and 24–30% in fish >20 cm SL; HL 29–39% SL in young, and 21–25% SL in adults; predorsal length 28–37% SL in adults (~40% SL in 53-mm specimen); preanal length 55–58% SL in adults (~64% SL in 53-mm specimen); eye diameter 16–22% HL in adults (~29% HL in 53-mm specimen); snout length 29–35% HL in adults (~23% HL in 53-mm specimen). Dorsal-fin origin above pectoral-fin origins in juveniles, and at mid-pectoral-fin length or further back in adults. Anal-fin origin in hind quarter of body in small juveniles, and at about midbody in fish >10 cm SL. Head and trunk with many small pores. Scales small, cycloid, deciduous; head naked; LSS 160–230. Lateral line curves gently upwards and then runs midlaterally to peduncle (less curved in adults than in juveniles). GR 18–22. Pyloric caeca ~10. Vertebrae 25.

Head and dorsum dark brown to almost black or bluish, abdomen silvery grey, and snout in front of eyes pinkish; juveniles pale tan or brown, with 2–4 dark vertical bars. Attains 150 cm TL.



Centrolophus niger, 53 mm TL, juvenile holotype of *Mupus bifasciatus* (Namibia). Source: Smith 1961



Centrolophus niger, 90 cm TL, adult (South Africa). Source: SSF

DISTRIBUTION Circumglobal, antitropical, including Mediterranean Sea. WIO: southern Madagascar and South Africa.

REMARKS Epipelagic and mesopelagic; juveniles associate with jellyfish and salps near surface, adults found deeper (usually 300–700 m). Feeds on pyrosomes, salps, small fishes, squid, crustaceans and available plankton.

GENUS *Hyperoglyphe* Günther 1859

Body fusiform, muscular; pectoral fins falcate; caudal fin shallowly forked. First elements of dorsal fin appear as short, thick, subequal spines. Adults demersal on outer continental shelf, commonly to ~500 m deep; young associate with flotsam near surface. Generic description by Haedrich (1967). Six or 7 species, 2 in WIO.

KEY TO SPECIES

- 1a Dorsal fin 7 or 8 spines, 19–22 rays; patch of scales above and behind eyes; LSS 85–95 *H. antarctica*
- 1b Dorsal fin 5 or 6 spines, 23–26 rays; no scales on head; LSS <80 *H. pringlei*

Hyperoglyphe antarctica (Carmichael 1819)

Antarctic butterfish

PLATE 85

Perca antarctica Carmichael 1819: 501, Pl. 25 (Tristan da Cunha).

Palinurichthys porosus: Barnard 1948; Smith 1949.

Mupus perciformis (non Mitchell 1818): Smith 1949.

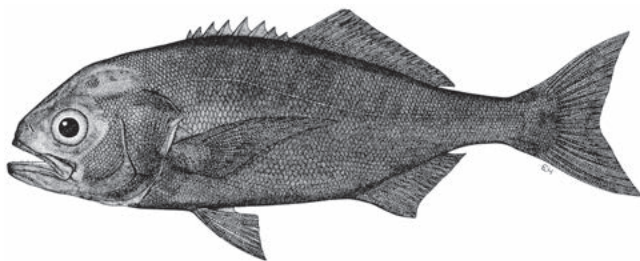
Palinurichthys antarcticus: Penrith 1967.

Hyperoglyphe antarctica: Haedrich 1967; McDowall 1982*, 2001*;

SSF No. 254.2*.

Dorsal fin 7 or 8 spines, 19–21 rays; anal fin 3 spines, 14–17 rays; pectoral fins 18–22 rays. Head robust, with diagnostic patch of scales on occiput. Percentage SL: HL 32–36%, body depth 33–39%, predorsal length 35–42%, preanal length 60–70%, and pectoral-fin length 27–34%. Percentage HL: snout length 27–32%, eye diameter 19–24%. Dorsal-fin origin slightly behind pectoral-fin origins; first element of soft-rayed portion of fin a stiff unbranched but segmented ray. Anal-fin origin below anterior third of dorsal-fin rays. Lateral line curves gently upwards as far as middle of dorsal-fin rays and then straightens to peduncle; LSS 85–95. Gill opening extends ventrally to vertical through middle of eye; GR 20–25, long and slender. Vertebrae 25.

Body bluish grey or almost black dorsally, paler metallic grey on belly, and fins dark grey. Attains 140 cm SL and ~63 kg.



Hyperoglyphe antarctica, 50 cm SL (Tristan da Cunha). Source: Andrew et al. 1995

DISTRIBUTION Circumglobal in Southern Hemisphere. WIO: Cape Agulhas, off South Africa.

REMARKS Adults occur in shoals near bottom and over reefs, at ~70–700 m, rising by day to feed. Juveniles found inshore, and sometimes associate with flotsam not jellyfish. Marketed fresh and frozen. The food habits (Winstanly 1978) and reproductive biology (Baelde 1996) have been studied of species off Australia. Parin & Piotrovsky (2004) included records of *H. pringlei* as *H. antarctica*.

Hyperoglyphe pringlei (Smith 1949)

Black butterfish

PLATE 85

Palinurichthys pringlei Smith 1949: 304, Fig. 849

(off Dassen I., South Africa).

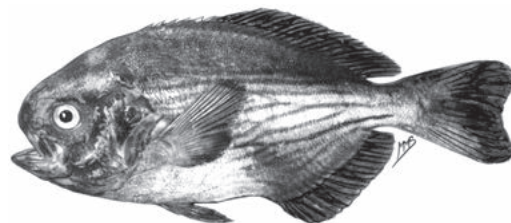
Mupus pringlei: Smith 1949.

Palinurichthys matthewsi Smith 1960: 91, Pl. 1 (off Walvis Bay, Namibia).

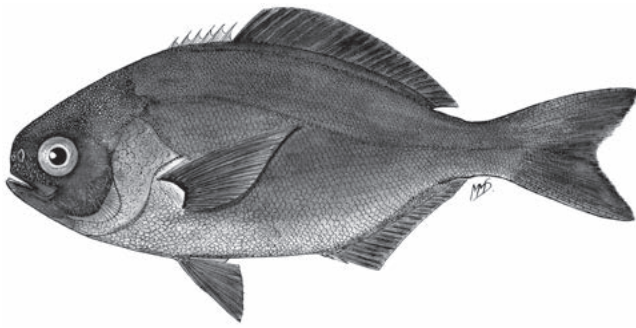
Hyperoglyphe pringlei: Karrer 1973*; Heemstra 1995.

Dorsal fin 5 or 6 spines, 23–26 rays; anal fin 3 spines, 15–19 rays; pectoral fins 20–22 rays. Head soft, entirely naked, with numerous small pores. Proportions here include 3 early juveniles, 25–28 mm SL; proportions of adults given in parentheses. Percentage SL: HL 36–37% (34–37%), body depth 30–32% (40–46%), predorsal length 36–40% (29–33%), preanal length 56–58% (56–64%), and pectoral-fin length 18–20% (26–28%). Percentage HL: snout length 18–20% (19–26%), and eye diameter 26–28% (19–22%). Dorsal-fin origin above pectoral-fin bases. Anal-fin origin below anterior third of dorsal-fin rays. Lateral line curves upwards slightly, to as far as middle of anal fin, then runs midlaterally to peduncle. Gill opening extends ventrally to vertical through middle of eye; GR 21–23, long and slender (Smith [1949a] gives GR 14 or 15, for the lower limb only). Vertebrae 25.

Body dark grey to black dorsally; young with numerous irregular stripes. Attains 34 cm SL.



Hyperoglyphe pringlei, 29 cm TL juvenile holotype of *Palinurichthys matthewsi* (South Africa). Source: Smith 1960



Hyperoglyphe pringlei, 44 cm TL, holotype (South Africa). Source: Smith 1949

DISTRIBUTION Namibia in southeastern Atlantic, to South Africa (Transkei region) and Madagascar in WIO.

REMARKS Haedrich (1967, 1986, 1990) and others have used the name *Hyperoglyphe moselii* for this species; however, that name is a synonym of *Schedophilus velaini*. Thus, earlier descriptive work of '*H. moselii*' is often an inclusion of two species. Adults demersal on continental shelf, to ~300 m deep, and juveniles found inshore.

GENUS *Psenopsis* Gill 1862

Body fusiform; caudal fin moderately forked. Dorsal-fin origin above pectoral-fin bases; first elements of dorsal fin appear as short, thick, subequal spines. Opercle with 2 spines, and margin deeply incised below lowermost spine. Biology little known; adults found mostly near bottom on upper slope, and juveniles shallower. *Psenopsis anomala* is commercially fished off Japan, where it shoals in large schools. Five species, 3 in WIO.

KEY TO SPECIES

- | | | |
|----|--|----------------------|
| 1a | Anal fin 3 or 4 spines, 21–23 rays; preanal length 50–59% SL | 2 |
| 1b | Anal fin 2 or 3 spines, 25–28 rays; preanal length 45–54% SL | <i>P. obscura</i> |
| 2a | Pectoral fins 16–22 rays; eye diameter 18–21% HL, interorbital width 23–33% HL; maximum body depth 25–31% SL | <i>P. cyanea</i> |
| 2b | Pectoral fins 22–24 rays; eye diameter 28–35% HL, interorbital width 33–35% HL; maximum body depth 31–40% SL | <i>P. intermedia</i> |

Psenopsis cyanea (Alcock 1890)

Blue driftfish

PLATE 85

Bathyseriola cyanea Alcock 1890: 202 (off Madras coast, India); Alcock 1898*, 1899.

Psenopsis cyanea: Haedrich 1967; Haedrich & Horn 1972; Venu & Madhusoodana Kurup 2003; Manilo & Bogorodsky 2003; Parin & Piotrovsky 2004.

Snout blunt, fleshy. Dorsal fin 6 or 7 spines, 25–28 rays, and fin origin above pectoral-fin bases; anal fin 3 or 4 spines (first spine under dorsal-fin spines 6 or 7), 21–23 rays; pectoral fins 16–20 rays. Body depth 25–31% SL; interorbital width 28–33% HL; eye diameter 18–21% HL. Lateral line curves gently upwards to peduncle. Gill opening large, extends ventrally to under eye, and membranes attached to each other; GR 20. Vertebrae 25.

Body uniformly bluish black, with uneven silvery tinges; median fins sometimes with black margins. Attains ~20 cm TL.

DISTRIBUTION Indian Ocean (patchy). WIO: Arabian Sea, including near Gulf of Aden and off Socotra, Pakistan and India; elsewhere to Bay of Bengal.

REMARKS Usually found 60–480 m, but known as shallow as ~3 m deep. Feeds on siphonophores, pyrosomes, copepods, euphausiids and small cephalopods. Of minor commercial importance in Arabian Sea.

Psenopsis intermedia Piotrovsky 1987

Deep-bodied driftfish

PLATE 85

Psenopsis intermedia Piotrovsky 1987: 506, Fig. 1 (Saya de Malha Bank, Mascarene Ridge); Parin & Piotrovsky 2004.

Dorsal fin 5 or 6 spines, 26–28 rays; anal fin 3 spines, 22 or 23 rays; pectoral fins 22–24 rays. Body depth 31–40% SL; interorbital width 33–35% HL; eye diameter 28–35% HL; snout length 21–28% HL. Dorsal-fin origin above pectoral-fin bases; first spine of anal fin under dorsal-fin rays 2–4. Lateral line curves gently upwards to peduncle. Gill opening extends ventrally to vertical through rear edge of eye, and membranes attached to each other; GR 21–24.

Body olive, with pale blue mottling; suborbital, postorbital and occipital regions brown; opercle dark blue; caudal fin yellow with white margins, and other fins with yellowish tinges. Attains 15 cm TL, probably much larger.

DISTRIBUTION WIO: Kenya, Saya de Malha Bank and southwestern India.

REMARKS Collected from ~230–300 m; juveniles found probably in shallower water.

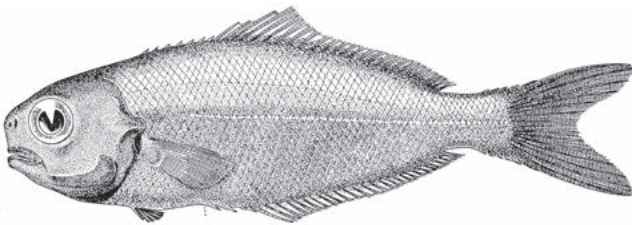
Psenopsis obscura Haedrich 1967

Dark driftfish

Psenopsis obscura Haedrich 1967: 188, Figs. 1–2 (Molucca Passage, Maren I., Indonesia); Haedrich 1968; Gloerfelt-Tarp & Kailola 1984*; McDowall 2001*; Parin & Piotrovsky 2004.

Dorsal fin 5–7 spines, 26–29 rays; anal fin 2 or 3 spines, 25–28 rays; pectoral fins 18–20 rays. HL 29–36% SL; body depth 31–38% SL; interorbital width 31–38% HL; eye diameter 27–36% HL; snout length 20–25% HL. Dorsal-fin origin above pectoral-fin bases; first spine of anal fin under last dorsal-fin spine or first ray. Lateral line curves gently upwards to peduncle. Gill opening extends ventrally to vertical through rear edge of eye, and membranes attached to each other; GR 20–22. Vertebrae 25.

Newly preserved specimens dark brownish blue to brown dorsally, with yellowish fins and dark blotch on shoulder. Attains 20 cm TL.



Psenopsis obscura, 13 cm SL, holotype (Indonesia). Source: Haedrich 1967

DISTRIBUTION Indo-Pacific. WIO: Mozambique Channel; elsewhere to Andaman Sea, Indonesia and western Australia.

REMARKS Found at 90–740 m, over sandy and muddy bottom, and juveniles in shallower water.

GENUS *Schedophilus* Cocco 1839

Body fusiform, relatively deep in adults; dorsal-fin origin in front of pectoral-fin insertions, and first few elements of dorsal fin all grading in length to soft rays; caudal fin shallowly forked. Teeth minute. Preopercle margin with 9–15 small spines. Worldwide in tropical to temperate seas;

oceanic and deepwater, but juveniles epipelagic for extended periods, and adults of *Schedophilus huttoni* (Waite 1910) may be mesopelagic (this species is known only from one WIO specimen, collected from a southwestern seamount at ~690 m, and is included here in the key only). The generic limits have been discussed by Haedrich (1967) and McDowall (1982). Eight or 9 species, 3 in WIO.

KEY TO SPECIES

- 1a Flesh firm; dorsal- and anal-fin spines readily distinguishable from soft rays; total dorsal-fin elements 32–41; total anal-fin elements 21–28 2
- 1b Flesh flabby; dorsal- and anal-fin spines not distinct from soft rays; total dorsal-fin elements 51–65; total anal-fin elements 32–41 [only 1 record, from deep water] *S. huttoni*

- 2a Anal fin 23–25 rays; length of longest pectoral-fin ray 9–13% SL (specimens >10 cm SL); pectoral fins 19–21 rays; GR 13–15 on lower limb; sensory canal under dorsal-fin base opening to pore behind each soft ray *S. maculatus*
- 2b Anal fin 18–21 rays; length of longest pectoral-fin ray 22–27% SL (specimens >10 cm SL); pectoral fins 21–23 rays; GR 16 or 17 on lower limb; no sensory canal under dorsal-fin base *S. velaini*

Schedophilus maculatus Günther 1860

Spotted driftfish

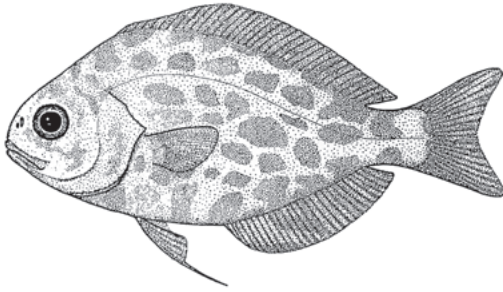
PLATE 85

Schedophilus maculatus Günther 1860: 412 (China Sea); Smith 1949; Haedrich 1967; Haedrich & Horn 1972; Ahlstrom *et al.* 1976*; McDowall 1980*, 1981*, 1982*; SSF No. 254.7; Parin & Piotrovsky 2004. *Schedophilus marmoratus* Kner & Steindachner 1867: 366 (South Sea). *Lirus maculatus*: Gilchrist & Von Bonde 1923*. *Mupus maculatus*: SPSA No. 848*.

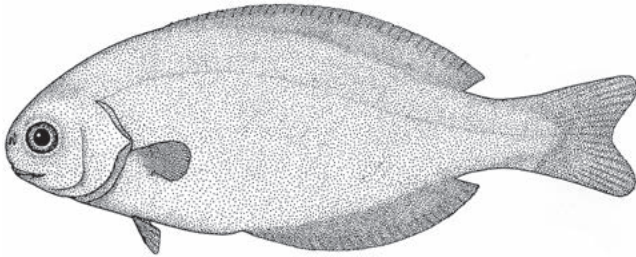
Dorsal fin 8 or 9 spines, 27–29 rays; anal fin 3 spines, 22–25 rays; pectoral fins 19–21 rays. Juveniles relatively deep-bodied with large eyes. Proportions here are for juveniles <10 cm TL, with proportions for larger fish given in parentheses. Percentage SL: HL 31–42% (15–27%), body depth 39–51% (37–47%), predorsal length 36–37% (27–35%), preanal length 55–58% (48–62%), and pectoral-fin length 15–25% (9–12%). Percentage HL: snout length 20–23% (17–21%), and eye diameter 26–37% (24–29%). Dorsal-fin origin in front of pectoral-fin bases in small fish, and above them in large adults; sensory canal running along dorsal-fin base of adults, with pore behind each ray. Anal-fin origin slightly behind midbody in young, and behind midbody in adults. Lateral line curves gently upwards and around to peduncle; LSS 100–130.

Gill opening extends ventrally to beneath eye; GR 5–7/13–17 = 20–24. Vertebrae 11 or 12 + 17 or 18 = 29; supraneural bones 3.

Adults with uniformly brown body, and blackish head and fins; juveniles silvery, with bright blue to blackish vertical variegated bars and blotches extending onto median fins. Attains 30 cm SL.



Schedophilus maculatus, juvenile. Source: McDowall 1982



Schedophilus maculatus, adult. Source: McDowall 1982

DISTRIBUTION Circumglobal in Southern Hemisphere (rare but widespread). WIO: off South Africa (Betty's Bay, Western Cape), Walters Shoals and Madagascar Ridge.

REMARKS Adults oceanic deep-pelagic, usually at 300–700 m; juveniles closer inshore and epipelagic and associate with jellyfish.

Schedophilus velaini (Sauvage 1879)

Oval driftfish

PLATE 85

Seriolella velaini Sauvage 1879: 32, Pl. 1, Fig. 2 (Saint-Paul I.); Stehmann & Lenz 1973.

Schedophilus ovalis (non Cuvier 1833): Barnard 1948*; Haedrich 1967 [in part]; SSF No. 254.8* [in part]; Piotrovsky 1994.

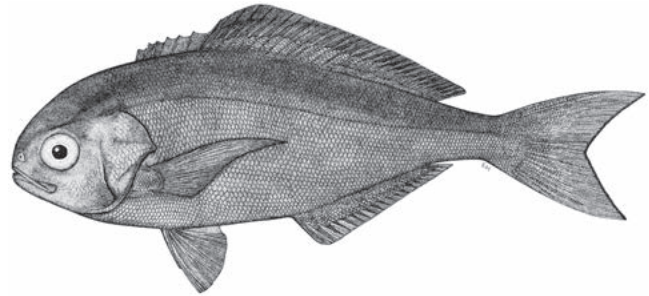
Mupus ovalis (non Cuvier 1833): Smith 1949.

Mupus imperialis (non Cocco 1840): Smith 1949; Penrith 1967.

Schedophilus velaini: Andrew *et al.* 1995*; Heemstra 1995; Heemstra & Heemstra 2004*; Parin & Piotrovsky 2004.

Dorsal fin 6–8 spines, 26–29 rays; anal fin 3 spines, 18–21 rays; pectoral fins 21–23 rays. Percentage SL: HL 27–35%, body depth 32–39%, predorsal length 23–28%, preanal length 47–59%, and pectoral-fin length 22–28%. Percentage HL: snout length 19–25%, eye diameter 24–29%. Dorsal-fin origin above pectoral-fin bases; no sensory canal and pores along dorsal-fin base. Anal-fin origin behind midbody in adults. Lateral line curves gently upwards and then straightens on peduncle; LSS 90–110. GR 6 or 7/16 or 17 = 22–24. Vertebrae 10 + 15; supraneural bones 2.

Adults dark olive-blue dorsally, silvery laterally; juveniles mottled. Attains 100 cm TL.



Schedophilus velaini, 43 cm SL (Tristan da Cunha). Source: Andrew *et al.* 1995

DISTRIBUTION Circumglobal in Southern Hemisphere. WIO: South Africa (off Western Cape to East London, Eastern Cape), Walters Shoals, Southwest Indian Ridge and Saint-Paul and Amsterdam Is.

REMARKS Adults shallow- to deep-pelagic and demersal, and often found near islands; juveniles found inshore.

GLOSSARY

pyrosomes – large, free-floating colonial tunicates of the genus *Pyrosoma*.

supraneural bones – unpaired bones above the neural spines of the anterior vertebrae, between the skull and the origin of the dorsal fin.

ORDER PLEURONECTIFORMES

Kunio Amaoka and
Thomas A Munroe

These fishes are characterised by a deep, laterally compressed body, with both eyes on the same side of the head in adults. All flatfishes have pelagic, bilaterally symmetrical larvae with an eye on each side of the head, similar to other fishes. During development, these fishes undergo a unique and spectacular metamorphosis where one eye migrates over or through the top of the head and comes to lie on the same side as the other eye. In most cases, shortly after eye migration, the transformed juvenile changes from a pelagic to benthic habit where the newly settled juvenile lies on its blind side, on or partially buried in the substrate.

Flatfishes are important predators in benthic food webs. Most are ambush predators that lie on the bottom or partially buried, waiting for unsuspecting prey (Gibson 2005). Many flatfishes can change the colouration of their ocular (eyed) side to match the colour and sometimes even the pattern of the surrounding substrate, and they use this remarkable ability to camouflage themselves from detection by prey and predators alike.

Species of *Asterorhombus* (Bothidae) employ an interesting mode of catching prey. They have an elongate 1st dorsal-fin ray that is separate from the other rays, and which is equipped with a modified fin membrane shaped into a lure. In *A. cocosensis* the ray is shrimp-like in colour and shape (orange with a black eyespot, mimicking a body with legs), whereas in *A. intermedius* it has a white membranous edge resembling a worm. These flatfishes move their lures to attract or distract small fishes and other prey, allowing the flounder to manoeuvre close enough to capture them (Amaoka *et al.* 1994; Shirai & Kitazawa 1998).

Flatfishes have eyes on either the left side of the head (sinistral asymmetry) or on the right side of the head (dextral asymmetry). In most species, lateral asymmetry (either sinistral or dextral) is genetically fixed; only a few species have indeterminate lateral asymmetry. Variations are known among individuals within the same population and can also occur between species within a family. Species of Psettodidae, for example, have individuals of the same population with either dextral or sinistral asymmetry, whereas species of Citharidae variously have either dextral or sinistral asymmetry (Hubbs 1945; Amaoka 1969, 1972; Hoshino 2001). In all other families of flatfishes, lateral asymmetry typically is fixed for a species, and this feature has been used as an important character in classification and identification of these species. Even so, in many species with fixed asymmetry, occasional specimens are discovered that feature reversed asymmetry, but this apparently occurs rarely. In still rarer cases, as in the pleuronectid *Platichthys stellatus*, lateral asymmetry of

individuals is variable between populations (off Japan, nearly all individuals of this species have sinistral asymmetry and reversals are rare, compared with populations off Alaska where ~70% of individuals are sinistral, and populations off California where only ~50% of individuals have sinistral asymmetry). Variability of ocular asymmetry in these populations appears to follow a typical pattern of Mendelian inheritance for this feature.

In addition to the dramatic asymmetry in eye position, other lateral asymmetries occur in various morphological features in the different lineages of flatfishes. Frequently observed differences of eyed-side versus blind-side features include those in body musculature, colouration, and the development of paired fins, lateral lines and scales.

The Pleuronectiformes are a large and diverse order comprising 16 families, with ~123 genera and at least 750 extant species (Chapleau & Amaoka 1998; Munroe 2015; Campbell *et al.* 2019). New species continue to be discovered as exploration continues and improvements in taxonomy are made (Munroe 2015). Members of this group inhabit nearly all oceans, ranging from tropical to polar seas, with the highest diversity found in tropical waters of the Indo-Pacific (Munroe 2015). Most flatfishes live on or near the bottom, usually on the continental shelf at depths <200 m. Some species also occur in brackish and fresh waters, and a few, such as *Chascanopsetta crumenalis*, occur deeper than 1 000 m. The species also span a considerable size range of several orders of magnitude. The largest is the endangered Atlantic halibut *Hippoglossus hippoglossus*, which attains >2.5 m TL and up to 320 kg; by contrast, among the smallest sizes recorded for a flatfish species is that of the paralichthyid *Tarphops oligolepis*, which occurs off Japan, with adults reaching only 4.5 cm TL and ~2 g.

Many flatfishes are caught by commercial trawlers, and many species, especially larger ones, are highly valued food fishes. Some species, including paralichthyids (e.g., *Paralichthys olivaceus*) and pleuronectids (e.g., *Verasper moseri*), have been successfully raised in mariculture operations (Howell & Yamashita 2005). In some areas, juveniles produced by these facilities are released into the wild in an attempt to augment natural populations that have been reduced through overexploitation.

Most flatfishes spawn enormous numbers of small buoyant eggs, whereas a few species spawn demersal adhesive eggs (Rijnsdorp & Witthames 2005). Spawning may take place during a relatively short, truncated season (especially for species spawning in cold-water climates) or may be protracted, with multiple spawning events taking place over a longer period throughout the year (tropical species). Recently hatched larvae

usually have an elongate body that eventually transforms into an extremely compressed and translucent, elliptical, heart-like or almost circular larva. Body shape is an important generic character for identifying flatfish larvae. Flatfish larvae usually have elongate anterior dorsal-fin ray(s), sometimes with several of the rays forming an elongate crest. In species of *Arnoglossus*, the elongate 2nd dorsal-fin ray is pole-like and adorned with several flag-like membranous flaps. Larvae of some flatfish species have a protruding intestine extending beyond the body margin, and in some species (*Laeops*) this intestinal loop is thought to help the larva float (Amaoka 1972). Some flatfish larvae have distinctive orange, pinkish, yellow or red blotches that are helpful in identification, though this pigmentation often disappears soon after death. Most flatfish larvae are planktonic and occur from near surface to midwater depths. Larvae of the majority of flatfish species measure ≤ 2 cm TL just prior to metamorphosis, but those of *Taeniopsetta ocellata* and *Laeops nigromaculatus* are ~ 6 cm SL, whereas the largest flatfish larvae, measuring ~ 12 cm SL, are those of *Chascanopsetta lugubris*.

Classifications based on molecular data (e.g., Chen *et al.* 2003; Smith & Wheeler 2006; Near *et al.* 2012; Betancur-R *et al.* 2013; Chen & Lopez 2013; Campbell *et al.* 2014) consistently place the pleuronectiforms within a phenotypically varied assemblage of percomorph fishes known as the Carangimorpha or Carangimorpharia (Campbell *et al.* 2019). Based on morphological (Chapleau 1993; Hoshino 2001; Chanet 2003; Chanet *et al.* 2004) and molecular (Berendzen & Dimmick 2002; Betancur-R *et al.* 2013) data, some studies hypothesised that Order Pleuronectiformes, including Psettodidae, was monophyletic. In contrast, other studies (Chen *et al.* 2003; Smith & Wheeler 2006; Near *et al.* 2012; Betancur-R *et al.* 2013; Campbell *et al.* 2013) incorporating different molecular sequence data do not recover Pleuronectiformes as a monophyletic group. Only when *Psettodes* is excluded is a monophyletic clade of flatfishes, the Pleuronectoidei, recovered. Campbell *et al.* (2019), using both morphological and molecular evidence, proposed that the Pleuronectoidei consists of three superfamilies, the Citharoidea, Pleuronectoidea and Soleoidea. The classification of Campbell *et al.* (2019) recognises 16 families within Pleuronectoidei, with *Tephrinectes* representing another distinct lineage within the Order, and transfers 5 families, formerly placed in Pleuronectoidea, to the Soleoidea.

Morphologically, Psettodoidei is characterised by: dorsal-fin origin situated well behind eyes; 1 or more spines in each of the dorsal, anal and pelvic fins; presence of large supramaxilla, palatine teeth and basisphenoid bone; widely separated gill membranes; no enlarged 1st interhaemal spine; caudal skeleton similar to typical percoid type (Amaoka 1969); and vertebrae 10 + 14. The Pleuronectoidei is characterised by: dorsal-fin origin above or anterior to eyes; no fin spines (except flexible pelvic-fin spine in citharids); absence of supramaxilla, palatine teeth and basisphenoid bone; enlarged interhaemal spine

(rarely not enlarged); variously modified caudal skeletons distinct from typical percoid type; and ≥ 26 vertebrae.

Among the Pleuronectoidei, superfamily Citharoidea includes only Citharidae characterised by: pelvic fins with 1 flexible spine and 5 soft rays; gill membranes not united to each other; anus located on eyed side; middle 15 (rarely 13) rays of caudal fin branched; percoid-type caudal skeleton (except for *Brachypleura*); and, enlarged posterior ocular-side nostril (Amaoka 1972; Hoshino 2001). Superfamily Pleuronectoidea includes 4 families characterised (in part) by: fused gill membranes; no pelvic-fin spine; fused 1st and 2nd hypurals, not fused with preural; and fused 3rd and 4th hypurals. Superfamily Soleoidea includes 8 families characterised (in part) by: incomplete neural arch on 1st abdominal vertebra; and neural spines of abdominal vertebrae inclined towards the cranium. At least 9 families in WIO.

KEY TO FAMILIES

- 1a Dorsal-fin origin behind eyes; dorsal and anal fins each with 1 or more spines PSETTODIDAE



- 1b Dorsal fin extending onto head, origin at least to point equal with vertical through rear margin of upper eye; dorsal and anal fins without spines 2

- 2a Pelvic fins 1 spine, 5 soft rays; posterior nostril on blind side enlarged; branchiostegal membranes separate CITHARIDAE

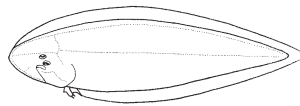


- 2b Pelvic fins without spines; posterior nostril on eyed side not enlarged; branchiostegal membranes united (except separate in Achirosettidae) 3

- 3a Eyes on left side of head (sinistral asymmetry) 4

- 3b Eyes on right side of head (dextral asymmetry) 7

- 4a Preopercle margin concealed by skin or scales; dorsal and anal fins joined to caudal fin CYNOGLOSSIDAE



- 4b Preopercle margin distinct; dorsal and anal fins not joined to caudal fin 5

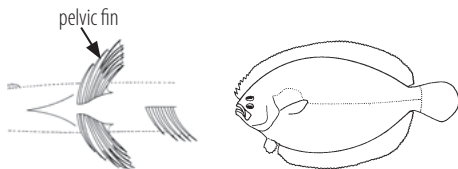
Continued...

KEY TO FAMILIES

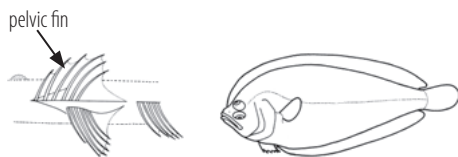
5a No pectoral fins; branchiostegal membranes separate
 **ACHIROPSETTIDAE** [Southern Ocean]

5b Pectoral fins present; branchiostegal membranes united **6**

6a Bases of both pelvic fins short, almost symmetrical
 in position **PARALICHTHYIDAE**



6b Eyed-side pelvic-fin base elongate, blind-side pelvic-fin
 base short; origin of eyed-side pelvic fin anterior to that of
 blind side **BOTHIDAE**

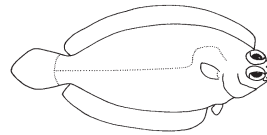


7a Preopercle margin completely concealed by skin
 and scales **SOLEIDAE**



7b Preopercle margin distinct **8**

8a Dorsal-fin origin at or behind vertical through mid-region of
 upper eye and posterior to vertical through posterior margin
 of blind-side nostril; lateral line on blind side rudimentary,
 inconspicuous **POECILOPSETTIDAE**



8b Dorsal-fin origin in front of eyes and above or below
 blind-side nostril; lateral line well-developed, rudimentary
 or absent **9**

9a Both pectoral fins present; lateral line well-developed on
 both sides of body; dorsal-fin origin above horizontal through
 nostrils on blind side **PARALICHTHODIDAE**



9b Only eyed-side pectoral fin present; lateral line absent or
 rudimentary and scarcely noticeable; dorsal-fin origin below
 horizontal through nostrils on blind side **SAMARIDAE**



FAMILY PSETTODIDAE

Spiny turbot or adalaks

Dannie A Hensley and Kunio Amaoka

Flatfishes with dorsal-fin origin well behind eyes; eyes on right or left side of head (dextral or sinistral), and migrating eye on dorsal edge of head. Body compressed but fairly thick; preopercle margin easily seen, not hidden by skin and scales. Mouth large, extending well beyond rear margin of lower eye, and lower jaw projecting; supramaxilla well-developed. Teeth strong, in 2 or 3 rows in each jaw, straight or curved and pointed, some with barbed tips; some teeth in inner row depressible, those of outer row not moveable; minute teeth on vomer, palatines and tongue; gill rakers with clusters of teeth. Dorsal fin and anal fin with spines and rays; pectoral fins on eyed side and blind side about equal in length; pelvic

fins symmetrically placed on each side of midventral line, with 1 spine, 5 rays; caudal fin with 24 or 25 rays, 15 branched, and fin not attached to dorsal fin and anal fin. Lateral line developed on both sides of body, with branch present below lower eye, but no supratemporal branch, and no high arch over pectoral fin. Scales on both sides of body small and weakly ctenoid.

Considered the most primitive of flatfishes; evidence of their percoid ancestry includes some symmetry still present (the migrating eye moving only to the top of the head and being either right- or left-sided, and the frequent behaviour of swimming upright) as well as retaining teeth on the palatines and vomer, having spines in the dorsal fin, anal fin and pelvic fins, a basic feature of the caudal skeleton (Amaoka 1969) and relatively few vertebrae.

One genus with 3 species.

GENUS *Psettodes* Bennett 1831

Three species: 2 in tropical West Africa, and 1 in Indo-Pacific.

Psettodes erumei (Bloch & Schneider 1801)

Indian spiny turbot or adalah

PLATE 86

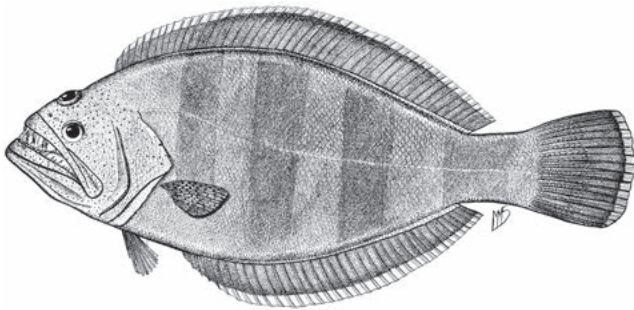
Pleuronectes erumei Bloch & Schneider 1801: 150 (Tharangambadi, India).

Psettodes erumei: Norman 1934*; SFSA No. 299*; Stauch & Cadenat 1965;

Amaoka 1969*; Kuronuma & Abe 1986; SSF No. 257.1*; Hensley 2001*.

Dorsal fin 9–11 spines, 38–45 rays; anal fin 1 spine, 33–42 rays; pectoral fins 1 weak spine, 13–16 rays on both sides. Body depth 2.3–2.5 in SL; HL 3.2–3.6 in SL. Scales small, weakly ctenoid on both sides of body; LL scales 61–77; scales around peduncle 32–38. Vertebrae 10 + 14.

Body on eyed side generally brown or grey, sometimes with 4 or 5 broad dark crossbars; tips of dorsal, anal and caudal fins darker. Blind side pale brownish, but occasionally partly coloured. Attains ~70 cm TL.



Psettodes erumei, 16 cm TL (off Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Arabian Sea, Red Sea to South Africa, Madagascar, Mauritius, India and Sri Lanka; elsewhere to Bay of Bengal, Philippines, Taiwan, South China Sea and Australia.

REMARKS Often swims in upright position; inhabits mud and sand bottoms, at 1–100 m (frequently caught at ~20–50 m). Usually deeply buried during day; feeds at night, predominantly on fishes, including some pelagic species.

FAMILY CITHARIDAE

Large-scaled flounders

Dannie A Hensley and Kunio Amaoka

Flatfishes with eyes on right side or left side of head (dextral or sinistral) (reversals within species are rare); body elliptical and moderately compressed; preopercle margin free, not hidden by skin and scales; gill membranes completely separate; anus on eyed side. Mouth large, somewhat arched downward; teeth not greatly enlarged; vomerine teeth present in some species. Dorsal-fin origin somewhat on blind side, and rear of dorsal fin and anal fin slightly deflected to blind side; no spines in dorsal fin and anal fin, and those fins high for length (rays not shorter posteriorly) and separate from caudal fin; pectoral fin on each side of body; pelvic fins with short bases, and 1 spine, 5 rays. Lateral line usually on both sides of body, with long flat-topped arch over pectoral fin. Scales large; ctenoid on eyed side, cycloid on blind side.

Four genera and 6 species; 2 genera and 2 species in WIO.

KEY TO GENERA

- 1a Eyes normally on left side of head; all dorsal- and anal-fin rays branched; anterior dorsal-fin rays never elongated; no teeth on vomer; LL scales ≥ 40 *Citharoides*
- 1b Eyes normally on right side of head; only a few posterior dorsal- and anal-fin rays branched; anterior dorsal-fin rays elongated in males; vomer with patch of strong teeth; LL scales 29–32 *Brachypleura*

GENUS *Brachypleura* Günther 1862

One species.

Brachypleura novaezeelandiae Günther 1862

Yellow-dappled flounder

PLATE 86

Brachypleura novaezeelandiae Günther 1862: 419

(New Zealand [locality probably incorrect]); Norman 1934*.

Brachypleura novaezeelandia: Hubbs 1945; Amaoka 1972*;

Kuronuma & Abe 1986; Randall 1995; Anderson *et al.* 1998;

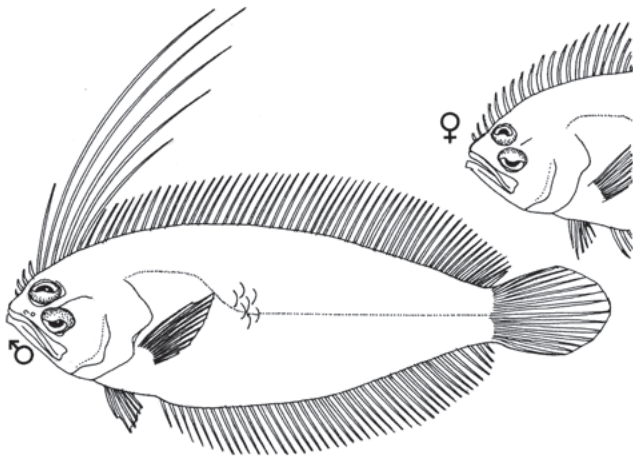
Hensley & Amaoka 2001*.

Brachypleura xanthosticta Alcock 1889: 281, Fig. (Bay of Bengal);

Regan 1908.

Eyes normally on right side of head, and upper eye in front of lower eye; dorsal-fin origin just below posterior nostril of blind side. Dorsal fin 65–77 rays, and some anterior rays elongated in males but not in females; anal fin 41–50 rays; all dorsal- and anal-fin rays unbranched except for few near rear of fins; pectoral fin 11–13 rays on eyed side; pelvic fins 1 spine, 1 unbranched and 4 branched rays; caudal fin 21 rays, 13 branched; GR 5 or 6/7–10; LL scales 28–33. Body depth 2.2–2.7 in SL; HL 3–3.6 in SL. Teeth in both jaws biserial (in 2 rows) and pointed; anterior teeth in upper jaw somewhat enlarged; teeth in outer row of lower jaw larger than teeth in inner row; teeth present on vomer; no supramaxilla. Scales deciduous; no scales around eyes or on interorbital region, snout and jaws.

Body on eyed side yellowish or yellowish brown; dorsal, anal and caudal fins paler than body, but with dark spots. Attains 14 cm TL.



Brachypleura novaezeelandiae, 10 cm SL, male (Java Sea); pectoral and caudal fins reconstructed; female head Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to India, Sri Lanka and Maldives; elsewhere to Bay of Bengal, Indonesia, northern South China Sea, Philippines, New Guinea, Taiwan and northwestern Australia; probably does not occur in New Zealand.

REMARKS Lives on sand and mud bottoms, at 18–97 m; frequently collected from estuaries. Caught by commercial trawlers and mostly used for fish meal but sometimes discarded.

GENUS *Citharoides* Hubbs 1915

Eyes on either side of head (normally on left side in *C. macrolepis*); anus on eyed side; lateral line on both sides of body. Vomer with or without teeth; no teeth on palatines and tongue. Dorsal-fin origin at posterior nostril of blind side; pectoral fins well-developed; pelvic fins 1 spine, 5 rays, and fins equally developed and short-based. Vertebrae 10 + 24 or 25. Two species, 1 in WIO.

Citharoides macrolepis (Gilchrist 1904)

Two-spot large-scaled flounder

PLATE 86

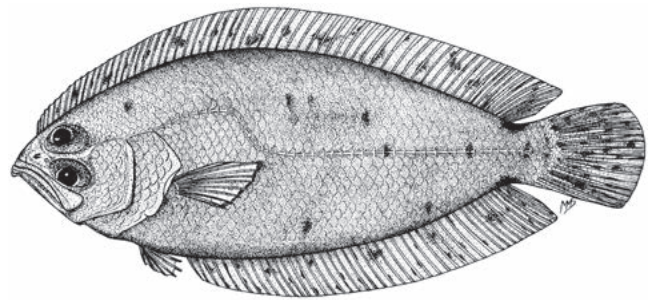
Arnoglossus macrolepis Gilchrist 1904: 12, Pl. 31 (off Thukela River mouth, KwaZulu-Natal, South Africa).

Paracitharus macrolepis: Regan 1920.

Citharoides macrolepis: Norman 1934*; SFSA No. 305*; SSF No. 258.1*; Quéro & Maugé 1989.

Eyes normally on left side of head; dorsal-fin origin just above and behind slit of posterior nostril of blind side. Dorsal fin 65–72 rays; anal fin 45–50 rays; pectoral fins 10 rays; all dorsal-, anal- and pelvic-fin rays branched; caudal fin 23 rays; GR 1, with 6 rudiments/7, with 2 rudiments; LL scales 43–47. Body depth 2.4–2.7 in SL; HL 3–3.5 in SL. Teeth on sides of premaxilla of upper jaw small and in bands; teeth in anterior lower jaw in large band or group, and posterior teeth depressible; no teeth on vomer; supramaxilla small, present only on blind side. Lateral-line tubules T- or Y-shaped.

Body on eyed side buff, with a few dark spots or blotches on body, dorsal fin and anal fin, and 2 black spots on peduncle at bases of last dorsal- and anal-fin rays. Attains at least 25 cm TL.



Citharoides macrolepis, 18 cm TL (South Africa). Source: SSF

DISTRIBUTION WIO: Kenya to South Africa (KwaZulu-Natal) and Madagascar.

REMARKS Found to ~200 m deep. This species may become included in the genus *Paracitharus* (Hoshino 2001).

FAMILY BOTHIDAE

Lefteye flounders

Dannie A Hensley and Kunio Amaoka

Flatfishes with eyes on left side of head (sinistral), but some showing rare reversals; body shape variable, deep to elongate, and laterally compressed. Preopercle margin easily seen, not hidden by skin or scales. Dorsal-fin origin above or ahead of front margin of upper eye; pectoral fin present on blind side, but shorter than eyed-side fin in Indo-Pacific species; pelvic fins with 6 or 7 rays: eyed-side pelvic fin with long base on midventral line, its origin in front of origin of blind-side pelvic fin, which has a shorter base and is set above midventral line; caudal fin 15–18 rays, 9–13 branched, and fin not attached to dorsal fin or anal fin. No fin spines. Lateral line on eyed side with high arch over pectoral fin, sometimes with branch above upper eye, and without suborbital branch below lower eye; lateral line on blind side generally absent or feebly developed. Some species with cirri over eyes. Many species show sexual dimorphism, namely males display various combinations of wider interorbital region, elongate fin rays, presence of rostral and/or orbital spines, and dark colour patterns on blind side.

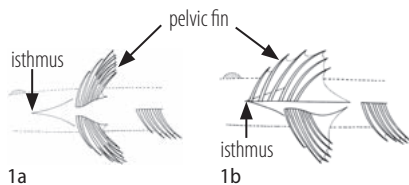
Occur in tropical to warm-temperate seas worldwide.

Adept at camouflage and able to quickly bury themselves in the sediment (mostly open sand or mud bottom). Ambush predators that feed on small fishes and crustaceans. Twenty genera and ~161 species; 13 genera and 47 species in WIO.

KEY TO GENERA

1a First ray of eyed-side pelvic fin behind isthmus (which is fairly pointed at front of throat region); 1st ray of blind-side pelvic fin opposite 2nd ray of eyed-side pelvic fin *Taenioipsetta*

1b First ray of eyed-side pelvic fin on or near isthmus; 1st ray of blind-side pelvic fin opposite 3rd or 4th ray of eyed-side pelvic fin 2



2a Upper jaw 0.9–1.8 in HL, and rear end of maxilla extending to or well beyond rear margin of lower eye 3

2b Upper jaw 2 or more times in HL, and rear end of maxilla not extending to rear margin of lower eye 4

Continued ...

KEY TO GENERA

3a Very large canines at tip of lower jaw; front of upper jaw protruding beyond tip of snout *Kamoharaia*

3b Small to moderate canines at tip of lower jaw; front of upper jaw not protruding beyond tip of snout *Chascanopsetta*

4a All upper-jaw teeth and all (or nearly all) lower-jaw teeth confined to blind side jaws; first 2 rays of dorsal fin detached from other fin rays, or if not detached then first 3 dorsal-fin rays elongate *Laeops*

4b Teeth present on all jaws; no detached dorsal-fin rays 5

5a Lateral line distinct on blind side; 3 obvious blotches or eye-spots forming triangle on eyed side of body *Grammatobothus*

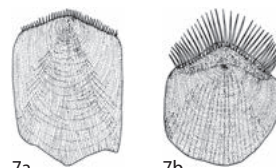
5b Lateral line weakly developed or absent on blind side 6

6a Eyes separated by bony ridge or narrow concave space anteriorly; interorbital width usually similar in males and females; no rostral spine (both sexes) 7

6b Eyes separated by conspicuous concave space (except in very small specimens) without bony ridge; interorbital region of males and large specimens usually broader than that of females and small specimens; males generally with rostral spine 8

7a Scales on eyed side cycloid, or if ctenoid, ctenii short *Arnoglossus*

7b Scales on eyed side ctenoid, ctenii elongate *Psettina*



8a First ray of dorsal fin elongate, longer than 2nd ray; gill rakers palmate *Asterorhombus*

8b First ray of dorsal fin not elongate, shorter than 2nd ray; gill rakers not palmate 9

9a Tip of isthmus below or behind rear margin of lower eye ... 10

9b Tip of isthmus below before middle of lower eye 11

10a Series of pale spots along head margin in front of interorbital region *Tosarhombus*

10b No pale spots along head margin in front of interorbital region *Parabothus*

Continued ...

KEY TO GENERA

- 11a LL scales ≥ 69 ; blind side with 4 suborbital bones *Bothus*
 11b LL scales 36–63; blind side with 3 suborbital bones 12
- 12a Scales on eyed side with elongate ctenii; outer plates of 4 hypural plates without deep clefts *Crossorhombus*
 12b Scales on eyed side with short ctenii; all 4 hypural plates with deep clefts *Engyprosopon*

GENUS *Arnoglossus* Bleeker 1862

Body elongate. Pectoral fins not elongate in either sex; left (eyed-side) pelvic fin starting at tip of isthmus and extending below or beyond rear margin of eye; 3rd or 4th ray of left pelvic fin opposite 1st ray of right (blind-side) pelvic fin. Eyes separated by bony ridge or very narrow concave space anteriorly; interorbital width usually similar in both sexes; 3 suborbital bones on blind side. No rostral, orbital or mandibular spines. Maxilla extends to below front margin or slightly beyond middle of lower eye. Teeth uniserial, small or moderate, sometimes enlarged anteriorly. Gill rakers few, slender and moderate in size, and sometimes serrated on rear margin. Scales moderate to small and deciduous; feeble ctenoid scales on eyed side, cycloid scales on blind side. Four hypural plates, all without clefts or grooves. About 38 species, 6 in WIO.

KEY TO SPECIES

- 1a Caudal-fin base with distinct dark band and 6 dark spots in distinct submarginal row *A. sayaensis*
 1b No distinct dark band or spots on caudal-fin base 2
- 2a Front teeth of upper jaw larger than rear teeth; teeth of lower jaw stronger and more widely spaced than lateral teeth of upper jaw *A. dalgleishi*
 2b Front teeth of upper jaw at most scarcely larger than rear teeth; teeth in both jaws small and closely spaced 3
- 3a Anterior dorsal-fin rays noticeably elongate in both sexes 4
 3b Anterior dorsal-fin rays only slightly elongate or not elongate 5

Continued...

KEY TO SPECIES

- 4a Upper jaw 2.6–2.8 in HL; dorsal fin 88–98 rays; anal fin 67–77 rays; LL scales 48–62; distinct dark spot posteriorly at bases of dorsal and anal fins *A. macrolophus*
 4b Upper jaw 3–3.2 in HL; dorsal fin 96–105 rays; anal fin 73–82 rays; LL scales 56–66; no distinct dark spot posteriorly at bases of dorsal and anal fins *A. capensis*
- 5a Dorsal fin 80–84 rays; anal fin 61–64 rays; GR 7–10 on lower limb of 1st arch *A. aspilos*
 5b Dorsal fin 94–102 rays; anal fin 74–78 rays; GR 11–13 on lower limb of 1st arch *A. arabicus*

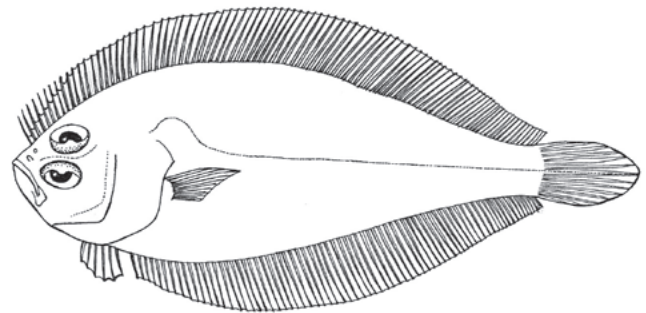
Arnoglossus arabicus Norman 1939

Arabian flounder

Arnoglossus arabicus Norman 1939: 99, Fig. 30 ('south coast of Arabia'); Fowler 1956*; Randall 1995; Manilo & Bogorodsky 2003.
Arnoglossus kotthausi Klausewitz & Schneider 1986: 222 (Gulf of Aden).

Dorsal fin 94–102 rays; anal fin 74–78 rays; pectoral fin 11–14 rays on eyed side, 9–11 rays on blind side; GR 5–7/11–13; LL scales ~60–67. Body depth 2.5–2.8 in SL; HL 3.3–3.7 in SL; interorbital region narrow and ridge-like.

Eyed side yellowish brown, without distinct markings; fins greyish, without distinct dark markings. Attains 11 cm SL.

*Arnoglossus arabicus*, 9 cm TL. Drawn from Norman 1939**DISTRIBUTION** WIO: Gulf of Aden to Oman and India.

REMARKS Known from 83–300 m. *Arnoglossus kotthausi* is regarded as a junior synonym of *A. arabicus* because counts and proportions of both nominal species fall within ranges of variation in the type specimens of both.

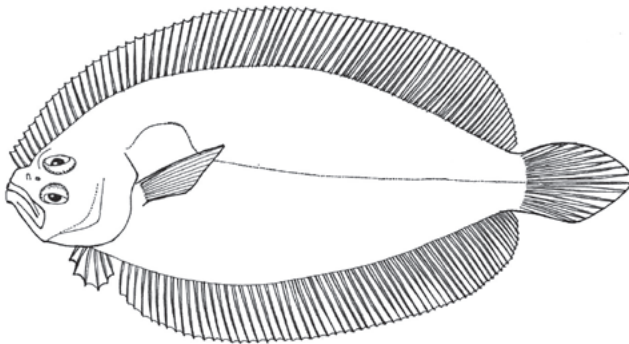
Arnoglossus aspilos (Bleeker 1851)

Brown flounder

Rhombus aspilos Bleeker 1851: 408 (Jakarta, Java, Indonesia).*Arnoglossus aspilos*: Norman 1934*; Blegvad & Løppenthin 1944*;
?Kuronuma & Abe 1986; Randall 1995*; Hensley & Amaoka 2001*.

Dorsal fin 80–84 rays; anal fin 61–64 rays; pectoral fin 11 or 12 rays on eyed side, 9 rays on blind side; GR 0–3/7–10; LL scales 45–48. Body depth 2.3–2.6 in SL; HL 3.9–4 in SL. Interorbital region ridge-like.

Eyed side uniformly brownish. Attains 19 cm SL.

*Arnoglossus aspilos*, ~7 cm TL. Drawn from Norman 1934**DISTRIBUTION** Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman and Red Sea to South Africa (KwaZulu-Natal); elsewhere, Indonesia to Australia.**REMARKS** Known from 28–71 m, on sand, mud and clay bottom. The account of this species from the Persian/Arabian Gulf by Kuronuma & Abe (1986) is questionable, as they give very broad ranges for counts of dorsal- and anal-fin rays (84–95 and 63–76, respectively), so it is possible that two species were included in their material. The subspecies *Arnoglossus aspilos praeteritus* from Australia has been reassigned by Amaoka & Last (2014) as a valid species of *Engyprosopon*.*Arnoglossus capensis* Boulenger 1898

Cape flounder

PLATE 86

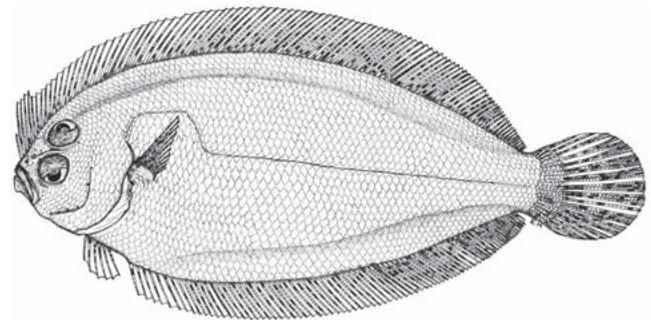
Arnoglossus capensis Boulenger 1898: 1 (False Bay, South Africa);

Norman 1934*; SFSA No. 311; Brownell 1979*; SSF No. 259.1*.

Arnoglossus entomorphynchus Stauch 1967: 661, Fig. (Gulf of Guinea).

Dorsal fin 96–105 rays, and anterior rays noticeably elongate in both sexes; anal fin 73–82 rays; pectoral fin 10–12 rays on eyed side, 9–11 rays on blind side; GR 0–2/8–14; LL scales 56–66. Body depth 2.1–2.7 in SL; HL 3.7–4.5 in SL. Interorbital region concave.

Eyed side brownish, with small indistinct dark spots and markings on body, median fins and pelvic fin. Attains 18 cm SL.

*Arnoglossus capensis*, 9 cm SL (Tristan da Cunha).Source: Andrew *et al.* 1995**DISTRIBUTION** South Africa (KwaZulu-Natal) in WIO, around Cape of Good Hope to Angola in southeastern Atlantic; elsewhere, St Helena I., Ascension I. and Tristan da Cunha in South Atlantic; and Gulf of Guinea in northeastern Atlantic.**REMARKS** Known from 100–182 m, from sand and shell bottom.*Arnoglossus dalgleishi* (Von Bonde 1922)

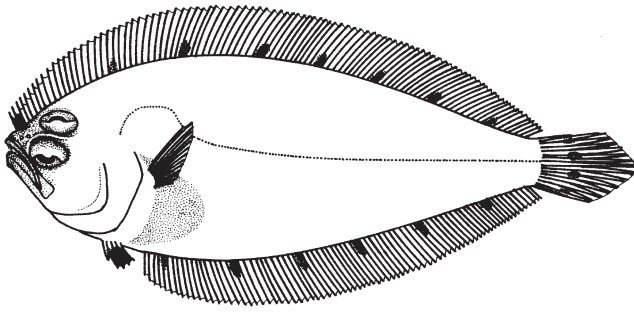
East-coast flounder

PLATE 86

Trichopsetta dalgleishi Von Bonde 1922: 6, Pl. 1, Fig. 1 (KwaZulu-Natal, South Africa).*Arnoglossus dalgleishi*: Norman 1934*; SFSA No. 310*; SSF No. 259.2*;
Hensley & Amaoka 2001*; Fricke & Kulbicki 2006.

Dorsal fin 101–108 rays; anal fin 78–84 rays; pectoral fin 14–16 rays on eyed side, 10–12 rays on blind side; GR 0/7–9; LL scales ~73–86. Body depth 2.4–2.8 in SL; HL 3.6–3.9 in SL. Interorbital region a sharp ridge.

Eyed side greyish, with regular series of dark blotches on dorsal and anal fins; last 3 rays of eyed-side pelvic fin and first 3 rays of dorsal fin darkened. Attains 19 cm SL.



Arnoglossus dalgleishi, 11 cm SL (Mozambique).

DISTRIBUTION WIO: Kenya, Tanzania (Zanzibar), Mozambique and South Africa (KwaZulu-Natal); elsewhere, Indonesia (south coast of Java).

REMARKS Known from 50–220 m.

Arnoglossus macrolophus Alcock 1889

Large-crested flounder

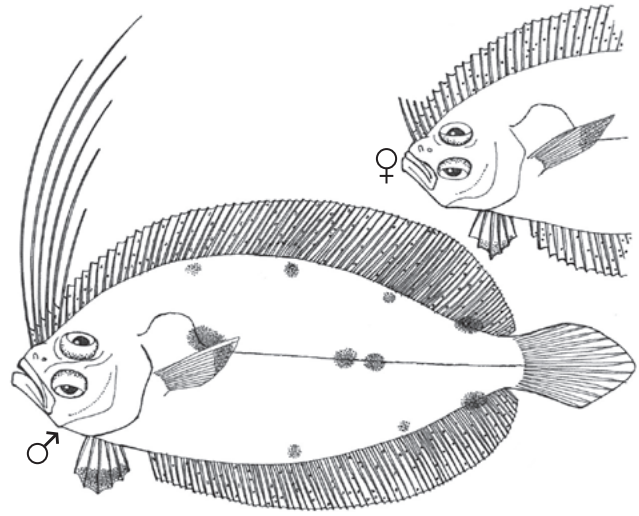
PLATE 87

Arnoglossus macrolophus Alcock 1889: 280, Pl. 18, Fig. 2 (Bay of Bengal, near Ganjam, Odisha, India); Munro 1955*; ?Fourmanoir & Crosnier 1963; Arai & Amaoka 1996*.

Arnoglossus tapeinosoma (non Bleeker 1865): Norman 1934*, 1939; De Silva 1956; Fowler 1956; Saramma 1963; Dor 1970*; Kotthaus 1977*; Nielsen 1984; Klausewitz & Schneider 1986; Randall 1995*; Hensley & Amaoka 2001*; Bogorodsky *et al.* 2014.

Dorsal fin 88–98 rays, with anterior rays greatly elongate in males, somewhat elongate in females; anal fin 67–77 rays; pectoral fin 10–14 rays on eyed side, 8–12 rays on blind side; GR 0/10–13; LL scales 48–62. Body depth 2.4–3 in SL; HL 3–4.1 in SL. Interorbital region a narrow body ridge.

Eyed side pale brownish, with indistinct dark blotch at junction of straight and curved sections of lateral line, 2 small blotches on middle of straight section of lateral line, series of distinct spots on dorsal and anal fins, and large distinct dark spot posteriorly on bases of those fins; distal margins of eyed-side pectoral fin and pelvic fins on both sides darkly pigmented. Attains 13 cm SL.



Arnoglossus macrolophus, 7 cm TL, male, and head of female. Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Aden (Saudi Arabia) and Persian/Arabian Gulf; elsewhere to Bay of Bengal, South China Sea, Taiwan, southern Japan, northern Australia and New Caledonia.

REMARKS Known from 18–141 m, on sand, mud and gravel bottom. The report from Madagascar by Fourmanoir & Crosnier (1963) is unconfirmed. Has been incorrectly synonymised with *A. tapeinosoma* (Bleeker 1865), which is known only from Sumatra (Indonesia) to Taiwan (Arai & Amaoka 1996).

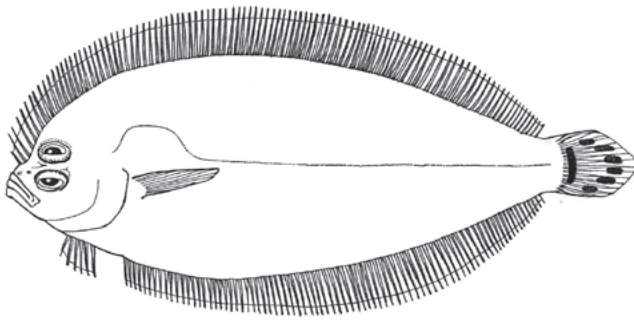
Arnoglossus sayaensis Amaoka & Imamura 1990

Saya flounder

Arnoglossus sayaensis Amaoka & Imamura 1990: 1015, Figs. 5–6 (Saya de Malha Bank).

Dorsal fin 102–110 rays; anal fin 81–86 rays; pectoral fin 11–14 rays on eyed side, 9–12 rays on blind side; GR 0/5–9; LL scales 72–76. Body depth 2.3–2.5 in SL; HL 4–4.6 in SL. Teeth in upper jaw larger anteriorly; teeth in lower jaw similarly sized and similarly placed as lateral teeth in upper jaw. Interorbital region a narrow low ridge.

Eyed side pale brown, with several indistinct traces of scattered dark spots; first 2 rays of dorsal fin dark brown; caudal fin with distinct dark crossband at middle of basal portion and 6 dark spots forming submarginal row. Blind side pale brown, except snout dark brown. Attains ~17 cm SL.



Arnoglossus sayaensis, 14 cm SL, male holotype (Saya de Malha Bank).
Drawn from Amaoka & Imamura 1990

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Collected from 120–148 m.

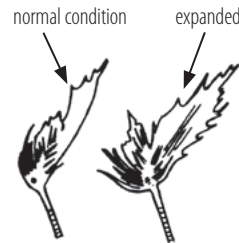
GENUS *Asterorhombus* Tanaka 1915

Body ovate. First dorsal-fin ray elongate and separate from other rays, with membranous flap on posterior margin. Fin rays in pectoral and pelvic fins not elongate; 3rd ray of left (eyed-side) pelvic fin opposite 1st ray of right (blind-side) pelvic fin. Eyes separated by narrow, deep, concave space, its width similar in both sexes or slightly broader in males compared with that of females; both eyes, or upper eye only, with or without tentacle; 3 suborbital bones on blind side. No rostral or orbital spines. Maxilla extends to below front margin of lower eye. Teeth uniserial in both jaws, equally developed on both sides of body, but anterior teeth in upper jaw slightly enlarged. Gill rakers palmate, with small tooth-like structure on margins. Scales ctenoid on eyed side, cycloid on blind side. Four hypural plates, with many deep clefts along distal margins. Closely related to *Engyprosoyon* in having the hypural plates with many clefts in distal margins, but differs in displaying no distinct sexual dimorphism in rostral and orbital spines, interorbital width, and anterior dorsal profile of head. Three species, all in WIO.

KEY TO SPECIES

[Fish >6 cm SL]

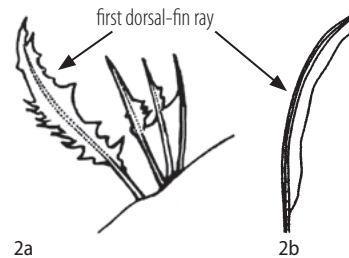
- 1a Body depth 1.7–1.9 in SL; interorbital width 3.7–5.8 in HL in males, 5.8–9 in HL in females; 1st dorsal-fin ray with distinct membranous structure at tip *A. cocosensis*



- 1b Body depth 2–2.4 in SL; interorbital width 8.9–35 in HL; 1st dorsal-fin ray with broad membrane along most of its length 2

- 2a First dorsal-fin ray 1.4–3.3 in HL, and its membrane with highly sculptured margin and mottled colouration; LL scales 46–57; interorbital width 12–35 in HL in both sexes (no sexual dimorphism) *A. intermedius*

- 2b First dorsal-fin ray 0.8–1.7 in HL, and margin of its membrane smooth, whitish and with ~5 dark crossbands; LL scales 56–67; interorbital width sexually dimorphic: 8.9–17.9 in HL in males, 14.6–21.2 in HL in females *A. filifer*



Asterorhombus cocosensis (Bleeker 1855)

Angler flatfish

PLATE 87

Rhombus cocosensis Bleeker 1855: 179 (Cocos [Keeling] Is.).

?*Rhomboidichthys* sp.: Günther 1880.

Asterorhombus fijiensis: Hensley 1986; Amaoka *et al.* 1994*;

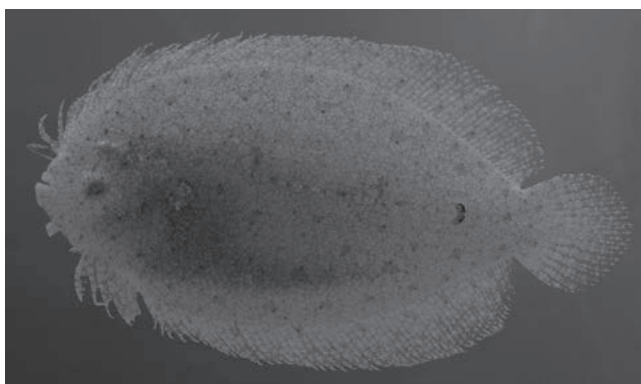
Hensley & Amaoka 2001*.

Asterorhombus cocosensis: Hensley 2003.

Dorsal fin 80–83 rays; anal fin 59–64 rays; pectoral fin 10–12 rays on eyed side, 9–11 rays on blind side; GR 0/8–10; LL scales 51–64. Body depth 1.7–1.9 in SL; HL 3.2–3.6 in SL; snout longer than eye diameter. Upper eye frequently with 1–9 cirri, often branched (no cirri on lower eye); interorbital width (specimens >6 cm SL) broad, and broader in males

than in females. First dorsal-fin ray elongate, not attached to 2nd ray, and with complicated membranous structure at tip.

Eyed side tan, with scattered small dark spots on body and fins; distinct dark spot on lateral line anterior to caudal peduncle; live fish with 7 red spots on lateral line, 2 along opercular margin, 1 in front of upper eye, and 1 on middle of lower jaw; vertical red band on interorbital region; series of paler red spots on dorsal, anal, caudal and pelvic fins; membranous structure at tip of 1st dorsal-fin ray white, except marginal areas yellowish red, and with pair of small dark spots at base of membrane near ray. Attains 15 cm SL.



Asterorhombus cocosensis, 10 cm SL, with diagram of eye (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific (widespread). WIO: Mozambique, Comoros and Seychelles; elsewhere to Cocos (Keeling) Is., Ryukyu Is., Philippines, Flores Sea, Banda Sea, Palau, Australia, northern Great Barrier Reef and Fiji.

REMARKS Lives on coral-sand bottom near coral reefs, to ~30 m deep. Apparently uses membranous structure (esca) at tip of the 1st dorsal-fin ray as a lure and moves the ray (illicium) in a manner to attract prey; when the esca is folded as it moves through the water, it resembles a small crustacean (Amaoka *et al.* 1994).

Asterorhombus filifer Hensley & Randall 2003

Filament flounder

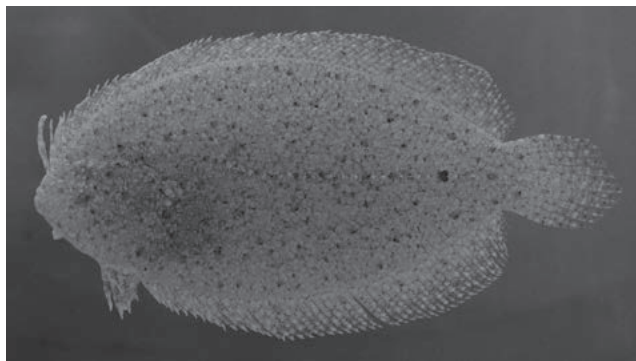
PLATE 87

Asterorhombus filifer Hensley & Randall 2003: 2, Figs. 1–3 (wreckage at shore, Midway Atoll, Hawaii); Hensley 2005; Randall 2005*.

Dorsal fin 81–88 rays; anal fin 63–69 rays; pectoral fin 11 or 12 rays on eyed side, 9–11 rays on blind side; GR 0–2/6–10. Body depth 2–2.3 in SL; HL 3.2–3.8 in SL; snout longer than

eye diameter. Interorbital width (specimens >6 cm SL) broader in males than in females; both eyes usually with 1 unbranched or branched cirrus. First dorsal-fin ray elongate (proportionally longer in smaller specimens), not attached to 2nd ray, and with attached broad membrane with smooth margin.

Eyed side tan, with scattered dark spots of variable size and darkness, including usually ~5 longitudinal rows of spots; interorbital area usually with 3 dark bars; 1st dorsal-fin ray usually with 3–6 dark crossbands. Attains ~13 cm SL.



Asterorhombus filifer, 9 cm SL, with diagram of eyes (Seychelles). PC Heemstra © NRF-SAIAB



DISTRIBUTION Indo-Pacific (widespread). WIO: South Africa, Comoros, Seychelles and Mauritius; elsewhere to Philippines, southern Japan, Marshall Is., Coral Sea, Australia, Great Barrier Reef, New Caledonia, Society Is. and Hawaii.

REMARKS Known from near reefs on sand, coral- or rock-rubble bottom, at 3–57 m. Often misidentified in collections as *A. intermedius*.

Asterorhombus intermedius (Bleeker 1865)

Blotched flounder

PLATE 87

Platophrys (Arnoglossus) intermedius Bleeker 1865: 47 [5] (Manado, Sulawesi, Indonesia).

Rhomboidichthys intermedius: Regan 1902.

Engyprosopon intermedius: Regan 1908.

Arnoglossus intermedius: Norman 1926, 1934*; Winterbottom & Anderson 1997; Winterbottom *et al.* 1989.

Asterorhombus intermedius: Chabanaud 1948; Amaoka 1969*; Hensley & Amaoka 2001*; Hensley & Randall 2003;

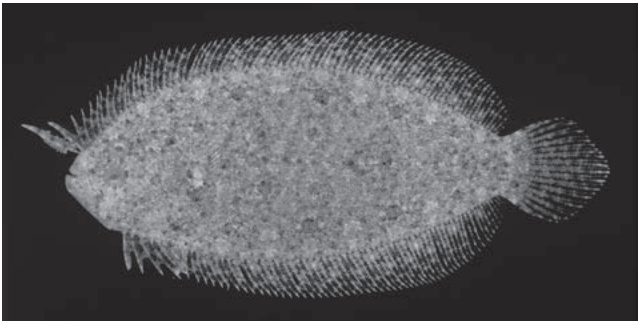
Manila & Bogorodsky 2003; Hensley 2005; Randall 2005*.

Asterorhombus stellifer Tanaka 1915: 567 (Nagasaki fish market, Japan).

Asterorhombus sp.: Randall & Anderson 1993.

Dorsal fin 79–86 rays; anal fin 57–65 rays; pectoral fin 10–13 rays on eyed side, 8–10 rays on blind side; GR 0/6–11; LL scales 46–57. Body depth 2–2.4 in SL; HL 3.2–3.8 in SL; snout longer than eye diameter. Interorbital width narrow in both sexes; both eyes usually with 1 cirrus, rarely branched or missing. First dorsal-fin ray elongate, not attached to 2nd ray, with margins of membrane sharply indented and branched.

Eyed side brownish, with many small and large darker blotches; distinct rows of dark blotches along upper and lower margins of body, at dorsal- and anal-fin bases, and above, below, and on straight part of lateral line. Attains 15 cm SL.



Asterorhombus intermedius, 8 cm SL, with diagram of eyes (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific (possibly widespread). WIO: Red Sea, Somalia, Madagascar, Seychelles, Chagos, Maldives and India; elsewhere to Indonesia, Taiwan, southern Japan, Australia, New Caledonia and Tonga.

REMARKS Lives on sand and mud bottom, to ~96 m deep.

GENUS *Bothus* Rafinesque 1810

Body deeply ovate or ovate, becoming more elongate with age. Eyes widely separated by concave or flat space; interorbital width broader in males than in females, and width variable with age; 4 suborbital bones on blind side; eyes of large males and sometimes females with dermal flaps. Mouth moderate or rather small, maxilla extending to below or slightly beyond front margin of lower eye. Teeth in 1 or 2 rows; no distinct canines. Gill rakers moderate to short, and pointed, without serrations. Scales ctenoid or cycloid on eyed side, cycloid on blind side. Upper rays of left (eyed-side) pectoral fin elongate in males, but not in females. Left (eyed-side) pelvic fin with

its origin below and before middle of lower eye, and with its 4th ray opposite 1st ray of right (blind-side) pelvic fin. Four hypural plates without clefts or grooves. Males with spines on snout and sometimes on orbital margins and lower jaw symphysis. About 16 species, 4 in WIO.

KEY TO SPECIES

- | | | |
|----|---|-----------------------|
| 1a | GR 9–11 on lower limb; dorsal fin 96–104 rays; anal fin 74–81 rays | <i>B. mancus</i> |
| 1b | GR 5–9 on lower limb; dorsal fin 84–97 rays; anal fin 61–73 rays | 2 |
| 2a | Scales on eyed side very small, all cycloid except those at margins of body; length of lower jaw on eyed side 2.3–2.9 in HL | <i>B. myriaster</i> |
| 2b | Scales on eyed side ctenoid; length of lower jaw on eyed side 2–2.1 in HL | 3 |
| 3a | Eyes with cirri; front margin of upper eye over middle or rear third of lower eye | <i>B. pantherinus</i> |
| 3b | Eyes without cirri; anterior margin of each eye nearly at same level | <i>B. swio</i> |

Bothus mancus (Broussonet 1782)

Peacock flounder

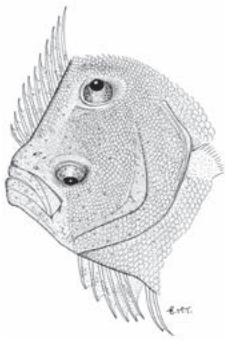
PLATES 87 & 88

Pleuronectes mancus Broussonet 1782: [19], Pls. [3–4] (Raiatea, Society Is.; Nomuka I., Tonga).

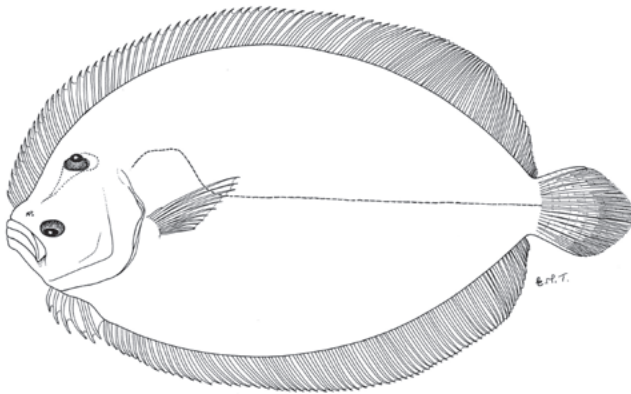
Bothus mancus: Norman 1934*; SFSA No. 318*; Amaoka 1969*; SSF No. 259.3*; Winterbottom *et al.* 1989; Hensley & Amaoka 2001*; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Randall 2005*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 96–104 rays; anal fin 74–81 rays; pectoral fin 10–13 rays on eyed side, 10–13 rays on blind side; GR 0/9–11; LL scales 76–90. Body depth 1.7–2 in SL; HL 3.2–3.8 in SL. Front margin of upper eye over rear margin of lower eye (specimens >13 cm SL). Scales on eyed side ctenoid. Sexual dimorphism develops at ~23 cm SL: males display cirri on eyes, elongate eyed-side pectoral fin, wider interorbital region, and rostral and orbital spines.

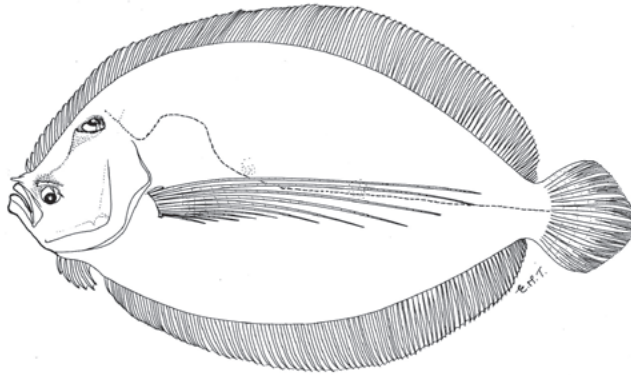
Eyed side with many large pale spots with dark margins (in life, spots are pastel shades of blue, yellow and pink), and numerous scattered small dark spots; usually 2 or 3 distinct dark blotches or spots on lateral line (just after junction of curved and straight sections, near middle of straight section, and near rear end of line); pectoral fin with narrow dark crossbars; dorsal and anal fins with longitudinal row of widely spaced small dark spots. Attains 47 cm SL.



Bothus mancus, 14 cm TL, female head (South Africa). Source: SSF



Bothus mancus, 18 cm TL, female (South Africa). Source: SSF



Bothus mancus, 39 cm SL, male (Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific to eastern Pacific (widespread). WIO: Gulf of Oman, Kenya, Mozambique Channel and South Africa (KwaZulu-Natal; juveniles and larvae possibly reach Eastern Cape), Madagascar, Seychelles, Mascarenes, St Brandon Shoals, Chagos and Maldives; not known from Red Sea; elsewhere to southern Japan, Hawaii, Australia, New Caledonia, Lord Howe I., Tonga, Society Is., Rapa Iti, Pitcairn Is., Easter I., Galápagos Is. and Mexico.

REMARKS Found in shallow water, often adjacent to coral reefs, on sandy bottom or flat areas of reef.

Bothus myriaster (Temminck & Schlegel 1846)

Disc flounder

PLATES 88 & 89

Rhombus myriaster Temminck & Schlegel 1846: 181, Pl. 92, Fig. 2 (Nagasaki, Japan).

Bothus myriaster: Norman 1934*; SFSA No. 316*; Amaoka 1964*, 1969*; SSF No. 259.4*; Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004.

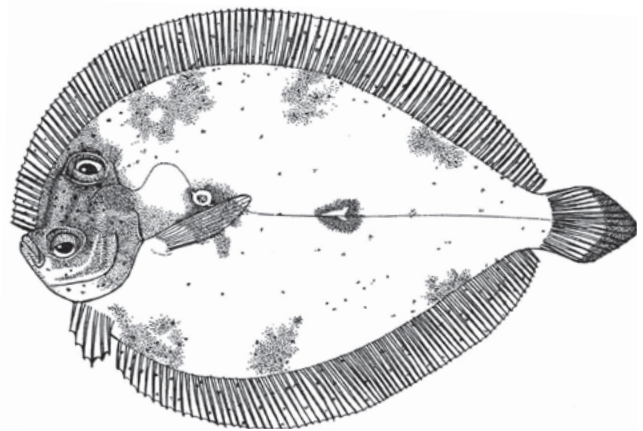
Platophrys ovalis Regan 1908: 232, Pl. 27, Fig. 6 (Amirante I., Seychelles); Norman 1934*; Munro 1955*.

?*Bothus pantherinus* (*non* Rüppell 1830): Nielsen 1961.

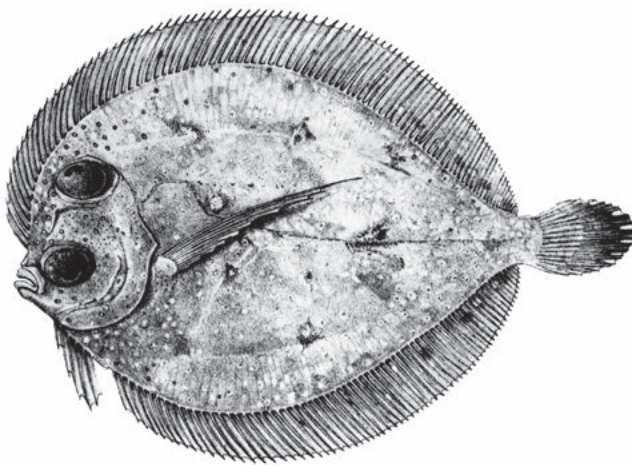
Bothus ypsigrammus Kotthaus 1977: 10, Fig. 440 (Somalia).

Dorsal fin 87–97 rays; anal fin 61–73 rays; pectoral fin 8–10 rays on eyed side, 7–10 rays on blind side; GR 0–5 (rudimentary)/5–8. Body depth 1.4–2 in SL; HL 3.7–4.5 in SL. Larvae and juveniles remain nearly circular in body shape until ~8.5 cm SL; relative body depth and HL reduce with growth in specimens >10 cm SL. Males (>8 cm SL) with elongate eyed-side pectoral fin; wider interorbital region; spines on snout, eyes and at symphysis of lower jaw; and flap-like appendages on eyes.

Eyed side brown, with many dark brown spots; dark brown blotch above junction of straight and curved sections of lateral line, and another on middle of straight section of lateral line; pectoral fin with faint crossbars; caudal-fin margin blackish. Blind side in males yellowish white on anterior half, darker posteriorly and with several transverse bars (bars faint or missing in females and juveniles). Attains 27 cm SL.



Bothus myriaster, 16 cm SL (Somalia). Drawn from photograph in Kotthaus 1977, www.schweizerbart.de/publications/list/series/meteor



Bothus myriaster, 10 cm TL, type of *Platophrys ovalis*. Source: Regan 1908

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Arabian Sea, Somalia, Mozambique, South Africa, Madagascar, Seychelles, Rodrigues and west coast of India; elsewhere to east coast of India, Philippines, Taiwan, Korea, Japan and Lord Howe I.

REMARKS Known from 10–155 m. Larvae and juveniles possibly occur south to Cape St Blaize, South Africa. Larvae show right-eye migration at ~30 mm SL and remain pelagic until 35–40 mm SL.

Bothus pantherinus (Rüppell 1830)

Leopard flounder

PLATE 88

Rhombus pantherinus Rüppell 1830: 121, Pl. 31, Fig. 1 (Al-Muwaylih, Saudi Arabia, Red Sea).

Bothus pantherinus: Norman 1934*; Munro 1955*; De Silva 1956; SFSA No. 317*; Amaoka 1969; Kuronuma & Abe 1972*; Winterbottom 1976; Kuronuma & Abe 1986*; SSF No. 259.5*; Randall 1995*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Bogorodsky *et al.* 2014.
Bothus budkeri Chabanaud 1943: 397 (Hurghada, Egypt, Red Sea).
Bothus tricirrhitus Kotthaus 1977: 11, Fig. 441 (Gulf of Aden).

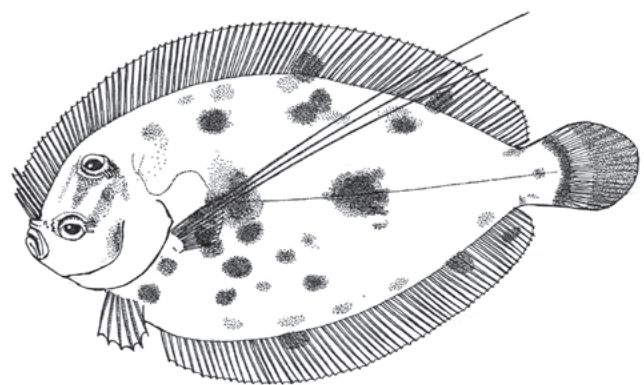
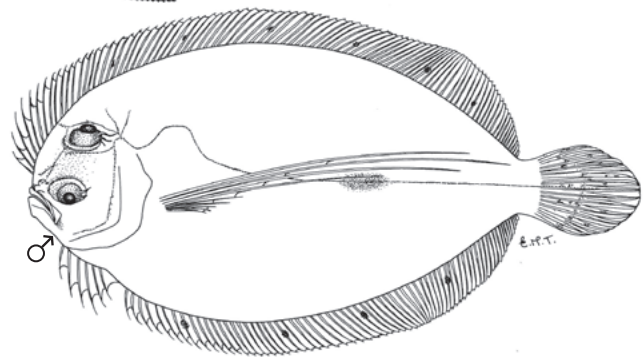
Dorsal fin 84–97 rays; anal fin 61–73 rays; pectoral fin 9–12 rays on eyed side, 9–11 rays on blind side; GR 0–7 rudimentary/6–8; LL scales 74–87 (67–92 reported in other literature). Body depth 1.6–1.9 in SL; HL 3.3–3.9 in SL. Front margin of upper eye over middle to posterior third of lower eye (specimens >5 cm SL). Each eye usually with 1–3 tentacles (rarely absent) in both sexes. Males (>12 cm SL) with elongate eyed-side pectoral fin, wider interorbital region, and spines on snout and margin of eyes.

Eyed side with numerous dark spots, blotches and rings on body and median fins; distinct large dark blotch on middle of straight section of lateral line; eyed-side pectoral-fin membrane usually with thin dark crossbars. Attains 30 cm SL (records of 45 cm SL are questionable).



Bothus pantherinus, female head; 15 cm SL, male (South Africa)

Source: female head drawn from Hensley 2001; male specimen from SSF



Bothus pantherinus, 12 cm TL, holotype of *B. tricirrhitus* (Gulf of Aden).

Drawn from photograph in Kotthaus 1977, www.schweizerbart.de/publications/list/series/meteor

DISTRIBUTION Indo-Pacific (possibly widespread). WIO: Persian/Arabian Gulf, Red Sea, Gulf of Aden, Kenya to South Africa (Port Alfred; juveniles probably farther south), Madagascar, Seychelles, Mascarenes, Chagos, Maldives and India; elsewhere to southern Japan, New Caledonia, Lord Howe I., Society Is., Marquesas Is. and Hawaii; doubtful record from eastern Mediterranean Sea.

REMARKS Found on sand and mud bottom, in tidepools, estuaries and sometimes near reefs, to ~150 m deep. Fin-ray counts for specimens from the Persian/Arabian Gulf are

lower (dorsal fin 77–87 rays; anal fin 58–64 rays) than those from other localities (Kuronuma & Abe 1986). Amaoka *et al.* (1974) found that male specimens from Seychelles had the rear half of the blind side pale brown, which has not been seen in specimens from other locations.

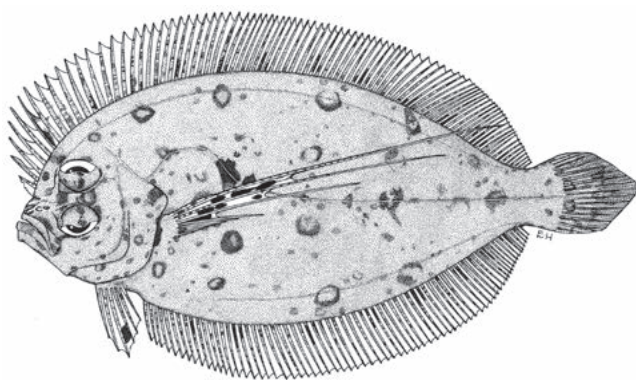
Bothus swio Hensley 1997

Swio flounder

Bothus swio Hensley 1997: 2, Fig.1 (off northern Mozambique).

Dorsal fin ~90 rays; anal fin ~71 rays; pectoral fin 11 rays on eyed side, 9 rays on blind side; GR 0/9; LL scales 92. Body depth 2 in SL; HL 3.6 in SL; eyed-side pectoral fin 0.4 in HL; interorbital region concave and narrow, 17 in HL. Teeth in both jaws similar, caniniform, uniserial, becoming slightly larger anteriorly. Male with well-developed rostral spine on eyed side (females possibly lack an elongate pectoral fin and rostral spine).

Eyed side tan, with 4 longitudinal rows of ocelli (1st row just below dorsal fin, 2nd row dorsal to lateral line, 3rd row ventral to lateral line, and 4th row above anal fin); 3 dark spots on lateral line (at junction of curved and straight sections, on middle of straight section, and near end of peduncle); 2 dark areas in front of upper eye, and 2 dark bars across interorbital area; dorsal and anal fins each with dark spots and distinct row of larger spots along their bases; pectoral fins with 6 or 7 distinct black spots; pelvic fin with large black spot on distal third of membrane between 3rd and 4th rays; caudal-fin base with 2 large dark spots. Attains at least 16 cm SL.



Bothus swio, 16 cm SL, male holotype (N Mozambique).
Source: Hensley 1997

DISTRIBUTION Known only from holotype (male) collected from Mozambique.

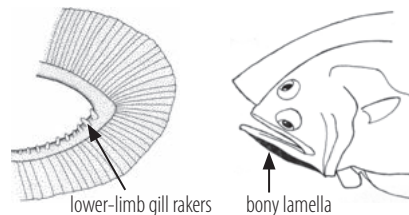
REMARKS Taken at ~88 m. Easily separated from other species of the genus by narrow interorbital width and large black spot on pelvic-fin membrane.

GENUS *Chascanopsetta* Alcock 1894

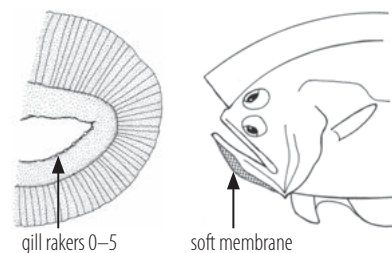
Body elongate, soft and strongly compressed; peduncle very narrow; left (eyed-side) pelvic-fin origin beneath rear of lower eye. Eyes separated by narrow and slightly concave or flat space; interorbital width same in both sexes; 4 suborbital bones on blind side. No rostral, orbital or mandibular spines. Mouth extremely large; maxilla extending below, to, or beyond hind margin of lower eye; tip of lower jaw projecting slightly beyond upper jaw. Teeth small, slender, uniserial on both jaws, and those of lower jaw depressible; no distinct canines. Gill rakers rudimentary or absent. Scales tiny, cycloid on both sides of body. Lateral line developed on both sides of body. Four caudal plates without clefts or grooves. Eight species, 2 in WIO.

KEY TO SPECIES

1a GR 13–19 on lower limb; ventral surface of lower jaw with dilated bony lamella *C. elski*



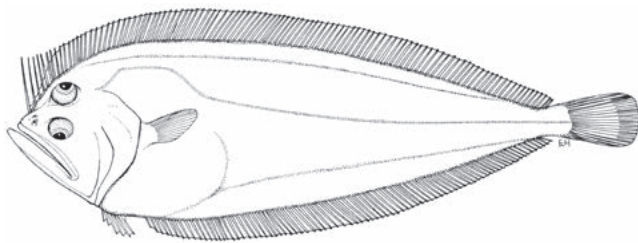
1b GR 0–5 (often vestigial) on lower limb; ventral surface of lower jaw with soft membrane *C. lugubris*



Chascanopsetta elski Foroshchuk 1991*Chascanopsetta elski* Foroshchuk 1991: 76, Fig. (Saya de Malha Bank).

Diagnosis as for genus. Dorsal fin 106–116 rays; anal fin 79–85 rays; pectoral fin 14–17 rays on eyed side, 13–16 rays on blind side; GR 0/13–19; LL scales 156–181. Body depth 2.7–3.3 in SL; HL 4–4.4 in SL.

Eyed side pale brown anteriorly, becoming darker posteriorly; entire body and fins covered with small dots and spots; abdominal area dark blue with several tan stripes slanting anteroventrally (formed from narrow hypaxial myotomes); dorsal-, anal- and pelvic-fin margins paler than their bases; median area of caudal fin darker. Attains 27 cm SL.



Chascanopsetta elski, 24 cm TL, male holotype (Saya de Malha Bank). Drawn from Foroshchuk 1991

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Known from 230–290 m.

Chascanopsetta lugubris Alcock 1894

Pelican flounder

PLATE 87

Chascanopsetta lugubris Alcock 1894: 129 [15], Pl. 6, Fig. 4 (Bay of Bengal, India); Norman 1934*; ?Saramma 1963; SFSA No. 306*; Amaoka 1969*; Amaoka & Yamamoto 1984*; SSF No. 259.6*; Hensley & Smale 1997; Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003; Trunov 2006.

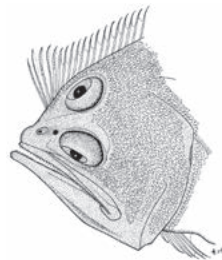
Chascanopsetta gilchristi Von Bonde 1922: 7, Pl. 2, Fig. 1 (KwaZulu-Natal, South Africa).

Chascanopsetta maculata Von Bonde 1922: 8, Pl. 2, Fig. 1 (KwaZulu-Natal, South Africa).

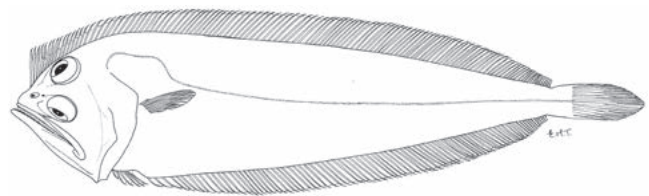
Chascanopsetta galathea Nielsen 1961: 220, Pl. 14 (off KwaZulu-Natal, South Africa).

Diagnosis as for genus. Dorsal fin 115–125 rays; anal fin 79–86 rays; pectoral fin 14–17 rays on eyed side, 12–16 rays on blind side; GR 0–5 (often vestigial); LL scales 152–205. Body depth 2.9–4 in SL; HL 4.6–5.7 in SL.

Eyed side brown, sometimes with numerous small dark spots; abdomen pale blue to black with several tan stripes slanting anteroventrally (formed from narrow hypaxial myotomes); median fins dusky, and paired fins pale. Attains 38 cm SL.



Chascanopsetta lugubris, 23 cm SL, and head of same specimen (Kenya). Source: SSF



DISTRIBUTION Atlantic Ocean and Indo-Pacific (widespread). WIO: Somalia to South Africa (KwaZulu-Natal to Cape of Good Hope and Agulhas Bank), and west coast of India to Sri Lanka.

REMARKS Two subspecies are often recognised: *Chascanopsetta lugubris lugubris* from the Indo-Pacific and *Chascanopsetta lugubris danae* from both sides of the Atlantic. Specimens from southern African tend to show higher dorsal- and anal-fin counts than those from more northern areas in the Atlantic, western Pacific and Indian oceans. Deepwater; on sand, mud and clay bottom, sometimes with minute shell fragments; known in the region from 120–977 m. Larvae metamorphose at a relatively large size, at ~10–12 cm SL; some juveniles remain pelagic after metamorphosis.

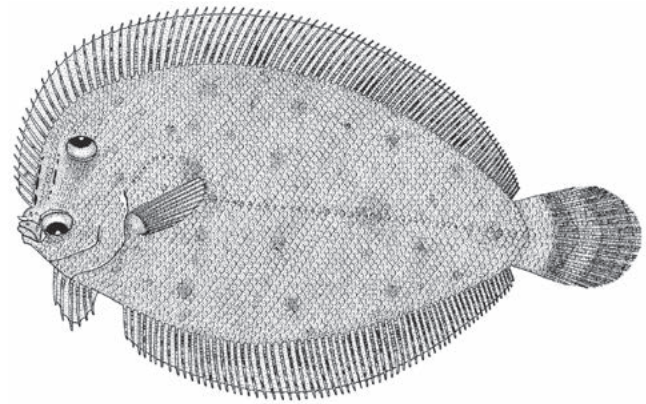
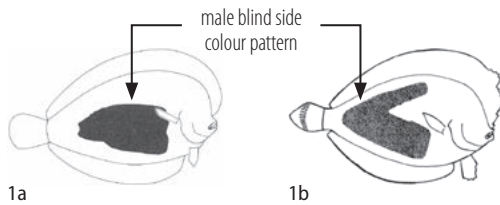
GENUS *Crossorhombus* Regan 1920

Body deep, ovate, very compressed; left (eyed-side) pelvic-fin origin below middle of lower eye. Anterior dorsal profile steeper in males than in juveniles and females. Tip of isthmus below middle of lower eye. Interorbital space flat or concave, its width becoming broader with growth, and broader in males than in juveniles and females; 3 suborbital bones on blind side. Males usually with strong rostral, orbital and sometimes mandibular spines. Mouth small, maxillary extending to below or slightly beyond front margin of lower eye. Teeth small; uniserial or biserial on upper jaw, uniserial on lower

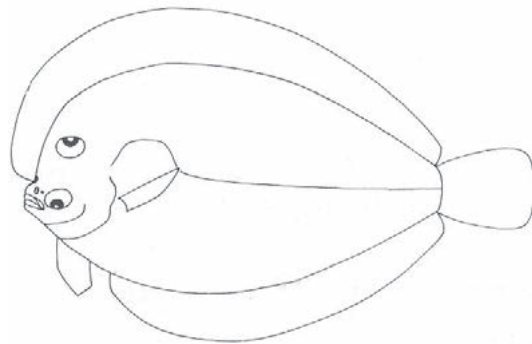
jaw. Gill rakers few and short. Scales small, adherent; ctenoid scales with long hair-like ctenii on eyed side, cycloid scales on blind side. Four hypural plates, with grooves or clefts only along distal margins of 2 inner plates. This genus is in need of revision. Four or 5 species, at least 2 in WIO.

KEY TO SPECIES

- 1a LL scales 56–63; eyed-side pectoral fin of males short, 1.3–1.5 in HL, 16–20% SL; blind side in males with dark pyriform colour pattern *C. azureus*
- 1b LL scales 50–58; eyed-side pectoral fin of males long, 0.6–0.9 in HL, 29–54% SL; at least half of blind side in males darkened, often as V-shaped area *C. valderostratus*



Crossorhombus azureus, 13 cm SL, male (Japan). Source: Amaoka 1969



Crossorhombus azureus, ~4 cm SL, female (Japan). Source: Amaoka 1969

Crossorhombus azureus (Alcock 1889)

Blue flounder

PLATE 89

Rhomboidichthys azureus Alcock 1889: 283, Pl. 16, Fig. 3 (near Puri, India, Bay of Bengal).

Crossorhombus azureus: Norman 1927, 1931 [in part], 1934*; Munro 1955*; De Silva 1956; Hensley & Randall 1993*; Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003.

Bothus (Arnoglossus) microstoma: Weber & De Beaufort 1929.

Bothus microstoma: Chabanaud 1929.

Crossorhombus kanekonis: Amaoka 1969*.

Diagnosis as for genus. Dorsal fin 84–92 rays; anal fin 63–74 rays; pectoral fin 11–14 rays on eyed side, 9–12 rays on blind side; GR 0–4 (small)/6–9; LL scales 56–63. Body depth 1.7–2 in SL; HL 3.3–4.5 in SL. Tip of isthmus below rear half of lower eye. Sexual dimorphism evident in fish >6 cm SL: males with greater interorbital width, flap-like appendages behind eyes, rostral spine, and 1–3 low bony bumps on orbital rims.

Eyed side brownish grey, with darker spots and blotches, and fins paler than body; dorsal and anal fins with small dark spots; caudal fin with 2 distinct bands. Blind side of males with distinct pyriform colour pattern. Attains 18 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Sri Lanka and Pakistan; elsewhere to Bay of Bengal, Vietnam, Aru Is. (Indonesia), South China Sea, Taiwan, Japan and Australia.

REMARKS Typically found on mud bottom, at 13–60 m.

Crossorhombus valderostratus (Alcock 1890)

Broadbrow flounder

PLATE 89

Rhomboidichthys valderostratus Alcock 1890: 435 (off southeastern Sri Lanka).

Platophrys dimorphus Gilchrist 1904: 10, Pl. 27 (near Mhlanga River mouth, KwaZulu-Natal, South Africa).

Crossorhombus valderostratus: Norman 1934* [in part]; Munro 1955*; De Silva 1956.

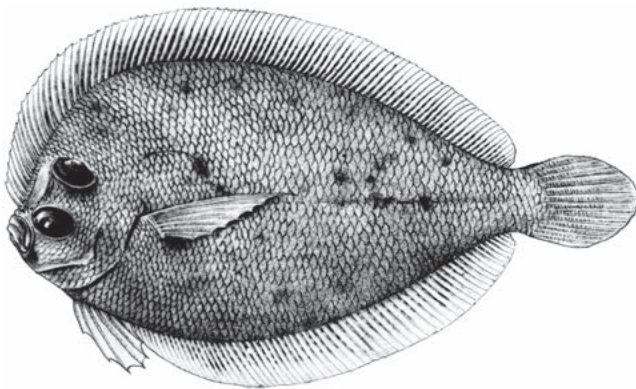
Engyprosopon valderostratus: SFSA No. 313*.

?*Crossorhombus azureus* (non Alcock 1889): Kotthaus 1977*.

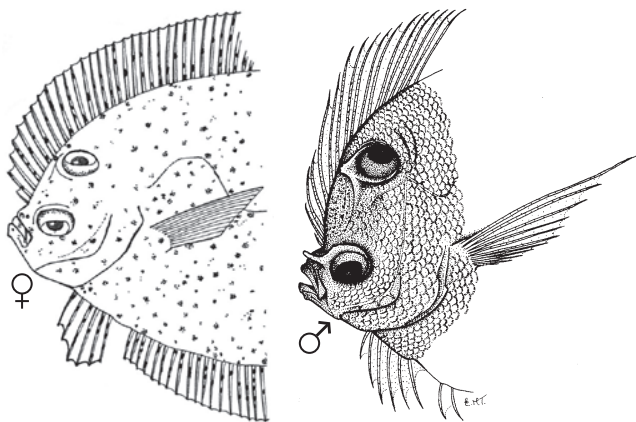
Crossorhombus valderostratus: SSF No. 259.7*; Hensley & Randall 1993*; Manilo & Bogorodsky 2003.

Diagnosis as for genus. Dorsal fin 86–93 rays; anal fin 68–74 rays; pectoral fin 11 or 12 rays on eyed side, 9–11 rays on blind side; GR 0/5–8; LL scales 50–58. Body depth 1.7–2.1 in SL; HL 3.6–4.3 in SL. Tip of isthmus below rear half of lower eye. Sexual dimorphism in fish >5–7 cm SL: interorbital width 2–3.1 in HL in males, 3.6–7.6 in HL in females; eyed-side pectoral fin 0.6–0.9 in HL in males, 1.1–1.4 in HL in females. Males also with flap-like appendages with crenulate or scalloped margins on eyes, sharp rostral spine, and several spines on orbital rims.

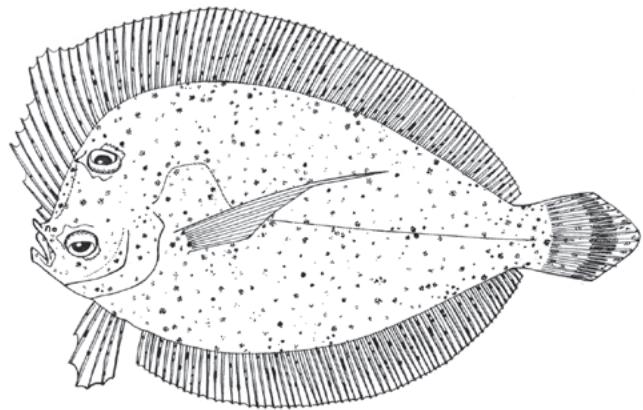
Eyed side brown, with dark spots roughly arranged in longitudinal rows; 2 or 3 spots on straight section of lateral line most prominent; dark bands on caudal fin. Sexual dichromatism: males (>5–6 cm SL) with dark spots immediately before interorbital region and on flap-like eye appendages, and dark colour pattern on blind side. Attains 14 cm SL.



Crossorhombus valderostratus, ~7 cm TL, female syntype of *Platophrys dimorphus* (South Africa). Source: Gilchrist 1904



Crossorhombus valderostratus, 9 cm SL, head of female (left); 11 cm SL, head of male (right). Male drawn from Norman 1934; female sourced from SSF



Crossorhombus valderostratus, ~11 cm TL, male (South Africa). Composite

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique, South Africa (KwaZulu-Natal), Madagascar, Seychelles, India and Sri Lanka; elsewhere to southern Japan; report from Hong Kong needs confirmation.

REMARKS Known from sand, shell rubble and dead coral bottom, at 2–72 m. Mature males collected from South Africa, Mozambique and Madagascar tend to have the rear half to three-quarters of blind side completely dark, whereas specimens from Somalia, Arabian Sea (near Kochi, India: Kotthaus 1977) and Kenya have darkened area in pronounced V-shape. It is probable that 2 species are represented, and that *Crossorhombus dimorphus* (Gilchrist 1904) described from specimens from South Africa is distinct from *C. valderostratus*.

GENUS *Engyprosopon* Günther 1862

Body ovate to deeply ovate, and very compressed. Anterior dorsal profile steeper in males than in juveniles and females. Tip of isthmus below middle of lower eye. Interorbital space flat or concave, its width becoming broader with growth, and broader in males than in females and juveniles; 3 suborbital bones on blind side. Males usually with 1 or 2 spines on snout tip, and sometimes on orbital rims and mandibular symphysis; females with or without feeble spines. Mouth moderately large; upper jaw length on eyed side 2.2–3.6 in HL. Teeth uniserial or biserial on upper jaw, uniserial on lower jaw. GR 0–9/5–19. Scales deciduous, ctenoid with short, feeble ctenii on eyed side, and cycloid on blind side. Four hypural plates all with deep clefts along distal margins. Closely resembles *Asterorhombus* in having parhypural and hypural plates with clefts in their distal margins, but it clearly differs in having distinct sexual dimorphism in interorbital width, rostral and orbital spines, and anterior head profile. About 29 species, 12 in WIO.

KEY TO SPECIES

- 1a Pair of large distinct dark blotches on distal half of caudal fin 2
- 1b No distinct dark blotches on caudal fin 4

- 2a GR 5–8 on lower limb *E. grandisquama*
- 2b GR 16–19 on lower limb 3

- 3a Body depth 2.3–2.7 in SL; eyed-side pectoral fin 0.8–1 in HL *E. hensleyi*
- 3b Body depth 1.9–2.1 in SL; eyed-side pectoral fin 1–1.1 in HL *E. xystrius*

- 4a Gill rakers on lower limb not serrate, or with only dorsalmost 2 rakers slightly serrate 5
- 4b All gill rakers on lower limb serrate 9

- 5a Teeth in upper jaw uniserial 6
- 5b Teeth in upper jaw biserial 8

- 6a Interorbital region with 2 distinct dark crossbands; adult males with flap on each eye *E. macrolepis*
- 6b No distinct crossbands in interorbital region; males without flap on eyes 7

- 7a Pectoral fin on eyed side 1.2–1.3 in HL (both sexes); no orbital spines (both sexes) *E. hureaui*
- 7b Pectoral fin on eyed side longer than HL in males; males with 1 or 2 orbital spines (unknown for females) *E. filimanus*

- 8a LL scales 49–55; dorsal fin 83–89 rays; anal fin 63–69 rays *E. mogkii*
- 8b LL scales 41–48; dorsal fin 77–84 rays; anal fin 55–63 rays *E. maldivense*

- 9a Upper jaw length 2–2.4 in HL *E. mozambiquense*
- 9b Upper jaw length 2.6–2.8 in HL 10

- 10a Body depth 2.2 in SL; orbital spines present in males (females unknown) *E. sechellense*
- 10b Body depth 1.8–2.1 in SL; no orbital spines in either sex 11

- 11a Eye diameter 1–1.5 in interorbital width in males, 0.5–0.6 in females; front margin of upper eye over middle of lower eye *E. latifrons*
- 11b Eye diameter 0.3–0.9 in interorbital width in males, 0.1–0.3 in females; front margin of upper eye over anterior quarter to third of lower eye *E. natalense*

Engyprosopon filimanus (Regan 1908)

Scaeops filimanus Regan 1908: 234, Pl. 25, Fig. 2 (Maldives);

Quéro & Golani 1990.

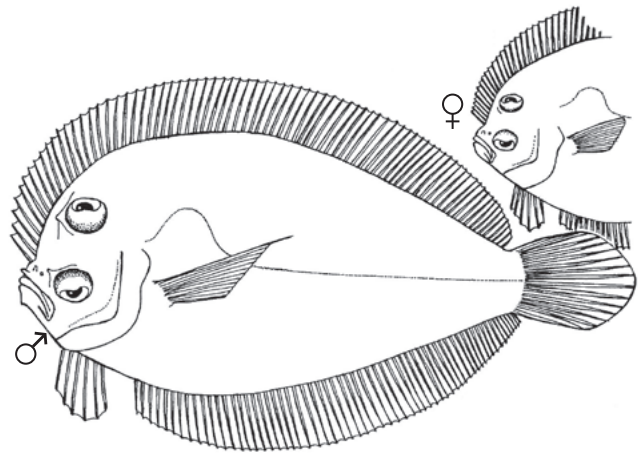
Engyprosopon filimanus: Norman 1927, 1934*.

Male specimens: dorsal fin ~78–80 rays; anal fin ~62 rays; eyed-side pectoral fin 12 rays; GR 7 on lower limb, not serrate; LL scales 40. Body depth ~1.8–2 in SL; HL ~3.3–3.7 in SL. Males with rostral spine, 1 or 2 spines in front of upper eye, 1 or 2 spines below upper eye, 1 or 2 spines above lower eye, and eyed-side pectoral fin longer than HL.

Eyed side pale brown, with more or less distinct darker spots and markings. Attains at least 7 cm SL.

DISTRIBUTION WIO: Maldives; reports from Persian/Arabian Gulf and Gulf of Oman (Muscat) need confirmation.

REMARKS Known from 49–80 m. Identification of females uncertain (Hensley & Randall 1990).



Engyprosopon filimanus, 7 cm SL, male, and head of female.

Drawn from Norman 1934

Engyprosopon grandisquama

(Temminck & Schlegel 1846)

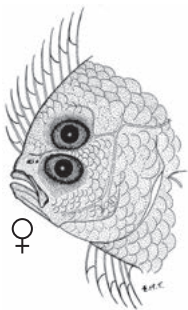
Warthog flounder

PLATES 88 & 89

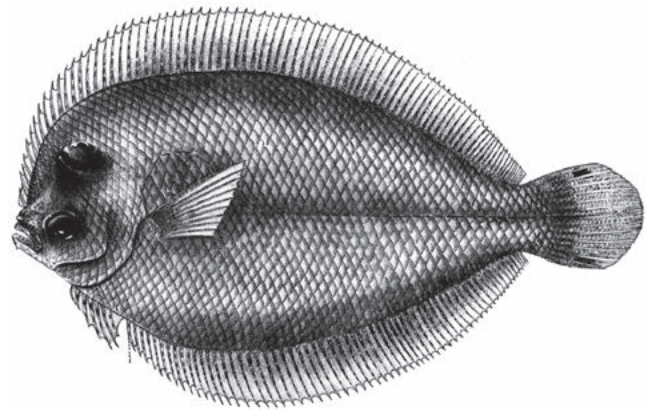
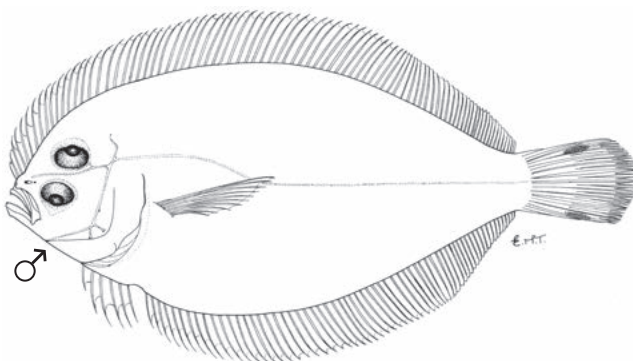
Rhombus grandisquama Temminck & Schlegel 1846: 183, Pl. 92, Figs. 3–4 (Nagasaki, Japan).*Engyprosopon grandisquama*: Norman 1926, 1927*, 1934*; Blegvad & Løppenthin 1944*; Munro 1955*; De Silva 1956; Amaoka 1963*, 1969*; Saramma 1963; SFSA No. 314; Kuronuma & Abe 1986; SSF No. 259.8*; Randall 1995*; Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003; Bogorodsky *et al.* 2014.*Engyprosopon grandisquamum*: Amaoka *et al.* 1993*; Randall & Anderson 1993; Randall 2005*.

Dorsal fin 79–91 rays; anal fin 57–69 rays; pectoral fin 10–13 rays on eyed side, 8–10 rays on blind side; GR 0–2/5–8, serrate; LL scales 36–48. Body depth 1.6–2.1 in SL; HL 3.4–4.2 in SL; upper jaw 2.8–4 in HL; eyed-side pectoral fin 0.9–1.4 in HL. Upper-jaw teeth biserial. Males with wider interorbital area compared with that of females (specimens from southern Africa possibly have narrower interorbital widths than that reported for other populations), and also with rostral and orbital spines (probably developing at ~5 cm SL).

Eyed side pale brown, with scattered dark spots and rings; 2 or 3 obscure dark spots on straight section of lateral line; dorsal and anal fins with series of dark spots; caudal fin with pair of distinct dark blotches between 2nd–5th rays on dorsal and ventral margins. Blind side of males pale brown, except pale yellowish white head; blind side of females uniformly pale yellowish. Attains 15 cm TL.



Engyprosopon grandisquama, 5 cm SL, female head; 4 cm SL, male (both South Africa). Source: SSF



Engyprosopon grandisquama. Source: Jordan & Starks 1904

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, East Africa to South Africa (St Lucia), Madagascar, Maldives and Sri Lanka; elsewhere to Andaman Sea, Indonesia, Philippines, southern Japan, Australia and New Caledonia.

REMARKS Found on mud, clay, sand and coarse sand with shell fragments, at ~7–200 m. Females of 63–89 mm SL are sexually mature with ovaries containing well-developed eggs 0.29–0.44 mm in diameter. Sold in fish markets in moderate numbers in Thailand.

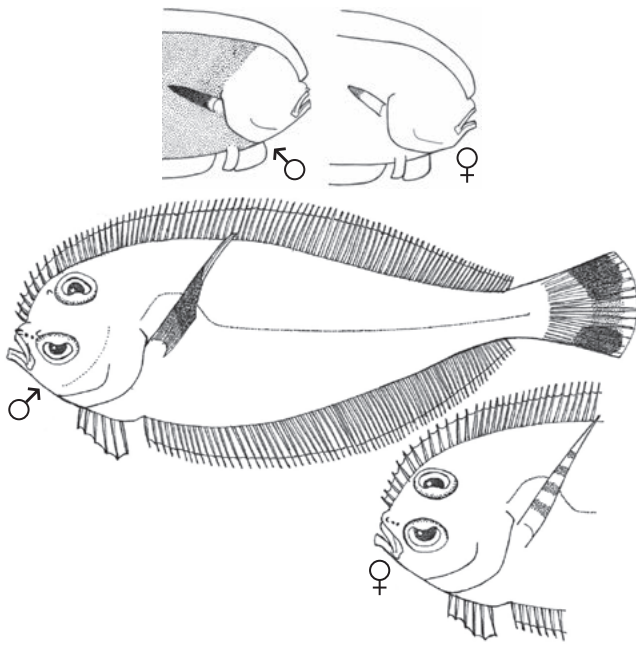
Engyprosopon hensleyi Amaoka & Imamura 1990

Hensley's flounder

Engyprosopon hensleyi Amaoka & Imamura 1990: 1011, Figs. 1–2, 4 (Saya de Malha Bank); Amaoka *et al.* 1993.

Dorsal fin 90–93 rays; anal fin 70–73 rays; pectoral fin 12 rays on eyed side, 10 or 11 rays on blind side; GR 6–9/16–19, not serrate; LL scales 51. Body depth 2.3–2.7 in SL; HL 4–4.2 in SL; upper jaw 2.7–2.9 in HL; eyed-side pectoral fin 0.8–1 in HL. Upper-jaw teeth biserial. Interorbital region possibly wider in males than in females. Males with rostral spine on both sides, but spine on eyed side longer than spine on blind side, and with blunt orbital spine on anterior margins of both eyes.

Eyed side pale brown; males with eyed-side pectoral fin dark in middle section, but otherwise pale; eyed-side pectoral fin of females with 4 dark brown crossbands; distal half of caudal fin with pair of large dark blotches; dorsal, anal and pelvic fins pale brown. Blind side dark brown in males, pale brown in females; blind-side pectoral fin of males entirely dark, fin of females pale brown distally. Attains ~14 cm SL.



Engyprosopon hensleyi, blind side of heads to show sexual dimorphism (top); 11 cm SL, male, and head of female (bottom) (Saya de Malha Bank). All drawn from Amaoka & Imamura 1990

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Known from 187–254 m.

Engyprosopon hureaui Quéro & Golani 1990

Hureau's flounder PLATES 88 & 90

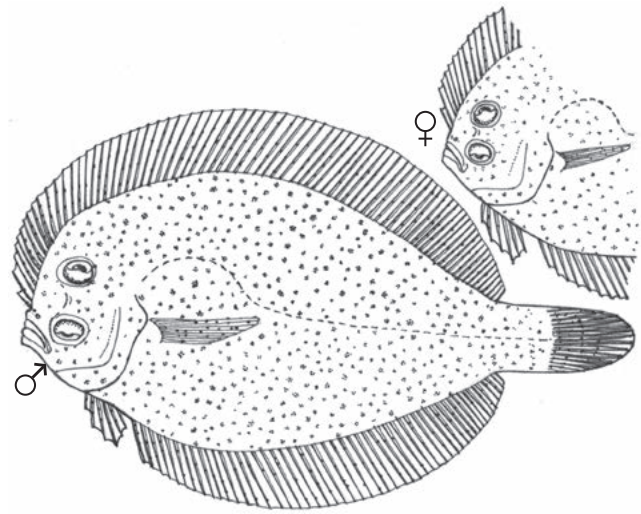
Scaeops maldivensis Regan 1908: 234 [in part: not Pl. 25, Fig. 1] (Maldives).

Engyprosopon maldivensis: Norman 1934 [in part: not Fig. 165].

Engyprosopon hureaui Quéro & Golani 1990: 38, Fig. 1 (beach at Eilat, Israel, Gulf of Aqaba, Red Sea); Amaoka *et al.* 1993*; Goren & Dor 1994; Anderson *et al.* 1998; Hensley & Amaoka 2001*.

Dorsal fin 73–78 rays; anal fin 52–58 rays; pectoral fin 10–12 rays on eyed side, 7–10 rays on blind side; GR 0/6–8; LL scales 36–41. Body depth 1.8–2 in SL; HL 3.3–3.8 in SL; upper jaw length 2.6–3.1 in HL; eyed-side pectoral fin 1.2–1.3 in HL. Males with rostral spine and wider interorbital space than in females.

Eyed side pale brown, with some spots on straight section of lateral line; dorsal and anal fins each with series of dark spots basally; caudal fin with pair of obscure blotches near base. Blind side yellowish white. Attains at least 7 cm TL.



Engyprosopon hureaui, 5 cm SL, male (left); 4.9 cm SL, female head (right) (Gulf of Aqaba). Drawn from Quéro & Golani 1990

DISTRIBUTION Indo-Pacific. WIO: Gulf of Aqaba (Red Sea) and Maldives; elsewhere, southern Japan, New Caledonia.

REMARKS Known to ~81 m deep. The type series of *Engyprosopon maldivensis* (Regan 1908) contained eight specimens, not three as stated (M Holloway, pers. comm.); four paralectotypes of that series are *E. hureaui* Quéro & Golani 1990 (Amaoka *et al.* 1993).

Engyprosopon latifrons (Regan 1908)

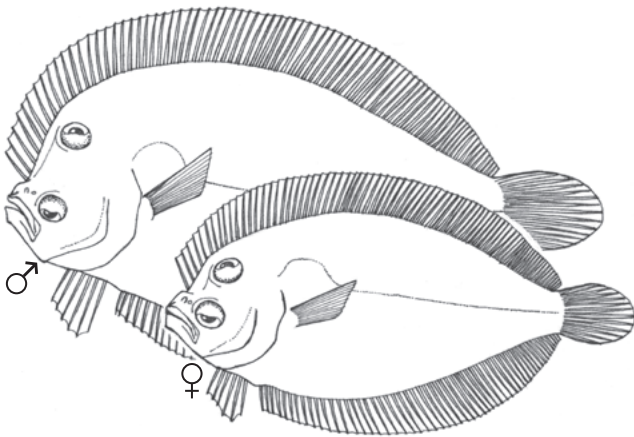
Broad flounder PLATE 90

Scaeops latifrons Regan 1908: 233, Pl. 25, Fig. 3 (Seychelles).

Engyprosopon latifrons: Norman 1927, 1934*, 1939; Gruvel & Chabanaud 1937; Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003.

Dorsal fin 77–90 rays; anal fin 58–67 rays; eyed-side pectoral fin 12 rays; GR 6–8 on lower limb, serrate; LL scales 38–40. Body depth 1.8–2 in SL; HL 3.5–4 in SL; upper jaw 2.6–2.7 in HL; eyed-side pectoral fin ~1.5 in HL. Upper-jaw teeth uniserial. Males with rostral spine and wider interorbital region than that of females.

Eyed side pale brown, with traces of dark spots and markings on body and median fins. Attains ~10 cm SL.



Engyprosopon latifrons, 8 cm SL, male (top); 6 cm SL, female (bottom).
Drawn from Norman 1934

DISTRIBUTION WIO: Red Sea, Seychelles, Saya de Malha Bank, St Brandon Shoals and Maldives; possibly to South China Sea and Philippines in western Pacific.

REMARKS Collected at 37–86 m.

Engyprosopon macrolepis (Regan 1908)

Eye-flap flounder

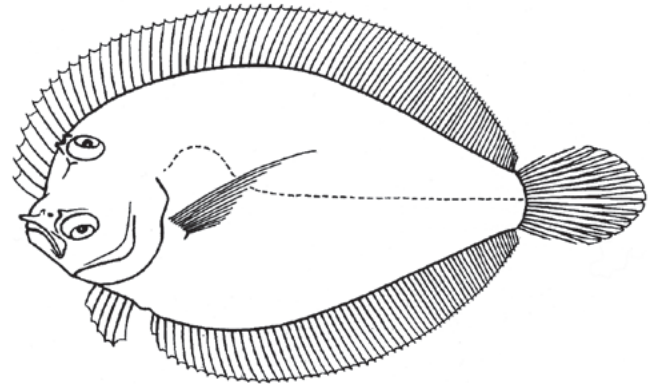
PLATE 88

Scaeops macrolepis Regan 1908: 233, Pl. 27, Fig. 4 (St Brandon Shoals).
Engyprosopon macrolepis: Norman 1927, 1934*, 1939; Hensley 1986;
Hensley & Randall 1990*; Amaoka *et al.* 1993*; Anderson *et al.* 1998;
Hensley & Amaoka 2001*; Manilo & Bogorodsky 2003; Randall 2005*.
Scaeops filimanus Regan 1908: 234 [in part: not Pl. 25, Fig. 2] (Maldives);
Quéro & Golani 1990.
Engyprosopon filimanus: Norman 1934 [not Fig.].
Scaeops maldivensis Regan 1908: 234 [in part: not Pl. 25, Fig. 1] (Maldives).
Engyprosopon maldivensis: Norman 1934 [not Fig.].

Dorsal fin 74–85 rays; anal fin 56–64 rays; pectoral fin 10–13 rays on eyed side, 8–11 rays on blind side; GR 0/6–8, not serrate; LL scales 40–51. Body depth 1.8–2.2 in SL; HL 3.2–3.7 in SL; upper jaw length 2.4–3 in HL; eyed-side pectoral fin 0.6–1.2 in HL in males, 0.7–1.6 in HL in females. Males with 1 rostral spine, 1 or 2 spines before upper eye, 1 spine anterodorsal to lower eye, and both eyes with 1 or 2 spines or slightly serrated medial borders; flap on each eye with smooth, indented or scalloped margins.

Eyed side tan to pale brown, scattered with dark and pale spots, and small patches of yellow scattered on body (in life); 3–5 indistinct dark spots along straight section of lateral line; triangular shapes formed from large and small dark spots pointing anteriorly and centred over lateral line near centre

of straight section; 2 distinct dark bands crossing interorbital region; pair of dark spots on caudal fin, dorsal and ventral to midlateral line immediately before midlength of fin; pectoral fin with several dark crossbands, 1 near base most distinctive, and dark spot in fin axil; eye flaps in males with red spots in life. Blind side of males darkly pigmented (black in life), except for large round dark spots (orange in life) in head region; blind side of females tan, without distinct markings. Attains 7.5 cm SL.



Engyprosopon macrolepis, 5 cm TL, holotype (St Brandon Shoals).
Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Aden to South Africa (Aliwal Shoal), Comoros, St Brandon Shoals and Maldives; elsewhere, Philippines, Coral Sea, New Guinea and New Caledonia.

REMARKS Known from ~3–91 m. One paralectotype of *E. filimanus* (Regan 1908) and one of *E. maldivense* (Regan 1908) are actually specimens of *E. macrolepis* (Regan 1908) (Amaoka *et al.* 1993).

Engyprosopon maldivense (Regan 1908)

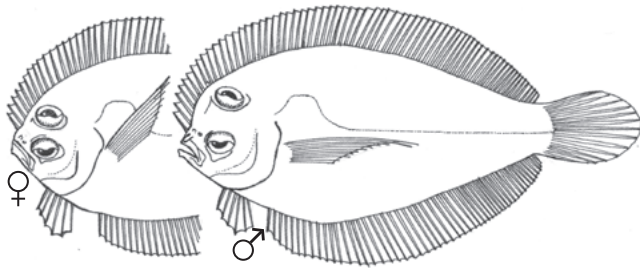
Olive wide-eye flounder

PLATE 88

Scaeops maldivensis Regan 1908: 234, Pl. 25, Fig. 1 [in part] (Maldives).
Engyprosopon maldivensis: Norman 1927, 1934*; Chabanaud 1942;
Amaoka *et al.* 1993*; Goren & Dor 1994.
Engyprosopon maldivense: Amaoka & Ho 2018*.

Dorsal fin 77–84 rays; anal fin 55–63 rays; pectoral fin 10–12 rays on eyed side, 8–10 rays on blind side; GR 0/7–9, serrate; LL scales 41–48. Body depth 1.8–2 in SL; HL 3.5–3.9 in SL; upper jaw 2.6–3 in HL; eyed-side pectoral fin 0.5–0.9 in HL. Males with rostral spine and wider interorbital region compared with that of females.

Eyed side dark brown, with obscure dark spot at junction of straight and curved sections of lateral line, 1 spot on middle of straight section of lateral line, and 1 spot on lateral line near caudal-fin base; pectoral fin with dark crossbars; dorsal and anal fins with series of dark spots; caudal fin with irregularly scattered dark spots, sometimes with pair of obscure dark blotches on basal third of fin. Attains 15 cm SL.



Engyprosopon maldivense, 10 cm SL, male, and head of female.
Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Red Sea and Maldives; elsewhere to Borneo (Indonesia), Taiwan, southern Japan, Philippines, Coral Sea, Australia and Chesterfield Is.

REMARKS Found at 30–210 m (most commonly 30–75 m) on sand and mud bottom. Females of 82–102 mm SL are sexually mature with ovaries containing well-developed eggs 0.26–0.31 mm in diameter.

Engyprosopon mogkii (Bleeker 1854)

Mogki flounder

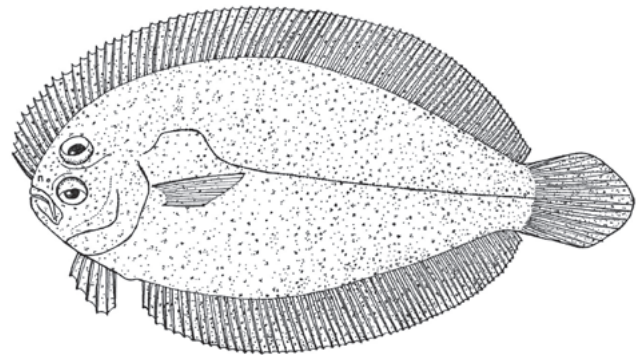
Rhombus mogkii Bleeker 1854: 256 (Manado, Sulawesi, Indonesia).

Engyprosopon mogki: Weber 1913.

Engyprosopon mogkii: Norman 1927*, 1934*; Hensley & Amaoka 2001*.

Dorsal fin 83–89 rays; anal fin 63–69 rays; pectoral fin 11 or 12 rays on eyed side, 8–10 rays on blind side; GR 0/6 or 7, not serrate; LL scales 49–55. Body depth 1.8–2 in SL; HL 3.8–4 in SL; upper jaw 2.7–3 in HL; eyed-side pectoral fin 1.3–1.5 in HL. Males possibly with wider interorbital region than that of females.

Eyed side brownish, with numerous small dark spots on head, body and fins. Attains 11 cm SL.



Engyprosopon mogkii, 9 cm SL. Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: southernmost India; elsewhere to Indonesia and Malay Peninsula.

REMARKS Known from 186–192 m.

Engyprosopon mozambiquense Hensley 2003

Mozambique flounder

PLATE 90

Engyprosopon cocosensis (non Bleeker 1855): Norman 1927*, 1934*; Hensley & Amaoka 2001*.

Arnoglossus annulatus (non Weber 1913): Norman 1927.

Bothus (*Arnoglossus*) *cocosensis* (non Bleeker 1855):

Weber & De Beaufort 1929.

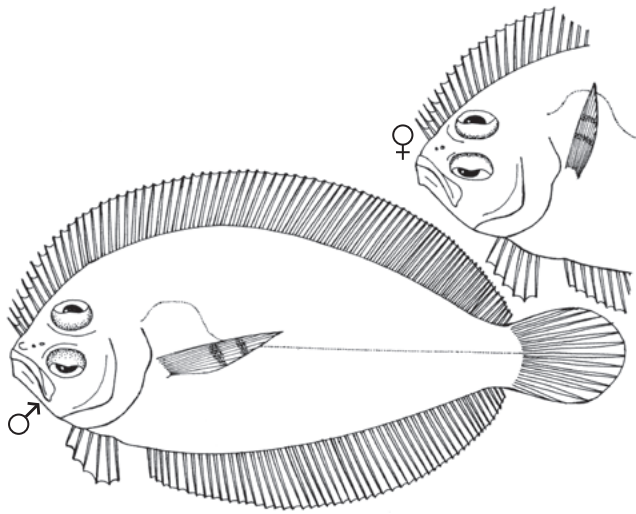
E. sp.: Hensley 1986.

Engyprosopon mozambiquense Hensley 2003: 834, Fig. 1 (Porto Amélia [Pemba], Mozambique).

Engyprosopon mozambiquense: Amaoka & Ho 2018*.

Dorsal fin 80–85 rays; anal fin 59–64 rays; pectoral fin 11 or 12 rays on eyed side, 8 or 9 rays on blind side; GR 0/6 or 7, serrate; LL scales 46–50. Body depth 1.9–2.1 in SL; HL 3.5–3.7 in SL. Eye diameter into interorbital width 0.3–0.4 in males, 0.1–0.2 in females. Pectoral fin on eyed side shorter than HL, and fin somewhat longer in males than in females. Upper-jaw teeth uniserial. One long dark cirrus on lower eye frequently present in both sexes. Males with short blunt rostral spine.

Eyed side brownish, with some paler areas and dark spots and blotches; median fins with small dark spots; pectoral fin with dusky crossbars; no large dark spots on caudal fin. Attains at least 8 cm TL.



Engyprosopon mozambiquense, 7 cm SL, male, and head of female (Nicobar Is.). Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Mozambique and northern Madagascar; elsewhere, Myanmar, Nicobar Is., Philippines (Mindanao) and Taiwan.

REMARKS Collected by bottom trawl at 8–90 m. The holotype of the nominal species *Engyprosopon cocosensis* (Bleeker 1855) is a species of *Asterorhombus*. Specimens of *Engyprosopon* formerly identified as *E. cocosensis* (Bleeker 1855) were found to be an undescribed species, subsequently described by Hensley (2003) as *E. mozambiquensis*.

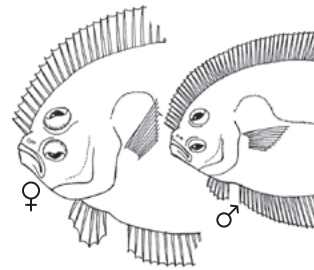
Engyprosopon natalense Regan 1920

Natal flounder

Platophrys grandisquama (non Temminck & Schlegel 1846): Gilchrist 1908.
Engyprosopon natalensis Regan 1920: 211 (Amatikulu River mouth, KwaZulu-Natal, South Africa); Norman 1934*; SFSA No. 315; SSF No. 259.9*.

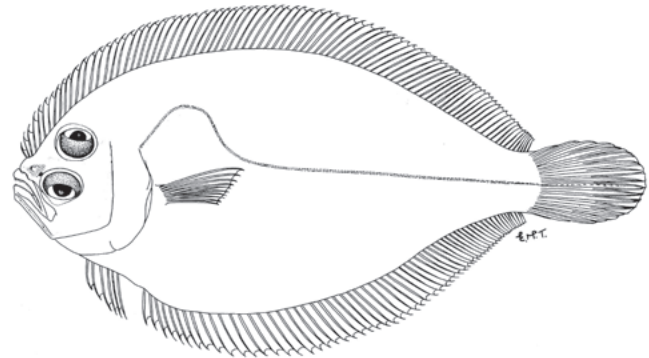
Dorsal fin 81–87 rays; anal fin 62–65 rays; pectoral fin 11–13 rays on eyed side, 8–10 rays on blind side; GR 0/6 or 7; LL scales ~40. Body depth 1.9–2.1 in SL; HL 3.7–4 in SL; upper jaw 2.6–2.8 in HL; eyed-side pectoral fin 1.4–1.5 in HL in males, 1.5–1.7 in HL in females. Upper-jaw teeth uniserial. Males with rostral spine, wider interorbital region and longer eyed-side pelvic-fin rays compared with those of females.

Eyed side brownish, with small dark spots on median fins, and eyed-side pectoral fin with dark crossbar. Attains 8 cm SL.



Engyprosopon natalense, female head (left) and male head (right) to show sexual dimorphism.

Drawn from Norman 1934



Engyprosopon natalense, 5.5 cm SL, female (South Africa). Source: SSF

DISTRIBUTION WIO: South Africa (KwaZulu-Natal) and possibly Mozambique (Maputo Bay).

REMARKS Known from 8–110 m.

Engyprosopon sechellense (Regan 1908)

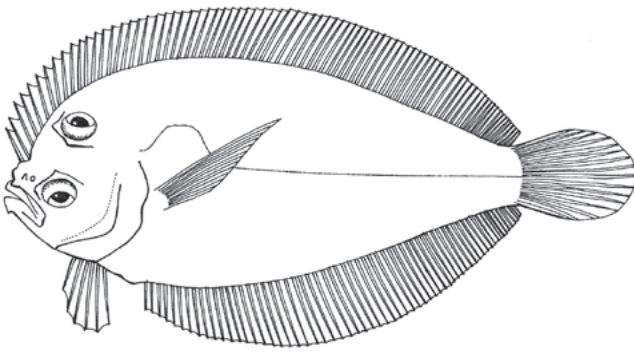
Seychelles flounder

Scaeops sechellensis Regan 1908: 234, Pl. 27, Fig. 5 (Seychelles).

Engyprosopon sechellensis: Norman 1927, 1934*.

Dorsal fin 84 rays; anal fin 62 rays; eyed-side pectoral fin 12 rays; GR 6 on lower limb, serrate; LL scales 42. Body depth 2.2 in SL; HL 3.6 in SL; upper jaw ~2.6 in HL. Upper-jaw teeth uniserial. Males with rostral spine, each eye with 1 spine anteriorly and 1 spine medially, and eyed-side pectoral fin longer than HL.

Eyed side pale brownish, with dark spots or markings on fins and body. Attains at least 12 cm TL.



Engyprosopon sechellense, 12 cm SL. Drawn from Norman 1934

DISTRIBUTION Known only from the holotype (male) from the Seychelles.

REMARKS Taken at ~68 m.

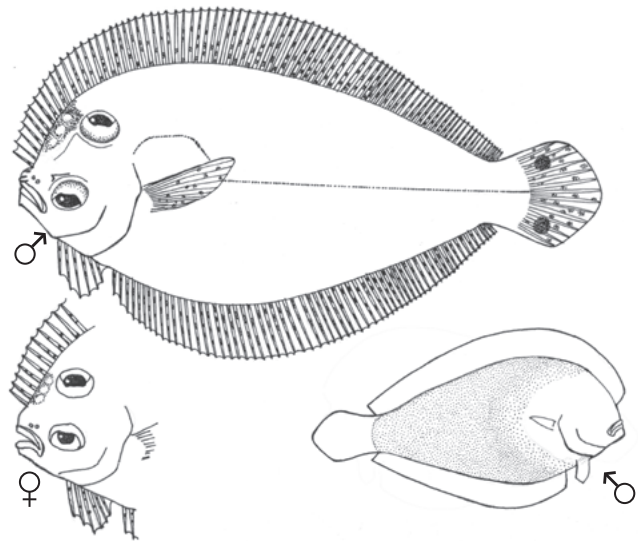
Engyprosopon xystrias Hubbs 1915

Smooth flounder

Engyprosopon xystrias Hubbs 1915: 457, Pl. 25, Fig. 3 (Vincennes Strait, Japan); Norman 1934*; Amaoka 1969*; Amaoka *et al.* 1993*; Hensley & Amaoka 2001*.

Dorsal fin 89–98 rays; anal fin 68–77 rays; pectoral fin 12 or 13 rays on eyed side, 10–12 rays on blind side; GR 0–6/13–18, not serrate; LL scales 35–50. Body depth 1.9–2.1 in SL; HL 3.6–4 in SL; upper jaw 2.5–3 in HL; eyed-side pectoral fin subequal to HL. Upper-jaw teeth biserial. Males with wider interorbital region than that of females, distinct rostral spine (spine poorly developed or absent in females), and orbital spine on upper margin of lower eye.

Eyed side pale brown, with several pale blotches on snout anterior to interorbital region and upper eye, and 1 dark spot on middle of straight section of lateral line; dorsal and anal fins with series of dark spots; eyed-side pectoral fin with dark bands; eyed-side pelvic fin with dark spot; caudal fin with pair of large dark blotches near middle of fin. Blind side in males pale brown, except head pale yellowish white; blind side in females entirely yellowish white. Attains ~13 cm SL.



Engyprosopon xystrias, 9 cm SL, male (top), and head of female (bottom) and blind side of male. Drawn from Amaoka *et al.* 1993

DISTRIBUTION Indo-Pacific. WIO: Saya de Malha Bank; elsewhere, South China Sea, southern Japan and Coral Sea.

REMARKS Collected at 105–240 m, on bottom with broken shell, pebbles and coral.

GENUS *Grammatobothus* Norman 1926

Body deeply ovate and strongly compressed. Anterior dorsal-fin rays elongate and pinniform in both sexes, but longer in males than in females; upper pectoral-fin rays on eyed side filamentous in males, not in females; left (eyed-side) pelvic-fin origin below middle of lower eye. Eyes widely separated by narrow concave space; interorbital width similar in both sexes. No rostral or orbital spines (both sexes). Mouth moderate; maxilla extending to below or slightly beyond front margin of lower eye. Teeth uniserial in both jaws, scarcely enlarged anteriorly. Gill rakers short, not serrate. Lateral line developed on both sides of body. Scales ctenoid with short ctenii on eyed side, cycloid on blind side. Three species, 1 in WIO.

Grammatobothus polyophthalmus

(Bleeker 1865)

Three-spot flounder

PLATES 88 & 90

Platophrys (Platophrys) polyophthalmus Bleeker 1865: 46 [4]

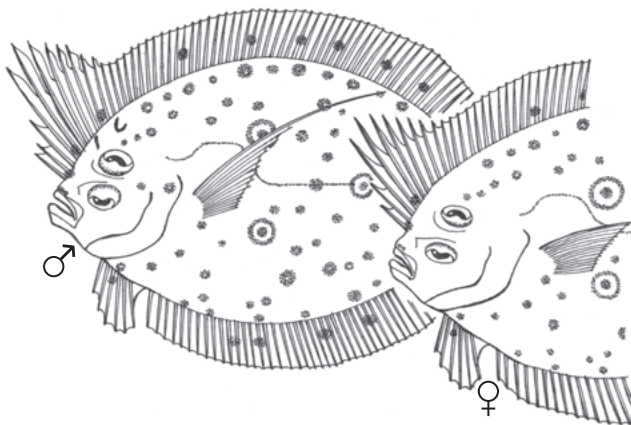
(Sumatra, Indonesia).

Rhomboidichthys angustifrons Günther 1880: 46, Pl. 21, Fig. B (Arafura Sea).*Psettylis ocellata*: Jenkins 1910.*Platophrys angustifrons*: Fowler 1928.*Bothus (Platophrys) polyophthalmus*: Weber & De Beaufort 1929.*Grammatobothus polyophthalmus*: Norman 1926, 1934*; Munro 1955*;De Silva 1956; Kuronuma & Abe 1986; Amaoka *et al.* 1992*;

Randall 1995*, 2001*.

Diagnosis as for genus. Dorsal fin 77–86 rays; anal fin 61–71 rays; pectoral fin 14–17 rays on eyed side, 12–14 rays on blind side; GR 0–5/7–8; LL scales 75–77. Body depth 1.5–1.8 in SL; HL 3.5–4 in SL. Dorsal-fin rays 2–10 elongate in both sexes, but longer in males than in females; eyed-side pectoral fin of males elongate, 0.5–1.2 in HL, that of females ~1.4 in HL.

Eyed side pale brown, with 3 large dark ocelli (above and below pectoral fin, and on middle of straight section of lateral line); head and body with many small distinct spots and obscure markings along dorsal and ventral margins; eyed-side pectoral fin with broad pale crossbars; dorsal, anal fin and eyed-side pelvic fin with indistinct dusky spots and markings; pair of marks on posterior caudal-fin base; males with 2 distinct markings above upper eye. Attains 21 cm SL.



Grammatobothus polyophthalmus, male (left) and female (right) to show sexual dimorphism. Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, southern India and Sri Lanka; elsewhere to Indonesia, South China Sea, Philippines, southern Japan, northern Australia and New Caledonia.

REMARKS Lives on mud, sand and rubble bottom, at 6–90 m.

GENUS *Kamoharaia* Kuronuma 1940

One or 2 species, 1 in WIO.

Kamoharaia megastoma (Kamohara 1936)

Widemouth flounder

PLATE 91

Chascanopsetta megastoma Kamohara 1936: 308, Fig. 1

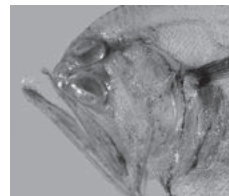
(Mimase, Kochi Prefecture, Japan).

Kamoharaia megastoma: Kuronuma 1940; Amaoka 1969*;

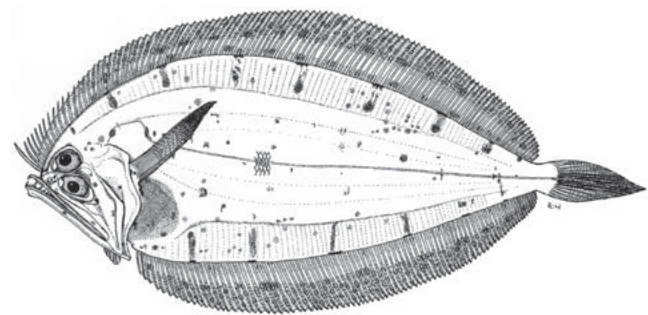
Hensley & Amaoka 2001*.

Dorsal fin 106–113 rays, with 1st ray longer than those immediately following; anal fin 84–88 rays; pectoral fin 11–14 rays on eyed side, 10–12 rays on blind side; GR 0–7 + 7–10; LL scales 124–139. Body depth 2.4–3.2 in SL; HL ~4.6 in SL. Tip of vomer projects deeply into mouth cavity.

Eyed side pale brown, with dark spots and blotches often arranged in ~4 or 5 longitudinal rows on body; eyed-side pectoral fin blackish; dorsal- and anal-fin margins darkened; middle rays of caudal fin darkened. Attains 21 cm SL.



Kamoharaia megastoma. (Japan)
Source: Amaoka 2016



Kamoharaia megastoma, 18 cm SL (Madagascar).

DISTRIBUTION Indo-Pacific. WIO: southern Madagascar; elsewhere, Taiwan, Japan and Western Australia.

REMARKS Identification is unconfirmed: all specimens from southern Madagascar were collected at 150–576 m and differ slightly from specimens from southern Japan in some meristic features (e.g., gill rakers on upper limb and eyed-side pectoral-fin rays); a detailed comparison of specimens from these two areas is needed.

GENUS *Laeops* Günther 1880

Body elliptical; peduncle very narrow; first 2 dorsal-fin rays separated by interspace from remaining rays, or with first 3 dorsal-fin rays elongate and not separate from remainder of fin rays; left (eyed-side) pelvic fin below middle to rear of lower eye. Tip of isthmus below or slightly behind middle of lower eye. Eyes separated by narrow ridge; interorbital region similar in both sexes. No rostral, orbital or mandibular spines. Mouth very small, asymmetrical on both sides, and curved towards blind side; maxilla extending to beneath or slightly beyond front margin of lower eye. Teeth confined to blind side, minute, and in narrow bands in both jaws. Gill rakers short and slender, not serrated. Scales tiny, deciduous, and cycloid on both sides of body. Twelve species, 6 in WIO.

KEY TO SPECIES

- 1a Pectoral fin on eyed side as long as or longer than HL 2
- 1b Pectoral fin on eyed side shorter than HL 3

- 2a Dorsal fin 110–116 rays; anal fin 91–96 rays;
HL 5–6.3 in SL *L. pectoralis*
- 2b Dorsal fin 95–98 rays; anal fin 80–83 rays;
HL 4–4.4 in SL *L. nigrescens*

- 3a First dorsal-fin ray inserted over anterior nostril of blind side;
dorsal fin 100–105 rays, and first 3 or 4 rays elongate;
LL scales 133–144 *L. nigromaculatus*
- 3b First dorsal-fin ray inserted over posterior nostril of blind side;
no elongate dorsal-fin rays (except probably in very small
specimens); dorsal fin 85–102 rays; LL scales ~84–100 4

- 4a HL 3–3.6 in SL; dorsal fin 85–90 rays; anal fin
67–70 rays *L. macrophthalmus*
- 4b HL 4.1–5.6 in SL; dorsal fin 87–102 rays; anal fin
70–84 rays 5

- 5a Dorsal fin 95–102 rays; anal fin 76–84 rays *L. guentheri*
- 5b Dorsal fin 87–97 rays; anal fin 70–75 rays *L. sinusarabici*

Laeops guentheri Alcock 1890

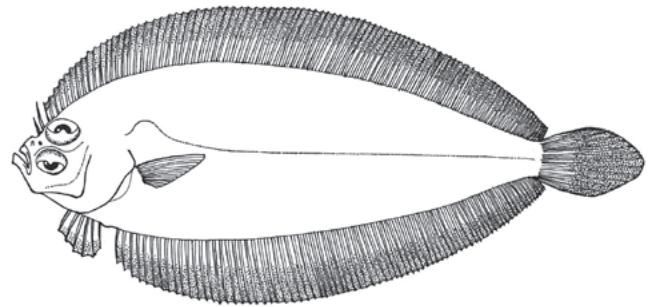
Günther's flounder

PLATE 91

Laeops guentheri Alcock 1890: 438 (Gulf of Martaban, Andaman Sea; off Ganjam District and Visakhapatnam, India); Alcock 1898: Pl. 23, Fig. 4; Norman 1934*; Blegvad & Løppenthin 1944*; Saramma 1963; Kotthaus 1977*; Randall 1995*; Hensley & Amaoka 2001; Manilo & Bogorodsky 2003.

Dorsal fin 95–102 rays; anal fin 76–84 rays; pectoral fin 13 or 14 rays on eyed side, 12 rays on blind side; GR 0–3/5–8; LL scales ~91–95. Body depth 2.5–3 in SL; HL 4.1–5 in SL.

Eyed side pale brownish; dorsal and anal fins darker distally; caudal fin dusky. Attains 14 cm SL.



Laeops guentheri, 8 cm SL (India). Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Persian/Arabian Gulf, Oman to India and Sri Lanka; elsewhere to east coast of India, Bay of Bengal, Andaman Sea, Gulf of Thailand and Indonesia.

REMARKS Found at 15–329 m, primarily on sand-mud bottom, but also on sand and broken shell, hard bottom, or light clay and sand. Taken as bycatch.

Laeops macrophthalmus (Alcock 1889)

Scianectes macrophthalmus Alcock 1889: 292, Pl. 16, Fig. 4 (Akyab [Sittwe], Myanmar); Alcock 1898 [Fig.].

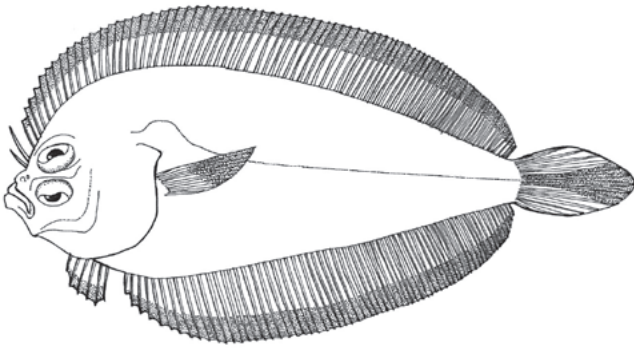
Laeops macrophthalmus: Alcock 1899; Norman 1934*; Saramma 1963; Manilo & Bogorodsky 2003.

Scianectes lophoptera Alcock 1889: 284. Pl. 16, Fig. 2 (near Mahanadhi Delta, India).

Laeops lophoptera: Norman 1927.

Dorsal fin 85–90 rays; anal fin 67–70 rays; eyed-side pectoral fin 13–15 rays; GR 6–8 on lower limb; LL scales ~93. Body depth 2.3–2.6 in SL; HL 3–3.6 in SL.

Eyed side brownish; dorsal and anal fins darker distally; middle rays of caudal fin and distal area of eyed-side pectoral fin brown or blackish. Attains 14 cm TL.



Laeops macrophthalmus, 5 cm SL. Drawn from Norman 1934

DISTRIBUTION Indian Ocean: Gulf of Oman to Bay of Bengal (India and Myanmar).

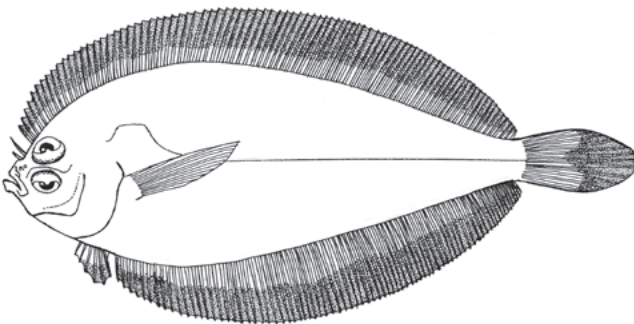
REMARKS Caught on hard bottom, at 124–329 m.

Laeops nigrescens Lloyd 1907

Laeops nigrescens Lloyd 1907: 9 (Gulf of Aden); Lloyd 1908 [Fig.]; Norman 1934*; Manilo & Bogorodsky 2003.

Dorsal fin 95–98 rays; anal fin 80–83 rays; eyed-side pectoral fin 13 rays; GR 8–10 on lower limb; LL scales 89–92. Body depth 2.5–2.6 in SL; HL 4–4.4 in SL. First dorsal-fin ray inserted over rear nostril of blind side; no elongate dorsal-fin rays.

Eyed side brownish, with irregular darker patches; dorsal and anal fins darker distally. Attains 15 cm SL.



Laeops nigrescens, 13 cm SL (Gulf of Aden). Drawn from Norman 1934

DISTRIBUTION Northern Indian Ocean. WIO: Gulf of Aden; reports from east coast of India (Ramanathan & Natarajan 1980) and Persian/Arabian Gulf need confirmation.

REMARKS Collected at 220–238 m.

Laeops nigromaculatus Von Bonde 1922

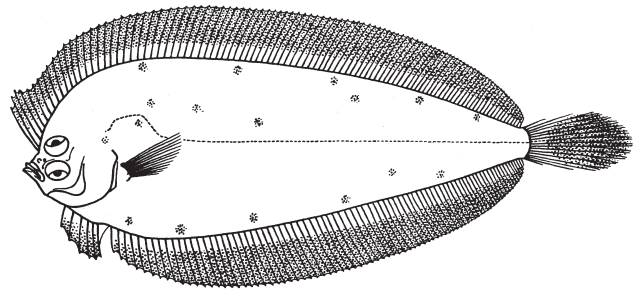
Blackspotted flounder

PLATE 90

Laeops nigromaculatus Von Bonde 1922: 10, Pl. 3 (KwaZulu-Natal, South Africa); Norman 1934*; SFSA No. 309*; Amaoka 1969*; SSF No. 259.12*; Hensley & Amaoka 2001.

Dorsal fin 100–105 rays; anal fin 82–85 rays; pectoral fin 15 or 16 rays on eyed side, 13 or 14 rays on blind side; GR 2–6/6–7; LL scales 133–144. Body depth 2.6–2.9 in SL; HL 5.4–6 in SL.

Eyed side brown, with small dark spots; distal areas of median fins and pelvic fin black. Attains 21 cm SL.



Laeops nigromaculatus, 18 cm TL, paratype (South Africa). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: northern Mozambique to South Africa (KwaZulu-Natal) and Saya de Malha Bank; elsewhere, Japan.

REMARKS Common in trawl catches at 130–300 m at Saya de Malha Bank (Foroshchuk & Fedorov 1992). Transforming larvae known from Eastern Cape (Kenton-on-Sea), South Africa.

Laeops pectoralis (Von Bonde 1922)

Longarm flounder

PLATE 91

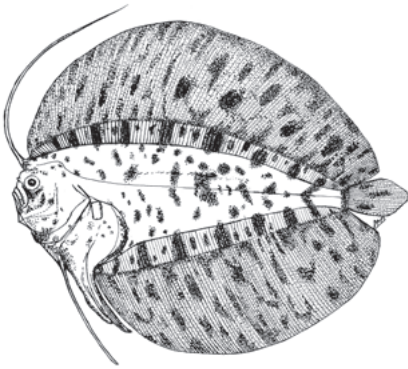
Lambdopsetta pectoralis Von Bonde 1922: 10, Pl. 1, Fig. 3 (KwaZulu-Natal, South Africa).

Laeops pectoralis: Norman 1934*; SFSA No. 307*; Kotthaus 1977*; SSF No. 259.13*.

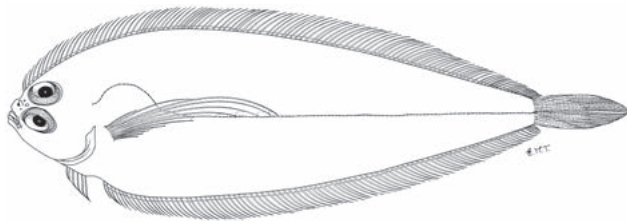
Parabothus thackwrayi Smith 1967: 457, Figs. 1–2a (Durban, KwaZulu-Natal, South Africa) [based on larvae].

Dorsal fin 110–116 rays; anal fin 91–96 rays; pectoral fin 11–13 rays on eyed side, 11 or 12 rays on blind side; GR 5–7/8–11; LL scales 96–104. Body depth 2.8–3 in SL; HL 5–6.3 in SL. First dorsal-fin ray inserted over interspace between nostrils or over rear nostril of blind side; no elongate dorsal-fin rays.

Eyed side brownish, and median fins and pectoral fin darker. Attains 19 cm SL.



Laeops pectoralis, 5 cm SL, larva, holotype of *Parabothus thackwrayi* (South Africa). Source: Smith 1967



Laeops pectoralis, 12 cm SL (Kenya). Source: SSF

DISTRIBUTION WIO: Kenya, Mozambique (Maputo Bay) and South Africa (KwaZulu-Natal).

REMARKS Collected at 180–310 m.

Laeops sinusarabici Chabanaud 1968

Red Sea flounder

PLATE 91

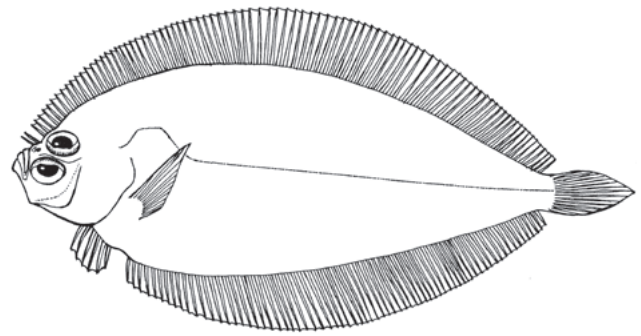
Laeops sinusarabici Chabanaud 1968: 838, Pls. 1–2 (Gulf of Suez, Red Sea);

Bogorodsky *et al.* 2014.

Laeops kitaharae (*non* Smith & Pope 1906); Dor 1970* [not drawing], 1984.

Dorsal fin 87–97 rays; anal fin 70–75 rays; pectoral fin 12–14 rays on eyed side, 12 or 13 rays on blind side; GR on lower limb 6 or 7; LL scales ~84–95. Body depth 2.2–2.6 in SL; HL 4.4–5.6 in SL.

Eyed side brownish; dorsal and anal fins somewhat darkened, and caudal fin darkest. Attains 13 cm SL.



Laeops sinusarabici, 13 cm TL (Red Sea). Drawn from Chabanaud 1968



Laeops sinusarabici, 11 cm SL (Red Sea). © SV Bogorodsky

DISTRIBUTION WIO: Gulf of Suez and Red Sea (Eritrea).

REMARKS Known from 40–80 m, on fine mud bottom with echinoids *Stellaster*, holothurians, sponges and polychaetes. Sold in markets in Suez, Egypt.

GENUS *Parabothus* Norman 1931

Body elliptical. Blunt rostral knob found rarely only in males; in females rostral knob barely noticeable or absent. Left (eyed-side) pelvic fin origin below posterior margin of lower eye. Tip of isthmus below rear of lower eye. Eyes separated by narrow concave space; interorbital space becoming broader with growth, and broader in males than in juveniles and females; 3 suborbital bones on blind side. Mouth moderate; maxilla extending to below or slightly beyond front margin of lower eye. Teeth uniserial, almost equally developed on both jaws, and not enlarged anteriorly. Gill rakers moderate in size and number. Scales small, not deciduous; cycloid or ctenoid with elongate ctenii on eyed side, cycloid on blind side. Four hypural plates without grooves or clefts along distal margins.

Closely resembles genus *Tosarhombus* in having an elliptical body, left pelvic-fin origin below posterior margin of lower eye and scales with long ctenii, but differs from this genus by a narrower body, narrower interorbital width, and lack of a strong rostral spine in males. About 9 species, 3 in WIO.

KEY TO SPECIES

- | | | |
|----|--|----------------------|
| 1a | Scales on eyed side cycloid; rear of maxilla below middle of lower eye; upper jaw length 2.2–2.5 in HL | <i>P. malhensis</i> |
| 1b | Scales on eyed side ctenoid; rear of maxilla below front of lower eye; upper jaw length 2.7–3 in HL | 2 |
| 2a | Dorsal fin 111–116 rays; anal fin 88–95 rays | <i>P. coarctatus</i> |
| 2b | Dorsal fin 88–95 rays; anal fin 69–75 rays | <i>P. polylepis</i> |

Parabothus coarctatus (Gilbert 1905)

Greenspotted flounder

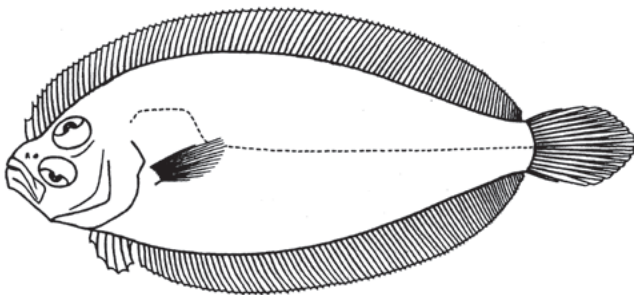
Platophrys coarctatus Gilbert 1905: 686, Fig. 269 (Pailolo Channel, Hawaii).

Parabothus coarctatus: Norman 1931; Amaoka 1969*;

Amaoka *et al.* 1997*; Hensley & Amaoka 2001*.

Dorsal fin 111–116 rays; anal fin 88–95 rays; pectoral fin 13 or 14 rays on eyed side, 10 or 11 rays on blind side; GR 0/8–10; LL scales 84–93. Body depth 2.5–2.8 in SL; HL 3.7–3.9 in SL. Eyed-side scales ctenoid.

Eyed side brown, with 2 dark blotches at junction of curved and straight parts of lateral line, 1 blotch near middle of straight section of line, and 1 blotch near end of line; dark rings along dorsal and ventral margins of body; small dark green spots anterior to interorbital region. Attains 25 cm TL.



Parabothus coarctatus, 13 cm SL (Hawaii). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Réunion; elsewhere, South China Sea, Taiwan, southern Japan, Coral Sea, New Caledonia and Hawaii.

REMARKS Known from 138–580 m.

Parabothus malhensis (Regan 1908)

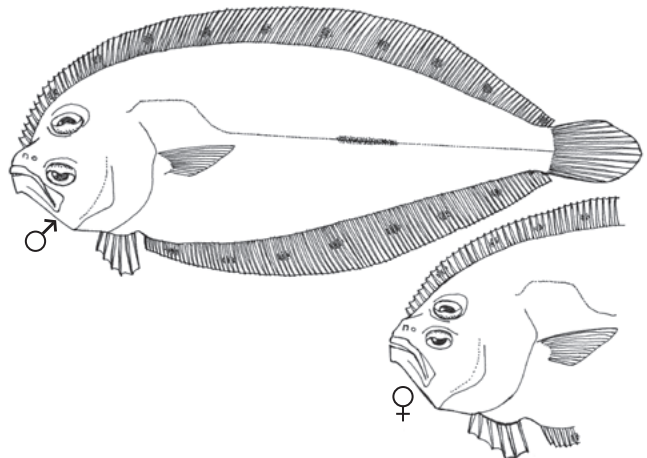
Malha flounder

Arnoglossus malhensis Regan 1908: 235, Pl. 26, Fig. 2 (Saya de Malha Bank); Norman 1934*.

Parabothus malhensis: Amaoka & Imamura 1990*.

Dorsal fin 111–114 rays; anal fin 90–93 rays; pectoral fin 13–15 rays on eyed side, 10–13 rays on blind side; GR 0/9–11; LL scales 93–98. Body depth 2.4–2.9 in SL; HL 3.5–4 in SL. Eyed-side scales cycloid.

Eyed side pale brown; green spots (dark in preservative) before interorbital region; dark blotch at middle of straight section of lateral line. Attains ~19 cm SL.



Parabothus malhensis, 14 cm SL, male; 16 cm SL, female, head (Saya de Malha Bank). Drawn from photograph in Amaoka & Imamura 1990

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Collected at 133–254 m. Norman (1934) was uncertain about the generic placement of this species, but Amaoka & Imamura (1990) were able to confirm it as *Parabothus*.

Parabothus polylepis (Alcock 1889)

Many-scaled flounder

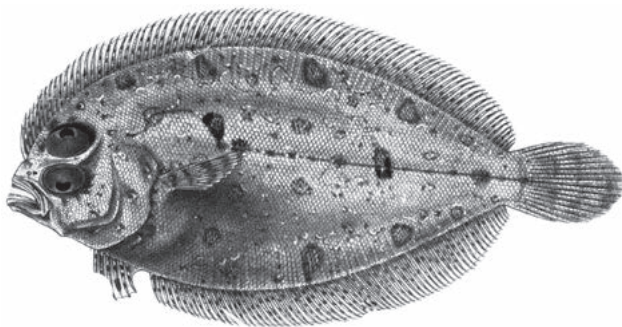
Arnoglossus polylepis Alcock 1889: 290, Pl. 16, Fig. 1 (east coast of Sri Lanka); Alcock 1898 [Fig.].

Bothus polylepis: Norman 1927; Munro 1955*.

Parabothus polylepis: Norman 1931, 1934*; Manilo & Bogorodsky 2003.

Dorsal fin 88–95 rays; anal fins 69–75 rays; pectoral fin 10–12 rays on eyed side, 6–11 rays on blind side; GR 0/8–11; LL scales 82–91. Body depth 2.1–2.3 in SL; HL 3.4–3.8 in SL. Blunt knob on snout, somewhat larger and sharper in males than in females. Males with elongate eyed-side pelvic fin and wider interorbital area than in females. Eyed-side scales ctenoid.

Eyed side brownish, with series of large dark rings on upper and lower margins of body, 2 dark blotches near junction of curved and straight sections of lateral line, 1 near middle of line, and 1 near peduncle. Attains 19 cm SL.



Parabothus polylepis, adult female type (Sri Lanka). Source: Alcock 1898

DISTRIBUTION WIO: Réunion and Sri Lanka.

REMARKS Known from 58–227 m.

GENUS *Psettina* Hubbs 1915

Body elliptical, moderately compressed, small-sized (up to ~14 cm SL); anterior dorsal profile similar in both sexes; eyed-side pectoral fin not elongate (both sexes); eyed-side pelvic fin starting below rear of lower eye. Blunt rostral knob rarely found only in males. Tip of isthmus below or slightly before rear of lower eye. Eyes separated by ridge or narrow concave space; interorbital width similar in both sexes; 3 suborbital

bones on blind side. Mouth very small; maxilla extends to below front of lower eye. Teeth tiny, uniserial. Gill rakers small and slender, not serrated. Scales small and adherent, ctenoid with long hair-like ctenii on eyed side, cycloid on blind side. Four hypural plates with several grooves along distal margins. Closely resembles genus *Arnoglossus* with its narrow interorbital region, but differs in having ctenoid scales with hair-like ctenii, a small mouth, and no enlarged teeth anteriorly. About 10 species, possibly 4 in WIO.

KEY TO SPECIES

- | | | |
|----|---|-------------------------|
| 1a | GR 2–6 on upper limb of 1st gill arch | <i>P. ijimae</i> |
| 1b | No gill rakers on upper limb of 1st gill arch | 2 |
| 2a | LL scales 85–97; <25 ctenii on each scale; eyed-side pectoral fin 11–14 rays | <i>P. multisquamata</i> |
| 2b | LL scales 47–60; >25 ctenii on each scale; eyed-side pectoral fin 9–12 rays | 3 |
| 3a | LL scales 47–55; dorsal fin 76–82 rays; anal fin 58–66 rays; caudal fin with broad blackish band | <i>P. brevirictis</i> |
| 3b | LL scales 55–60; dorsal fin 90–95 rays; anal fin 70–75 rays; no broad blackish band on caudal fin | <i>P. profunda</i> |

Psettina brevirictis (Alcock 1890)

Small-mouthed flounder

PLATE 90

Arnoglossus brevirictis Alcock 1890: 433 (off Ganjam District, India, Bay of Bengal).

Crossolepis brevirictis: Norman 1927*.

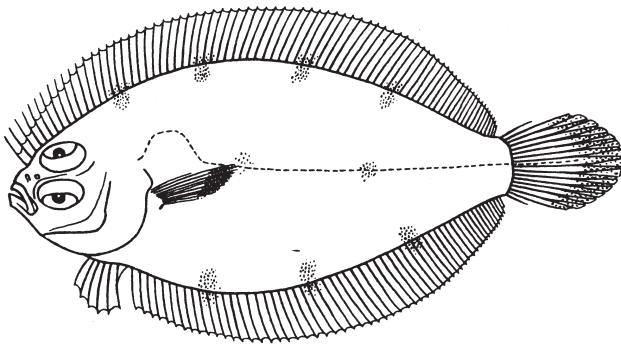
Bothus (Arnoglossus) brevirictis: Weber & De Beaufort 1929.

Psettina brevirictis: Norman 1934*; ?SSF No. 259.16*;

Fedorov & Foroshchuk 1988; Hensley & Amaoka 2001* [as *brevirictis*]; Manilo & Bogorodsky 2003.

Dorsal fin 76–82 rays; anal fin 58–66 rays; pectoral fin 10–12 rays on eyed side, 9 or 10 rays on blind side; GR 0/7 or 8; LL scales 47–55. Body depth 2–2.8 in SL; HL ~3.5 in SL.

Body brownish; series of indistinct dark blotches along upper and lower margins on both sides of body, and continuing onto bases of dorsal and anal fins; 2 or 3 blotches on lateral line; dark patch on distal area of eyed-side pectoral fin; caudal fin with broad blackish band. Attains ~10 cm SL.



Psettina brevirectis, ~8 cm SL (SE India). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: possibly South Africa (Transkei region) and southwestern India; elsewhere to east coast of India, Sulawesi, Malaysia, South China Sea and Sea of Japan.

REMARKS Found on sand and shell bottom. South African record based on a 3.5-cm-SL juvenile; see Remarks for *P. iijimae*, below.

Psettina iijimae (Jordan & Starks 1904)

Iijima flounder

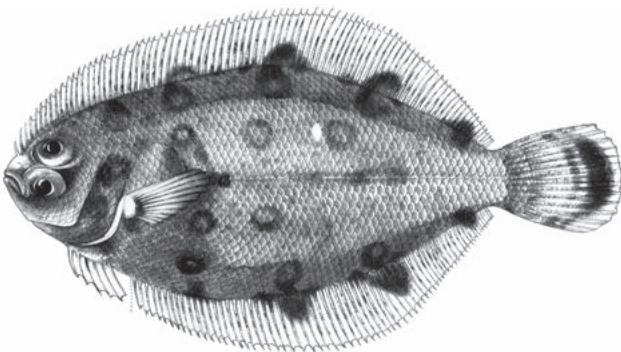
PLATE 91

Engyprosope iijimae Jordan & Starks 1904: 626, Pl. 8, Fig. 1 (Suruga Bay, Japan).

Psettina iijimae: Hubbs 1915; Amaoka 1969*; Fedorov & Foroshchuk 1988; Fukui & Ozawa 1990*; Hensley & Amaoka 2001* [as *iijimai*].
? *Psettina brevirectis* (non Alcock 1890): Kotthaus 1977*; SSF No. 259.16*.

Dorsal fin 80–93 rays; anal fin 62–72 rays; pectoral fin 11–13 rays on eyed side, 8–12 rays on blind side; GR 2–6/4–8; LL scales 53–61. Body depth 1.7–2.3 in SL; HL 3.8–4.4 in SL.

Body darkish brown, with series of dark blotches along upper and lower margins of body, continuing onto bases of dorsal and anal fins; 2 or 4 dark blotches on lateral line; eyed-side pectoral fin dark; rear part of caudal fin with broad blackish band. Attains 11 cm SL.



Psettina iijimae, 7 cm TL, type (Japan). Source: Jordan & Starks 1904

DISTRIBUTION WIO: possibly South Africa and Madagascar (see Remarks, below); elsewhere, Taiwan, China, Korea and southern Japan in western Pacific.

REMARKS Collected at 58–110 m. Fedorov & Foroshchuk (1988) included a preliminary key to the genus based on meristics: in it, they note *P. iijimae* as having 2–6 gill rakers on upper limb of 1st gill arch, and *P. brevirectis* with none. If this is true, *P. brevirectis* in Kotthaus (1977) and Hensley (1986: SSF No. 259.16), as well as some specimens examined from southern Madagascar, are correctly identified as *P. iijimae*. Accordingly, capture locations of these specimens from South Africa (Transkei region) and southern Madagascar would then be included in its range.

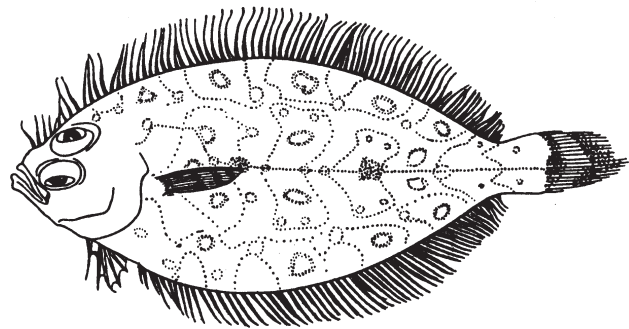
Psettina multisquamea Fedorov & Foroshchuk 1988

Malha many-scaled flounder

Psettina multisquamea Fedorov & Foroshchuk 1988: 532, Figs. 1–2 (Saya de Malha Bank).

Dorsal fin 88–92 rays; anal fin 69–72 rays; pectoral fin 11–14 rays on eyed side, 9–12 rays on blind side; GR 0/7–9; LL scales 85–97. Body depth ~2.2 in SL; HL 3.5–3.9 in SL.

Body brown, with variously shaped darker areas and ocelli, but ocelli do not extend onto dorsal or anal fins; caudal fin with broad dark band near distal margin and another darker band near base; eyed-side pectoral fin with alternating pale and green areas. Attains ~12 cm SL.



Psettina multisquamea, 9 cm SL, female holotype (Saya de Malha Bank). Source: Fedorov & Foroshchuk 1988

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Collected at 134–152 m.

Psettina profunda (Weber 1913)

Deepwater flounder

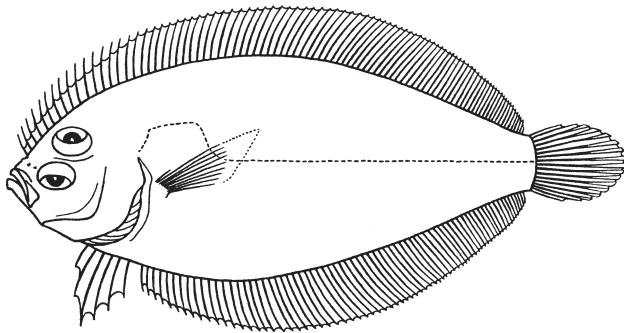
Arnoglossus profundus Weber 1913: 430, Pl. 6, Fig. 3 (Madura Strait and Timor Sea).

Bothus (Arnoglossus) profundus: Weber & De Beaufort 1929.

Psettina profunda: Norman 1934*; Saramma 1963; Hensley & Amaoka 2001*.

Dorsal fin 90–95 rays; anal fin 70–75 rays; pectoral fin 9–11 rays on eyed side, 5–10 rays on blind side; GR 0/6–7; LL scales 55–60. Body depth 2.3–2.7 in SL; HL 3.4–3.7 in SL.

Dark brown with indistinct, dark spots on lateral line and along bases of dorsal and anal fins; fins with dark spots. Attains 11 cm SL.



Psettina profunda, 11 cm TL, male paratype (Madura Strait). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: possibly southwestern India; elsewhere, Java Sea, Madura Strait and Timor Sea.

REMARKS Collected at 99–112 m. Included here because Saramma (1963) recorded collecting this species from the coast of Kerala, India.

GENUS *Taeniopsetta* Gilbert 1905

Body deeply ovate; no sexual dimorphism of anterior margin of head. Some anterior dorsal- and anal-fin rays very elongate in males, slightly or not elongate in females; pelvic fins subequal and subsymmetrical, 2nd ray of left (eyed-side) pelvic fin opposite 1st ray of right (blind-side) pelvic fin. Tip of isthmus below hind margin of lower eye. Eyes separated by ridge or narrow concave space; interorbital width similar in both sexes; 5 suborbital bones on blind side. Strong rostral spine, orbital spines, and mandibular knob present in males; these features usually present, but feeble, in females (sometimes absent). Mouth rather small; maxilla extending below or slightly beyond front margin of lower

eye. Teeth uniserial on both jaws, small and close-set, none enlarged anteriorly. Gill rakers short, not serrated. Scales tiny and adherent, ctenoid or cycloid on eyed side, and cycloid on blind side. Distinct from all other bothid genera by having only a slightly elongate left (eyed-side) pelvic-fin base, its 1st ray behind isthmus, and 2nd ray opposite 1st ray of blind-side pelvic fin, and in having 5 suborbital bones on the blind side. Two species, 1 in WIO.

Taeniopsetta ocellata (Günther 1880)

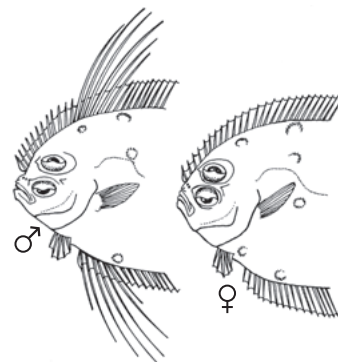
Ocellated flounder

PLATES 90 & 91

Pseudorhombus ocellatus Günther 1880: 56, Pl. 24, Figs. A–B (outside Nares Harbour, Admiralty Is., Bismarck Archipelago).
Taeniopsetta ocellata: Norman 1927, 1934*, 1939; Amaoka 1969*; Quéro & Maugé 1989; Hensley & Amaoka 2001*.

Diagnosis as for genus. Dorsal fin 85–97 rays; anal fin 71–81 rays; pectoral fin 12–16 rays on eyed side, 10–14 rays on blind side; GR 4–6 on lower limb; LL scales 95–113. Body depth 1.8–2.1 in SL; HL 3.7–4.3 in SL. Scales cycloid on both sides of body. Males with dorsal-fin rays 12–18 and anal-fin rays 1–7 greatly elongate; strong spine at front of each eye, spine on snout, and knob at symphysis of lower jaw. Females without elongate dorsal- or anal-fin rays; spine on snout, spine on lower eye (none on upper eye), and knob at symphysis of lower jaw present, but lower than in males, or else absent.

Eyed side brownish, with series of U-shaped darker markings along upper and lower margins of body; similarly coloured rings above, below, and on lateral line; median fins with scattered dark spots and streaks. Blind side white anteriorly, brown posteriorly, and paler in females than in males. Attains 22 cm SL.



Taeniopsetta ocellata, head of male (left) and female (right). Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Tanzania (Zanzibar), Mozambique, Madagascar and Saya de Malha Bank; elsewhere, southern Japan, Australia, Admiralty Is. and possibly New Caledonia.

REMARKS Rarely collected; known from 183–400 m.

GENUS *Tosarhombus* Amaoka 1969

Body ovate or elliptical; left (eyed-side) pelvic fin starting below rear margin of lower eye. Tip of isthmus below hind margin of lower eye. Strong rostral spine and orbital spines present in males, feebly developed or absent in females and juveniles. Eyes separated by wide concave area; interorbital width becoming broader with growth, and broader in males than in juveniles and females; 3 suborbital bones on blind side. Mouth moderate; maxilla extending to below or slightly beyond front margin of lower eye. Teeth uniserial or biserial, almost equally developed on both jaws. Gill rakers moderate in size and number. Scales ctenoid with short or elongate ctenii on eyed side, cycloid on blind side. Four hypural plates without grooves or clefts along distal margins. Closely resembles genus *Parabothus* in having elliptical body, left (eyed-side) pelvic-fin origin below hind margin of lower eye, and scales with long ctenii; but differs by its deeper body, broader interorbital width, strong rostral spine and sometimes orbital spines in males, and colour patches along dorsal margin before eyes. Six species, 2 in WIO.

KEY TO SPECIES

- 1a Pelvic fins elongate in males (females unknown): eyed-side fin 1.1–1.3 in HL, blind-side fin 2.3–2.5 in HL; blind-side pectoral fin 9 or 10 rays; lower eye large, its diameter 3.3–3.4 in HL *T. smithi*
- 1b Pelvic fins moderate in length in males and females: eyed-side fin 2.4–2.9 in HL, blind-side fin 3–3.4 in HL; blind-side pectoral fin 11 or 12 rays; lower eye small, its diameter 4–4.9 in HL *T. nielsenii*

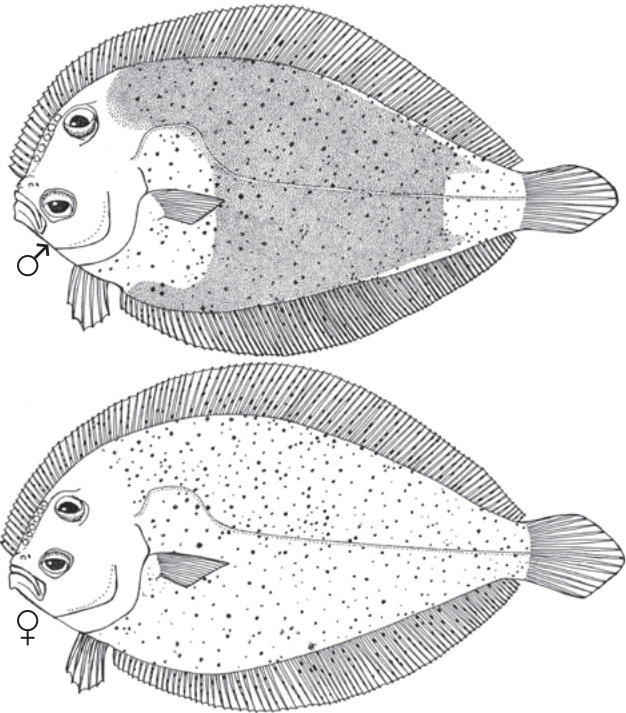
Tosarhombus nielsenii Amaoka & Rivaton 1991

Nielsen's dark-blue flounder

Tosarhombus nielsenii Amaoka & Rivaton 1991: 458, Fig. 9
(Saya de Malha Bank).

Dorsal fin 100–102 rays; anal fin 77–81 rays; pectoral fin 12 or 13 rays on eyed side, 11 or 12 rays on blind side; GR 0/8–9; LL scales 66–70. Body depth 2–2.2 in SL; HL 3.5–3.8 in SL; upper jaw 2.7–2.9 in HL; eyed-side pectoral fin 1.7–2 in HL, and blind-side fin 2.4–2.7 in HL. Teeth in outer row of upper jaw shorter, stronger, and more widely spaced than those in inner row. Males with short rostral spine, and females with smaller spine; males with wider interorbital space than that of females.

Sexual dichromatism on eyed side: body of females entirely pale brown, and males with pale violet area on middle of body, and remainder of body pale brown; 6 white blotches in front of interorbital space and upper eye. Attains 20 cm SL.



Tosarhombus nielsenii, 16 cm SL, male holotype (top); 15 cm SL, female paratype (bottom) (both Saya de Malha Bank).
Drawn from Amaoka & Rivaton 1991

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Collected from 124–230 m.

Tosarhombus smithi (Nielsen 1964)

Smith's dark-blue flounder

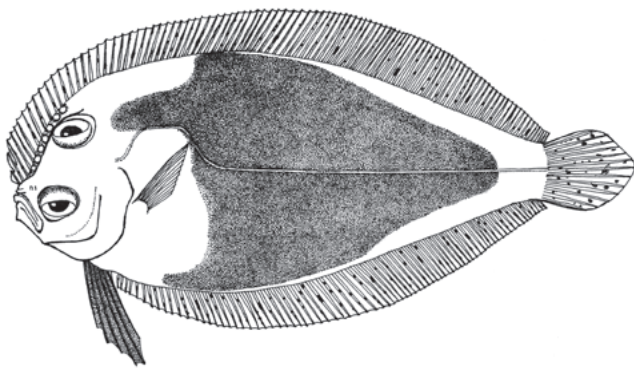
Engyproson smithi Nielsen 1964: 127, Fig. 1, Pl. 17, Figs. A–B (Durban, KwaZulu-Natal, South Africa); SSF No. 259.10*.

Tosarhombus smithi: Amaoka & Rivaton 1991*.

Males: dorsal fin 104–108 rays, none elongate; anal fin 81–85 rays; pectoral fin 12 or 13 rays on eyed side, 9 or 10 rays on blind side; GR 0/7; LL scales 64–67. Body depth 2–2.2 in SL; HL 3.8–4.2 in SL; upper jaw 2.6–2.9 in HL; interorbital width 3.1–3.6 in HL; eyed-side pectoral fin 1.5–1.7 in HL, and blind-side pectoral fin 2.8–2.9 in HL. Outer row of teeth in upper jaw larger and more widely spaced than those of inner row. Blunt

rostral spine present. (Females probably lack rostral spine and have narrower interorbital space.)

Male specimens: eyed side pale brown on anterior third, and dark blue on posterior two-thirds (females may lack dark blue area); blind side entirely pale brown. Attains at least 18 cm SL.



Tosarhombus smithi, 16 cm SL, male (South Africa).

DISTRIBUTION WIO: Kenya, South Africa (KwaZulu-Natal) and possibly Mozambique.

REMARKS Known only from three male specimens (14–18 cm SL) collected off South Africa and Kenya, at 124–230 m, and possibly two females (~16 cm SL) from Mozambique, collected at ~180 m.

GLOSSARY

- crenulate** – a margin with small, rounded scallops.
- distal** – furthest away from the point of attachment.
- hypaxial myotomes** – the blocks of muscles that lie ventral to the horizontal septum.
- hypurals** – the fan-shaped series of bones (sometimes fused to one or two plates) to which the caudal-fin rays are attached.
- median fins** – the dorsal and anal fins.
- paralectotype** – an additional specimen selected from a series of syntypes, after a lectotype has been designated.
- pinniform** – shaped like a fin.
- pyriform** – scales with a raised centre (from 'pyramid').

FAMILY PARALICHTHYIDAE

Sand flounders

Dannie A Hensley and Kunio Amaoka

Flatfishes with eyes usually on left side of head (sinistral); reversals in WIO species are rare, although reversals are common in some species from other areas, and some species may be either sinistral or dextral. Body ovate; preopercle margin free, not hidden by skin or scales. Dorsal-fin origin over or before upper eye; no fin spines; pectoral fin present on each side of body; pelvic-fin bases short, symmetrically placed in WIO species, but asymmetrically placed in some species from other areas; caudal fin 17–18 rays (10–13 branched), and fin not attached to dorsal fin and anal fin. Lateral line equally developed on both sides of body, with high arch over pectoral fin (but arch lacking in some species from other areas), and with infraorbital branch below lower eye (but branch absent in some species from other areas).

Formerly considered a subfamily of family Bothidae. However, recent research, mostly osteological (Amaoka 1969; Hensley & Ahlstrom 1984; Chapleau & Keast 1988; Chapleau 1993), has shown that Paralichthyidae should be considered a separate family. Bothids have the eyed-side pelvic fin anterior to the blind-side pelvic fin (asymmetrical placement on midline), whereas Indo-Pacific paralichthyids have the pelvic-fin origins symmetrically placed on midline. About 16 genera and ~113 species; 2 genera and 9 species in WIO.

KEY TO GENERA

- 1a Pelvic fin on eyed side 1.2–1.8 times longer than pelvic fin on blind side, with distinct ocellus between rays 3 and 5; HL 2.3–3.1 (usually 2.3–2.9) in SL *Cephalopsetta*
- 1b Pelvic fins subequal, with no distinct ocellus between rays; HL ~3–4 in SL *Pseudorhombus*

GENUS *Cephalopsetta* Dutt & Rao 1965

Differs from genus *Pseudorhombus* in having a larger head (2.3–3.1 in SL) and left pelvic fin (on eyed side) elongate (1.4–2.3 in HL). Regarded as a member of the *Pseudorhombus* group, however, in having a caudal skeleton identical with that of genus *Pseudorhombus*. One species.

Cephalopsetta ventrocellata Dutt & Rao 1965

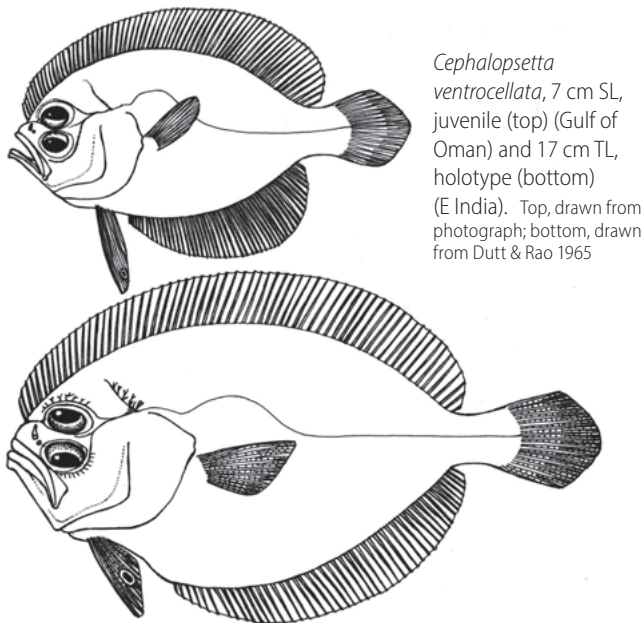
PLATE 92

Cephalopsetta ventrocellatus Dutt & Rao 1965: 181, Figs. 1–2
(Visakhapatnam, India, Bay of Bengal); Kotthaus 1977*.

Cephalopsetta ventrocellata: Hensley & Amaoka 1989*;
Manilo & Bogorodsky 2003.

Dorsal fin 64–68 rays; anal fin 47–50 rays; pectoral fins 12 or 13 rays on eyed side, 11 or 12 on blind side; GR 7–10/17–20, elongated; LL scales 67–79. Body depth 1.7–1.9 in SL; HL 2.3–3.1 in SL; upper jaw 2.1–2.5 in HL; pelvic fin on eyed side becomes shorter relative to SL with growth. First dorsal-fin ray usually inserted over space between nostrils of blind side, less frequently above either anterior or posterior nostril. Teeth in upper jaw widely spaced and enlarged anteriorly, closely spaced posteriorly; teeth in lower jaw not enlarged anteriorly, 23–31 on blind side. Supratemporal branch of lateral line not reaching dorsal-fin base. Scales on eyed side weakly ctenoid and covered by skin except for rear edges (ctenii very small near rear edge of scale and difficult to see); scales on blind side cycloid.

Body on eyed side brownish or greyish, with dark spots in ~5 longitudinal rows, and some specimens with several faint, broad, dark transverse bars; most conspicuous spots near bases of dorsal fin and anal fin, and in ~3 rows on lateral line, otherwise no distinct dark markings on median fins; left pelvic fin (on eyed side) with distinct ocellus near edge between rays 3–5. Attains 25 cm SL.



Cephalopsetta ventrocellata, 7 cm SL, juvenile (top) (Gulf of Oman) and 17 cm TL, holotype (bottom) (E India). Top, drawn from photograph; bottom, drawn from Dutt & Rao 1965

DISTRIBUTION Northern Indian Ocean: Gulf of Oman to Andaman Sea.

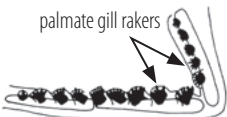
REMARKS Found at 75–210 m.

GENUS *Pseudorhombus* Bleeker 1862

Body ovate; eyes separated by narrow ridge, and interorbital width similar in both sexes; tip of isthmus below and slightly behind rear edge of lower eye. Gill rakers palmate, of moderate length, or short, with rear serrations. No rostral, orbital or mandibular spines. Maxilla extends to below middle to rear edge of lower eye. Teeth in 1 row; teeth in upper jaw small or moderate and generally enlarged anteriorly, teeth in lower jaw much stronger and wider apart. Pectoral fins not elongate; middle fin rays on eyed side branched, rays unbranched on blind side. Pelvic fins short-based, subequal, and symmetrical in position on midline, and posterior 3 or 4 fin rays branched. Four hypural plates of caudal skeleton with deep clefts along distal margins. Lateral line equally developed on both sides of body, with distinct curve above pectoral fin, and supratemporal branch running forward and upward to anterior part of dorsal fin. Scales present on both sides of body, ctenoid or cycloid.

About 28 species, 8 in WIO.

KEY TO SPECIES

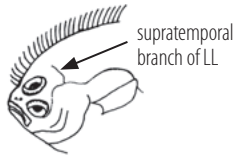
- 1a Gill rakers palmate, as broad as long, and with stout spines; 1 or 2 distinct double ocelli (eyespot) on body, above and below lateral line *P. dupliciocellatus*
- 
- 1b Gill rakers pointed, longer than broad; no double ocelli on body 2
- 2a Anterior dorsal-fin rays elongated and free from fin membrane; lower GR 23–25 3
- 2b Anterior dorsal-fin rays neither elongated nor free from membrane; lower GR 8–17 4
- 3a Scales on blind side cycloid, except on anterior part and edges of body; 3 conspicuous ocelli on body *P. triocellatus*
- 3b Scales on blind side ctenoid; body with dark rings but no conspicuous ocelli *P. annulatus*
- 4a Scales on blind side ctenoid *P. malayanus*
- 4b Scales on blind side cycloid 5
- 5a Lateral teeth in lower jaw large, widely spaced, 8–18 teeth on blind side of lower jaw; both jaws with large canines anteriorly *P. arsius*

Continued...

KEY TO SPECIES

5b Lateral teeth in lower jaw small, closely spaced, 14–47 teeth on blind side of lower jaw; anterior teeth in both jaws scarcely enlarged 6

6a Dorsal-fin origin above posterior nostril or space between nostrils of blind side; line from base of 1st dorsal-fin ray through posterior nostril crosses maxilla; supratemporal branch of lateral line reaches about halfway to dorsal-fin base *P. natalensis*



6b Dorsal-fin origin above or slightly before anterior nostril of blind side; line from base of 1st dorsal-fin ray through posterior nostril runs above or barely crosses rear of maxilla; supratemporal branch of lateral line reaches or nearly reaches bases of 8th–11th dorsal-fin rays 7

7a Dorsal profile of head with distinct notch in front of upper eye; body depth 1.7–2 in SL; all scales ctenoid on eyed side of body *P. elevatus*



7b Dorsal profile of head smooth, without notch; body depth 2.1–2.4 in SL; scales on eyed side ctenoid on anterior part and on dorsal and ventral edges of body, scales in other areas cycloid *P. javanicus*

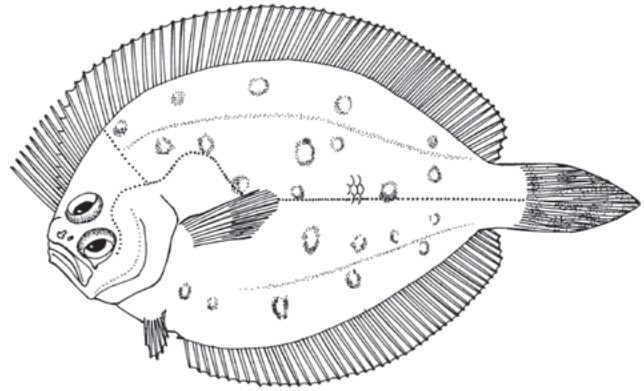
Pseudorhombus annulatus Norman 1927

Oman flounder

Pseudorhombus annulatus Norman 1927: 12, Pl. 2 (Muscat, Oman); Norman 1934*; Randall 1995*.

Dorsal fin 67–70 rays; anal fin 49–51 rays; pectoral fin on eyed side 12 rays; lower GR 23–25; LL scales 60–67. Body depth ~1.6 in SL; HL 3.5–3.6 in SL; upper jaw ~2.1 in HL. First dorsal-fin ray over or slightly before anterior nostril of blind side; anterior dorsal-fin rays somewhat elongated, free from fin membrane. Teeth in jaws small. Scales on both sides of body ctenoid.

Body pale brown with numerous dark rings (about size of pupils or larger); median fins with brown blotches and spots. Attains at least 10.5 cm TL.



Pseudorhombus annulatus, 10 cm TL, holotype (Gulf of Oman). Drawn from photograph by P Crabb, NHM

DISTRIBUTION Known only from five specimens from Gulf of Oman.

REMARKS Trawled at 23–55 m.

Pseudorhombus arsius (Hamilton 1822)

Large-tooth flounder

PLATES 92 & 93

Pleuronectes arsius Hamilton 1822: 128, 373 (estuary below Kolkata, India [Bay of Bengal]).

Pseudorhombus andersoni Gilchrist 1904: 9, Pl. 26 (Durban Harbour, KwaZulu-Natal, South Africa [based on ambicoloured specimen]).

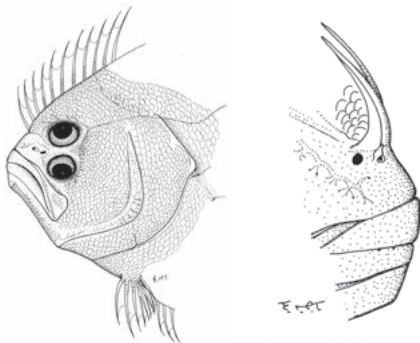
Pseudorhombus russelli: Regan 1920*; Barnard 1925 [in part: not Pl. 17, Fig. 2].

Pseudorhombus arsius: Norman 1934*; Blegvad & Løppenthin 1944; Munro 1955*; Khalaf 1961; Amaoka 1969*; Kuronuma & Abe 1972*, 1986; SSF No. 259.17*; Randall 1995*; Amaoka & Hensley 2001*; Heemstra & Heemstra 2004*.

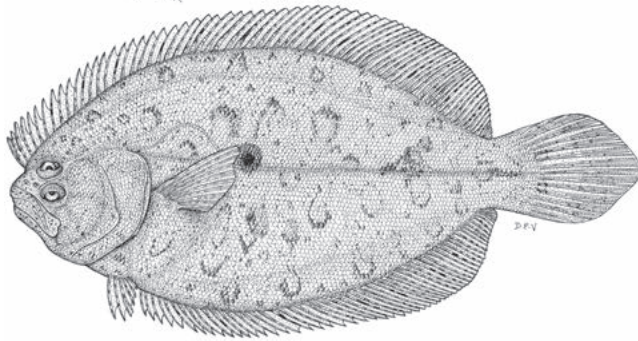
Dorsal fin 71–84 rays; anal fin 53–62 rays; pectoral fin 11–13 rays on eyed side, 11 or 12 rays on blind side; GR 1–8/8–15; LL scales 67–81. Body depth 1.7–2.3 in SL; HL 3.2–3.8 in SL; upper jaw 2.2–2.6 in HL. First dorsal-fin ray over anterior nostril or space between nostrils on blind side. Jaws with large canines anteriorly, and usually a marked difference in size and spacing of posterior teeth in both jaws; teeth in upper jaw widely spaced and enlarged anteriorly, small and closely spaced posteriorly; teeth in lower jaw large and

widely spaced, 8–18 on blind side. Supratemporal branch of lateral line reaches or nearly reaches bases of 8th–11th dorsal-fin rays. Scales ctenoid on eyed side, cycloid on blind side (except for those on dorsal- and anal-fin rays).

Body on eyed side greenish or pale brownish, with various dark spots and rings; usually large dark spot at origin of straight section of lateral line, and 2 smaller spots on lateral line at rear third of body and near peduncle; median fins with scattered dark spots, often arranged in longitudinal row on dorsal fin and anal fin. Attains 38 cm SL.



Pseudorhombus arsius, eyed side of head (left), and blind side of head showing 1st dorsal-fin ray over front nostril (right) (South Africa). Source: SSF



Pseudorhombus arsius, 11 cm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea to South Africa (Algoa Bay, possibly Knysna); elsewhere to Bay of Bengal, southern Japan, Marshall Is., northern Australia and Fiji.

REMARKS Mainly continental, inhabits shallow mud-sand or sandy bottoms, from brackish areas to ~200 m deep; juveniles common in estuaries. Matures at ~20 cm SL, at ~2 years; spawning occurs at sea in late spring in the northern Indian Ocean. Juveniles in estuaries feed mainly on benthic crustaceans; adults in the sea feed on fishes, prawns, crabs and polychaetes.

Pseudorhombus dupliciocellatus Regan 1905

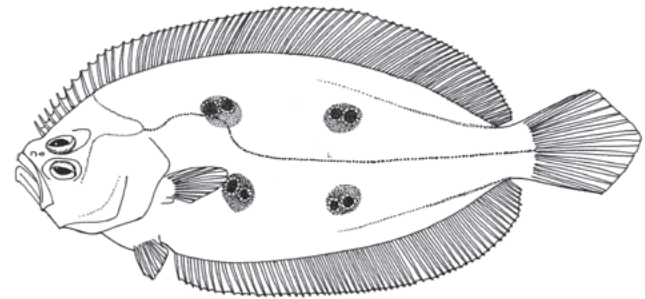
Ocellated flounder

PLATE 92

Pseudorhombus dupliciocellatus Regan 1905: 25 (Inland Sea, Japan); Norman 1934*; De Silva 1956*; Amaoka 1969*; Gloerfelt-Tarp & Kailola 1984*; Amaoka & Hensley 2001*.

Dorsal fin 72–78 rays; anal fin 56–63 rays; pectoral fin 11 or 12 rays on both sides; GR 5/8 or 9; LL scales 73–84. Body depth 2.2–2.4 in SL; HL 3.4–3.8 in SL; upper jaw 2.2–2.7 in HL. Gill rakers palmate, as broad as long. First dorsal-fin ray over or just behind posterior nostril of blind side. Teeth in upper jaw small and closely spaced posteriorly, somewhat larger and more widely spaced anteriorly; teeth in lower jaw larger, 13–22 on blind side. Supratemporal branch of lateral line reaches or nearly reaches bases of 7th–9th dorsal-fin rays. Scales ctenoid on eyed side, cycloid on blind side.

Body on eyed side brownish, with 3 or 4 double ocelli, arranged with 2 below and 1 or 2 above lateral line; additional, less prominent, spots and rings scattered on body; median fins with scattered dark spots and rings. Attains 40 cm SL.



Pseudorhombus dupliciocellatus, 18 cm SL (Sri Lanka). Drawn from photograph in De Silva 1956

DISTRIBUTION Indo-Pacific. WIO: Sri Lanka; elsewhere to Nicobar Is., Indonesia, Japan and northeastern Australia.

REMARKS Found on mud and sand bottoms, at 50–70 m. Feeds on fishes and small benthic animals.

Pseudorhombus elevatus Ogilby 1912

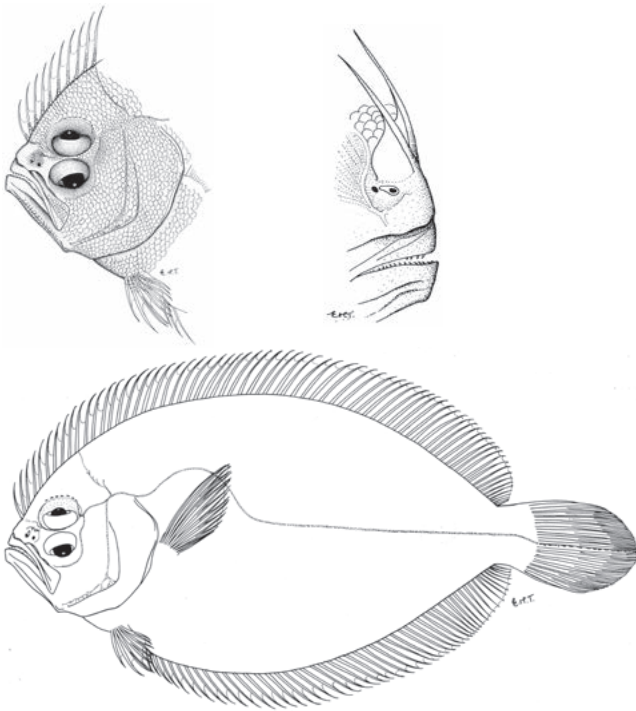
Deep-bodied flounder

PLATES 92 & 93

Pseudorhombus elevatus Ogilby 1912: 45 (Moreton Bay, Queensland, Australia); Norman 1934*; De Silva 1956*; Kuronuma & Abe 1986; SSF No. 259.18*; Randall 1995*; Amaoka & Hensley 2001*; Heemstra & Heemstra 2004.

Dorsal fin 68–74 rays; anal fin 52–58 rays; pectoral fin 10–12 rays on eyed side, 10 or 11 rays on blind side; GR 4–9/11–19; LL scales 61–74. Body depth 1.7–2 in SL; HL 3–3.8 in SL; upper jaw 2–2.3 in HL. Maxilla extends to below rear half of lower eye. First dorsal-fin ray over or before anterior nostril of blind side. Teeth in jaws small, closely spaced, sometimes slightly enlarged anteriorly, 25–47 on blind side of lower jaw. Supratemporal branch of lateral line reaches or nearly reaches bases of 8th–11th dorsal-fin rays. Scales ctenoid on eyed side, cycloid on blind side (except for those on dorsal- and anal-fin rays).

Body on eyed side brownish, with dark rings in ~5 longitudinal rows; usually large dark blotch at origin of straight section of lateral line, and 2 smaller dark spots on lateral line at rear third of body and near peduncle; median fins with small dark spots and elongate markings. Attains 19 cm SL.



Pseudorhombus elevatus, eyed side of head (top left), and blind side of head showing high flap-like membrane between snout and 1st dorsal-fin ray (top right); 12 cm SL (bottom) (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea to South Africa (Algoa Bay, Eastern Cape); elsewhere to Indonesia, Philippines, Taiwan, China, New Guinea and northern Australia.

REMARKS Mainly continental; inhabits clay, sand and mud bottoms, at 7–200 m. Larvae metamorphose at ~10 cm SL.

Pseudorhombus javanicus (Bleeker 1853)

Javan flounder

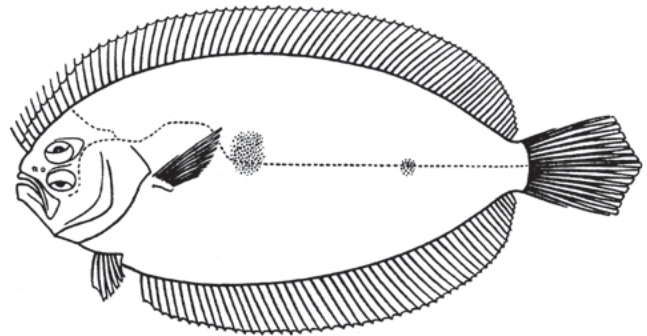
PLATE 93

Rhombus javanicus Bleeker 1853: 502 (Jakarta, Java, Indonesia).

Pseudorhombus javanicus: Norman 1934*; Munro 1955*; De Silva 1956; Gloerfelt-Tarp & Kailola 1984*; Amaoka & Hensley 2001*.

Dorsal fin 67–76 rays; anal fin 51–56 rays; pectoral fin 11 or 12 rays on eyed side, 11 rays on blind side; GR 4–7/12–16; LL scales 66–74. Body depth 2.1–2.3 in SL; HL 3.2–3.7 in SL; upper jaw 2.2–2.7 in HL. First dorsal-fin ray before anterior nostril of blind side. Teeth in jaws small, slightly enlarged anteriorly, 15–25 teeth on blind side of lower jaw. Supratemporal branch of lateral line reaches bases of 9th–11th dorsal-fin rays. Scales on eyed side ctenoid on anterior part and on dorsal and ventral margins of body, remaining areas with mostly cycloid scales; scales on blind side cycloid.

Body on eyed side brownish or greyish, with large dark blotch at origin of straight section of lateral line, and smaller dark blotch on middle section of lateral line; spots and rings scattered on body, and median fins with small dark spots. Attains 35 cm SL.



Pseudorhombus javanicus, 16 cm SL. Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf and India (Mumbai) to Sri Lanka; elsewhere to Indonesia, southern China, western New Guinea and Australia.

REMARKS Inhabits mud and sand bottoms on continental shelves, to at least 38 m deep. Mostly marketed fresh.

Pseudorhombus malayanus Bleeker 1865

Malayan flounder

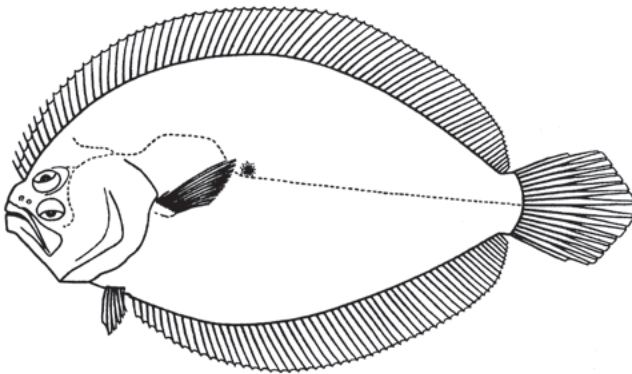
PLATE 93

Pseudorhombus malayanus Bleeker 1865: 43 [1] (Indonesia: Jakarta, Java;

Benkulen [Bengkulu], Sumatra; Singapore; Pemangkat, Borneo; Makassar, Sulawesi; Ambon I., Moluccas); Norman 1934*; Blegvad & Løppenthin 1944; Gloerfelt-Tarp & Kailola 1984*; Randall 1995*; Amaoka & Hensley 2001*.

Dorsal fin 72–77 rays; anal fin 55–61 rays; pectoral fin 11–13 rays on eyed side, 11 rays on blind side; GR 5–8/8–11; LL scales 70–78. Body depth 1.8–2 in SL; HL 3.1–3.8 in SL; upper jaw 2.3–2.4 in HL. First dorsal-fin ray above or slightly in front of posterior nostril of blind side. Teeth in upper jaw small, closely spaced posteriorly, enlarged anteriorly; teeth in lower jaw large, widely spaced, 7–11 on blind side. Supratemporal branch of lateral line extending to bases of 9th–11th dorsal-fin rays. Scales on both sides of body ctenoid.

Body on eyed side brownish, with small dark blotch at origin of straight section of lateral line; median fins with indistinct dark spots and rings; small pale spots often present on head, body and fins. Attains 35 cm SL.



Pseudorhombus malayanus, 16 cm SL. Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman to India; elsewhere to Indonesia, South China Sea, Philippines and Australia.

REMARKS Mainly continental; trawled from mud and sand bottoms, to ~52 m deep. Mostly sold fresh.

Pseudorhombus natalensis Gilchrist 1904

Natal flounder

PLATE 92

Pseudorhombus natalensis Gilchrist 1904: 8, Pl. 25 (off Cape Natal, KwaZulu-Natal, South Africa); Norman 1934*; Nielsen 1964; SSF No. 259.19*; Heemstra & Heemstra 2004.

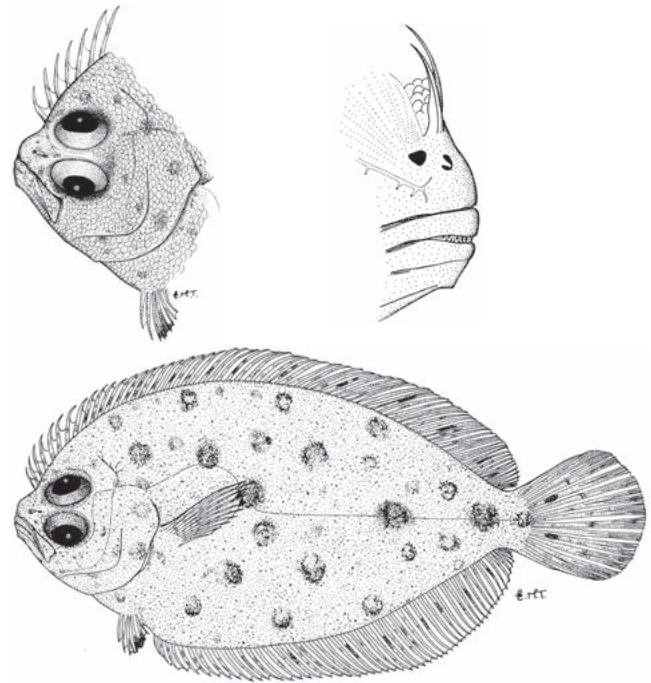
Pseudorhombus russelli (non Gray 1834): Barnard 1925.

Pseudorhombus arsius (non Hamilton 1822): SFSA No. 304 [in part: not Fig. 304 of Pl. 10].

Dorsal fin 68–72 rays; anal fin 52–55 rays; pectoral fin 11 or 12 rays on eyed side, 9–11 rays on blind side; GR 3–6/10–13; LL scales 51–63. Body depth 1.8–2.3 in SL; HL 3.2–3.7 in SL; upper jaw 2.2–2.5 in HL. First dorsal-fin ray over space between nostrils or over posterior nostril of blind side. Teeth

in jaws small, scarcely enlarged anteriorly, 14–31 on blind side of lower jaw. Scales ctenoid on eyed side, mostly cycloid on blind side.

Body on eyed side brownish, with dark rings in ~5 longitudinal rows; row of small dark spots on median fins; usually dark spot near margin of left pelvic fin (on eyed side). Attains at least 14 cm SL.



Pseudorhombus natalensis, eyed side of head (top left), and blind side of head showing low membrane between snout and 1st dorsal-fin ray (top right); 12 cm SL (South Africa). Source: SSF

DISTRIBUTION WIO: South Africa (Durban to Thukela River, KwaZulu-Natal) and Mozambique.

REMARKS Found on sandy bottoms, at 6–260 m.

Pseudorhombus triocellatus

(Bloch & Schneider 1801)

Three-spot flounder

PLATE 93

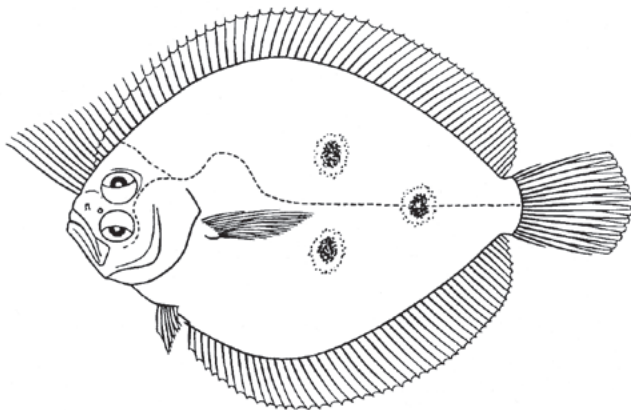
Pleuronectes triocellatus Bloch & Schneider 1801: 145 (Tharangambadi, India).

Pseudorhombus triocellatus: Norman 1934*; Blegvad & Løppenthin 1944; Munro 1955*; De Silva 1956; Gloerfelt-Tarp & Kailola 1984*; Randall 1995*; Amaoka & Hensley 2001*.

Dorsal fin 65–70 rays; anal fin 49–52 rays; pectoral fin on eyed side 11 or 12 rays; lower GR 20–25; LL scales 63–69. Body depth

1.5–1.8 in SL; HL 3.3–3.5 in SL; upper jaw 2.2–2.3 in HL. Body deeply ovoid; head profile without distinct notch in front of upper eye. Gill rakers pointed and slender. First dorsal-fin ray above or slightly in front of anterior nostril of blind side; anterior rays elongated and free from fin membrane. Teeth in jaws small, scarcely enlarged anteriorly. Supratemporal branch of lateral line extending to bases of 10th–13th dorsal-fin rays. Scales ctenoid on eyed side, mostly cycloid on blind side, but ctenoid on anterior part and near bases of dorsal and anal fins.

Body on eyed side brownish, with 3 ocelli: 1 above and 1 below lateral line, and 1 on rear third of straight section of lateral line; many white blotches and spots on body and median fins. Attains 17 cm SL.



Pseudorhombus triocellatus, ~6 cm SL (India). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, India and Sri Lanka; elsewhere to Bay of Bengal, Thailand, Sumatra and southern Indonesia, and northwestern Australia.

REMARKS Mainly continental; found on mud and sand bottoms, at 10–20 m. Feeds on benthic organisms. Sold in markets fresh or dried and salted.

FAMILY PARALICHTHODIDAE

Measles flounder

Dannie A Hensley

Flatfish with eyes on right side of head (dextral), and eyes separated; elongate, compressed body; and preopercle margin easily seen, not hidden by skin or scales. Dorsal-fin origin in front of eyes, above nasal organ on blind side; pectoral fin on both sides of body, middle rays branched; pelvic fins short-based, symmetrically placed, with 6 rays; caudal fin 16 rays, 12 branched, and fin not attached to dorsal fin and anal fin. No fin spines. No distinct caudal peduncle. Vent on blind side

above 1st anal-fin ray. Lateral line on both sides of body, with high arch over pectoral fins.

Some authors consider this taxon a subfamily of the Pleuronectidae. However, it differs from pleuronectids in having the dorsal-fin origin anterior to eyes, no distinct caudal peduncle, and in several osteological characters (Cooper & Chapleau 1998; Pardo *et al.* 2005).

Monotypic.

Paralichthodes algoensis Gilchrist 1902

Measles flounder

PLATE 93

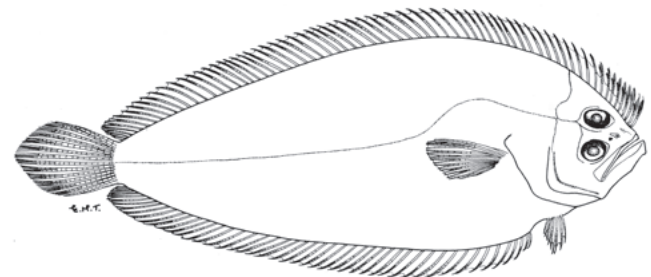
Paralichthodes algoensis Gilchrist 1902: 108, Pl. 8 (Algoa Bay, South Africa); Norman 1934*; SFSa No. 302*; SSF No. 260.2*; Cooper & Chapleau 1998; Heemstra & Heemstra 2004*.

Dorsal fin 67–74 rays; anal fin 47–54 rays; pectoral fins 12 or 13 rays on eyed side, 11 rays on blind side; pelvic fins 6 rays; GR 8 or 9/19–21; LL scales 110–125. Body depth 2.3–2.5 in SL; HL 3.8–4.5 in SL. Large opening between left and right gill chambers. Scales cycloid on both sides of body. Vertebrae 10 + 21.

Eyed side brownish grey, with small dark spots; fins paler, with single series of dark spots; blind side white. Attains 50 cm SL.



Paralichthodes algoensis, 19 cm SL, and head of same specimen (South Africa). Source: SSF



DISTRIBUTION WIO: Mozambique (Maputo Bay) to South Africa (Mossel Bay).

REMARKS Found on sandy and silty bottoms, to ~100 m deep. Often caught in large quantities as bycatch, especially in shrimp fisheries in Mozambique.

FAMILY POECILOPSETTIDAE**Righteye flounders**

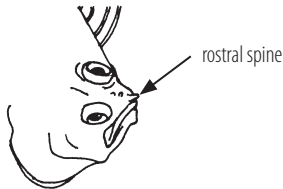
Dannie A Hensley and Kunio Amaoka

Flatfishes with eyes on right side of head (dextral); body ovate or elongate, compressed; preopercle margin not hidden by skin and scales; anus on midventral line. Mouth small, upper jaw less than half head length. Dorsal-fin origin above eyes, behind nasal organ on blind side; pectoral fin present on each side of body; pelvic fins short-based, with 6 rays; caudal fin with 20 rays, 14 or 15 branched, and fin not attached to dorsal fin and anal fin. No fin spines. Lateral line on eyed side with arch over pectoral fin; lateral line on blind side rudimentary or absent.

Some authors consider this group as subfamily Poecilopsettinae of the family Pleuronectidae. However, they differ from pleuronectids in the lateral line on the blind side being rudimentary or absent, and in some osteological characters (Sakamoto 1984; Chapleau 1993). Three genera and 21 species, in Atlantic and Indo-Pacific; all 3 genera and 9 species in WIO.

KEY TO GENERA

- 1a Anterior rays of dorsal fin and pelvic fin on eyed side elongate, more so in males; males with strong rostral spine, and teeth on eyed side of upper jaw extending onto outer surface of lower jaw *Marleyella*



- 1b No elongate dorsal- or pelvic-fin rays; males without rostral spines 2
- 2a No cirri (tentacles) over eyes *Poecilopsetta*
- 2b One cirrus (tentacle) present over at least one eye *Nematops*

GENUS *Marleyella* Fowler 1925

Differs from genus *Poecilopsetta* in having sexual dimorphism of several features: anterior rays of dorsal fin and pelvic fins elongated in both sexes, but very long in males; strong rostral spine present in males (spine small in females); teeth in upper jaw on eyed side extend onto outer surface of lower jaw in males. Two species, both in WIO.

KEY TO SPECIES

- 1a Body depth 1.9–2.2 in SL; eye diameter 3.3–4 in HL; lower GR 10–12; dorsal-fin origin over middle of upper eye *M. bicolorata*
- 1b Body depth 2.6–2.8 in SL; eye diameter 3–3.2 in HL; lower GR 15; dorsal-fin origin over rear half of upper eye *M. maldivensis*

***Marleyella bicolorata* (Von Bonde 1922)**

Comb flounder

PLATE 94

Poecilopsetta bicolorata Von Bonde 1922: 14, Pl. 5, Fig. 2 (KwaZulu-Natal, South Africa).

Poecilopsetta (Marleyella) bicolorata: Fowler 1925.

Marleyella bicolorata: Norman 1934*; SFSa No. 300*; Kotthaus 1977*; SSF No. 260.1*.

Body depth ~2 in SL; HL 3.4–3.5 in SL. Dorsal fin 55–57 rays; anal fin 46 or 47 rays; pectoral fin 11 or 12 rays on eyed side, 10 or 11 rays on blind side; GR 5 or 6 + 10–12; LL scales 70–78. Males with strong rostral spine overhanging upper jaw on eyed side, and similar but smaller spine on blind side; females with small rostral projection on eyed side, and none on blind side. Males with dorsal-fin rays 2–8 greatly elongated; females with dorsal-fin rays 2–4 or 5 somewhat longer than more posterior rays. Pelvic fin on eyed side with first 3 rays elongated, and these rays longer in males than females. Teeth irregularly biserial (in 2 rows) or in narrow bands; teeth extend onto outer surface of upper jaw in males. Scales weakly ctenoid on eyed side, cycloid on blind side. Vertebrae 10 + 26.

Body on eyed side dark brown, with black spots or blotches tending to form vague crossbars; pectoral fin on eyed side and pelvic fins with dark spots, and median fins with both smaller and larger black spots; caudal fin with dark vertical bar near base. Blind side also dark brown, with indistinct darker markings, but branchial area bluish, and head with small round black spots. Attains 19 cm TL.



Marleyella bicolorata, 18 cm TL, female (left) (Kenya); 19 cm TL, head of male specimen (right) (South Africa). Outlines drawn from Norman 1934

DISTRIBUTION WIO: Socotra, Kenya, Tanzania (Zanzibar), Mozambique and South Africa (KwaZulu-Natal); unconfirmed record from southwestern India (Samma 1963).

REMARKS Found at 20–400 m.

Marleyella maldivensis Norman 1939

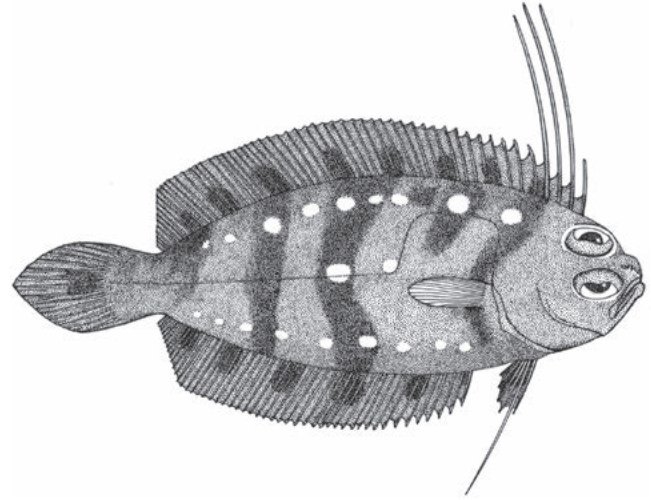
Maldives comb flounder

Marleyella maldivensis Norman 1939: 103, Fig. 34 (Maldives); Adam *et al.* 1998*.

Body depth 2.6–2.8 in SL; HL 3.1–3.3 in SL. Dorsal fin 58 or 59 rays; anal fin 49 or 50 rays; pectoral fin 13 or 14 rays on eyed side; GR 15 on lower limb; LL scales ~80. Dorsal-fin rays 2–3 or 4 elongated; 2nd ray of pelvic fin on eyed side elongated. Blunt prominence on snout in front of anterior nostril. Teeth in narrow bands in both jaws. Scales weakly ctenoid on eyed side, cycloid on blind side.

Body on eyed side greyish brown, with darker blotches tending to form irregular crossbars, and some small round white spots; median fins greyish; tips of dorsal- and anal-fin

rays white, and both fins with row of dark spots; both pectoral fins dusky, lower part of fin with black spot distally (spot more distinct on underside of fin); pelvic fins dusky, distal parts of 2nd and 3rd rays pale; round black spot on middle of caudal-fin base. Blind side yellowish anteriorly, more or less darker posteriorly, especially towards edges of body; black blotch on head just in front of dorsal fin. Attains 13 cm TL.



Marleyella maldivensis, 13 cm TL, female holotype (Maldives). Drawn from Norman 1939

DISTRIBUTION Known only from two specimens collected from the Maldives.

REMARKS Taken at ~229 m.

GENUS *Nematops* Günther 1880

Differs from genus *Poecilopsetta* in having a tentacle on one or both eyes and elongated pectoral-fin rays in males of only one species. Four species, possibly 1 in WIO.

Nematops grandisquama

Weber & De Beaufort 1929

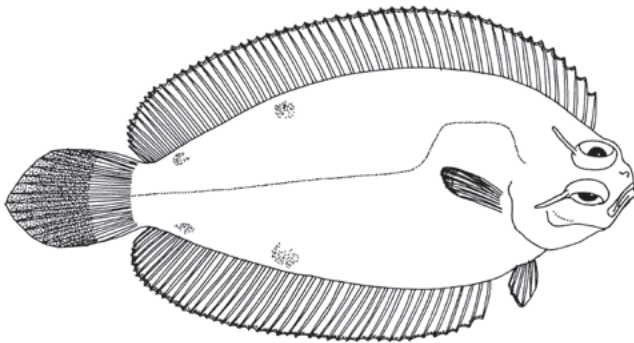
Large-scaled righteye flounder

Nematops grandisquama Weber & De Beaufort 1929: 134, Fig. 32 (St Nikolas Bay, Bali, Indonesia); Norman 1934*.

Body depth 2.2–2.4 in SL; HL 3.7–4 in SL. Dorsal fin 52–65 rays; anal fin 45–53 rays; pectoral fin 7–9 rays on eyed side, 6 or 7 rays on blind side; GR 4/11 or 12; LL scales 44–48.

Dorsal-fin origin above middle of upper eye. Eyes close-set, and upper eye enters dorsal profile; tentacle over eye nearly same length as eye diameter. Teeth small, in 1 or 2 rows. Scales deciduous; ctenoid on eyed side, cycloid on blind side. Vertebrae 10 + 26 or 27.

Body on eyed side brownish red, with black blotches on upper and lower edges: 1 blotch below beginning of rear third of dorsal fin, and 1 blotch above corresponding point of anal fin (most distinct); dorsal fin and anal fin with dark markings; caudal fin with transverse dark blotches posteriorly; pectoral-fin tip blackish; tentacle over eye(s) blackish. Attains 9 cm TL.



?*Nematops grandisquama*, 8 cm TL, paratype (Indonesia).

Drawn from Norman 1934

DISTRIBUTION Indo-Pacific: Indonesia (Bali), and an unconfirmed record from southwestern India in WIO (Saramma 1963).

REMARKS Type specimens collected from 108–162 m.

GENUS *Poecilopsetta* Günther 1880

Body ovate or elliptical, and strongly compressed. Dorsal-fin origin above middle of upper eye; no elongated rays in anterior part of dorsal fin in males or females. Eyes contiguous or separated by narrow space; interorbital width similar in both sexes. No rostral or orbital spines in males or females. Mouth rather small, maxilla extending to below or slightly beyond anterior margin of lower eye. Teeth in narrow bands in both jaws, and scarcely enlarged anteriorly. Gill rakers slender and without serrations. Lateral line on eyed side strongly arched over pectoral fin. Scales small or moderate; ctenoid on eyed side, cycloid on blind side. Fifteen species: 2 in Atlantic Ocean and 13 in Indo-Pacific; at least 6 species in WIO.

KEY TO SPECIES

- | | | |
|----|---|-------------------------|
| 1a | LL scales 126–147 | <i>P. normani</i> |
| 1b | LL scales 70–113 | 2 |
| 2a | Eyes separated by low, narrow, scaly interorbital region; body depth 1.9–2.2 in SL | <i>P. colorata</i> |
| 2b | No obvious scaly interorbital region, and eyes contiguous or nearly so; body depth 2.3–3 in SL | 3 |
| 3a | LL scales 87–113 | 4 |
| 3b | LL scales 70–82 | 5 |
| 4a | Head 3.8–4 in SL; front edge of lower eye distinctly in front of upper eye; length of lateral line curved section ~3 times in length of straight section | <i>P. praelonga</i> |
| 4b | Head 4–4.5 in SL; front edge of lower eye slightly in front of or level with that of upper eye; length of lateral line curved section 3.3–3.7 times in length of straight section | <i>P. zanzibarensis</i> |
| 5a | Dorsal fin 57–65 rays; GR 7 or 8/9–11; upper jaw 3.2–4.4 in HL; pectoral fin on eyed side 1.6–2.1 in HL | <i>P. natalensis</i> |
| 5b | Dorsal fin 65 or 67 rays; GR 6 or 7/12; upper jaw 2.8 in HL, pectoral fin on eyed side 2.7–3.3 in HL | <i>P. vaynei</i> |

Poecilopsetta colorata Günther 1880

Coloured righteye flounder

PLATE 94

Poecilopsetta colorata Günther 1880: 48, Pl. 22, Fig. B (Kai Is., Indonesia, Arafura Sea); Norman 1927, 1934*; Munro 1955*; Quéro *et al.* 1988.

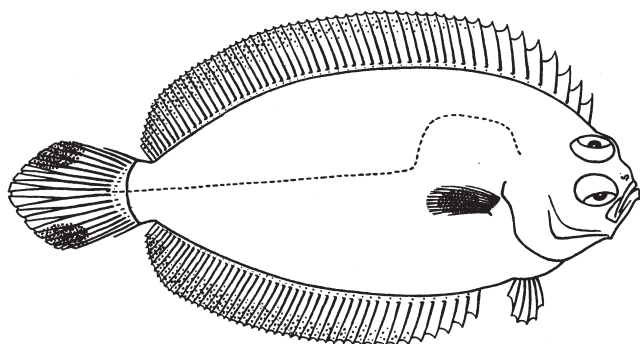
Poecilopsetta maculosa Alcock 1894: 130 [16], Pl. 7, Fig. 1 (Bay of Bengal).

Boopsetta maculosa: Alcock 1899.

Body depth 1.9–2.2 in SL; HL 3.5–4.2 in SL; upper jaw ~3 in HL; pectoral fin on eyed side 2–2.3 in HL. Dorsal fin 55–62 rays; anal fin 46–53 rays; pectoral fin on eyed side 11 or 12 rays; lower-limb GR 10 or 11; LL scales 90–124. Eyes separated by low, narrow, scaled ridge in adults. Scales on eyed side weakly ctenoid in adults, cycloid in juveniles; scales on blind side cycloid. Vertebrae 10 + 28 or 29.

Adults pale brownish on eyed side, and head and body with numerous blackish dots; pectoral fin with large dark spot covering most of fin; pair of black spots at middle of upper and lower margins of caudal fin; blind side whitish with traces of black spots. Juveniles pale yellowish brown on eyed side, with

series of 6 or 7 black blotches or short bars at upper and lower edges of body, and two series of rather large blotches on middle of body, one on each side of lateral line; blind side with similar blotches, those on middle of body smaller and in 4 rows. Attains ~17 cm TL.



Poecilopsetta colorata, 14 cm TL, holotype (Kai Is.). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Sri Lanka and Gulf of Mannar; elsewhere to Bay of Bengal, Indonesia and South China Sea.

REMARKS Found at 228–800 m.

Poecilopsetta natalensis Norman 1931

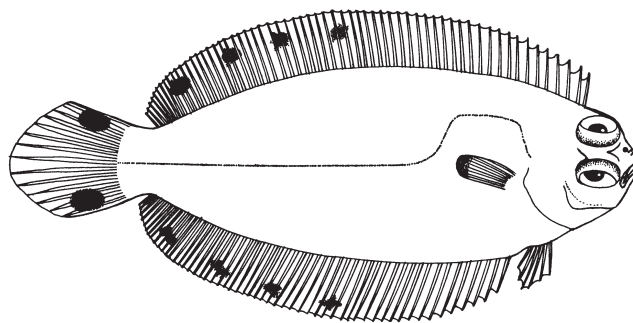
African righteye flounder

PLATE 94

Poecilopsetta natalensis Norman 1931: 426 (KwaZulu-Natal, South Africa); Norman 1934*; SFSA No. 301*; SSF No. 260.3*; Quérou *et al.* 1988*; Adam *et al.* 1998; Hensley 2001*.

Body depth 2.5–2.8 in SL; HL 4–4.6 in SL; upper jaw 3.2–4.4 in HL; pectoral fin on eyed side 1.6–2.1 in HL. Dorsal fin 57–65 rays; anal fin 49–56 rays; pectoral fin on eyed side 8–10 rays; GR 7 or 8/9–11; LL scales 75–82. Eyes contiguous or separated by very narrow, low, naked ridge. Vertebrae 10 + 30 or 31.

Body on eyed side brown, usually with 6 longitudinal rows of dark spots; dorsal fin, anal fin, pectoral fin on eyed side and pelvic fins darker than body; dorsal fin and anal fin with 5 or 6 dark spots, sometimes diffuse; pair of black spots at middle of upper and lower margins of caudal fin. Blind side pale with dusky spots. Prejuvenile stage with upper and lower third of body transparent, and prominent black spots on both sides of body. Attains 15 cm TL.



Poecilopsetta natalensis, 7 cm SL (South Africa). Drawn from Norman 1934

DISTRIBUTION Indian Ocean and possibly northwestern Pacific. WIO: Kenya to South Africa (KwaZulu-Natal), Madagascar, Réunion and Maldives; elsewhere, possibly Taiwan (Chen & Weng 1965; Shen 1982).

REMARKS Found at 213–450 m. Metamorphoses from prejuvenile to adult stage at ~7–8 cm SL.

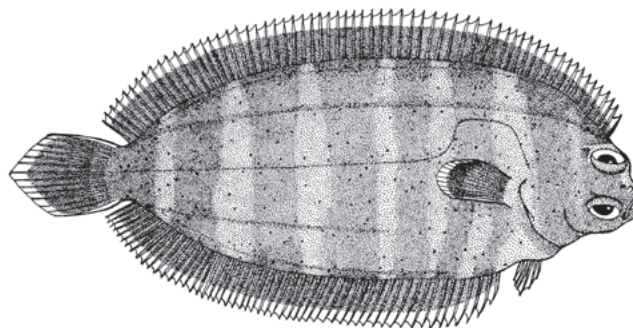
Poecilopsetta normani Foroshchuk & Fedorov 1992

Small-scaled poecilopsetta

Poecilopsetta normani Foroshchuk & Fedorov 1992: 11, Fig. (Saya de Malha Bank, Mascarene Ridge).

Body depth 2.1–2.4 in SL; HL 4.3–4.8 in SL; upper jaw 3.5–4.3 in HL; pectoral fin on eyed side 1.5–2 in HL. Dorsal fin 62–68 rays; anal fin 51–58 rays; pectoral fin on eyed side 13–17 rays; GR 13 or 14 on lower limb; LL scales 126–147. Eyes separated by narrow, scaly interorbital region. Scales ctenoid on eyed side, cycloid on blind side. Vertebrae 10 + 30–32.

Body on eyed side greyish, with 6 or 7 indistinct, broad, darker grey bars, and scattered with small brown spots; dorsal fin and anal fin darker than body, except tips of rays white; caudal fin blackish grey; middle parts of dorsal- and pelvic-fin margins with darker spot; pectoral fin with dark crescent-shaped band on distal half. Attains at least 14 cm TL.



Poecilopsetta normani, 10 cm SL, male holotype (Saya de Malha Bank). Drawn from photograph

DISTRIBUTION Known only from the type specimens collected from Saya de Malha Bank.

REMARKS Taken at 255–270 m.

Poecilopsetta praelonga Alcock 1894

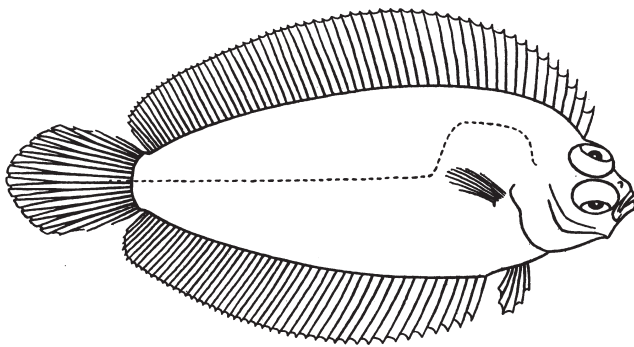
Alcock's narrowbody righteye flounder

Poecilopsetta praelonga Alcock 1894: 130 [16], Pl. 7, Fig. 2 (off Colombo, Sri Lanka); Norman 1934*; Munro 1955*; Chen & Weng 1965*;
Quéro *et al.* 1988; Hoshino *et al.* 2000; Hensley 2001*.

Boopsetta umbrarum Alcock 1896: 305 [5] (off Colombo, Sri Lanka).

Body depth 2.3–3 in SL; HL 3.8–4 in SL; upper jaw 3.6–4 in HL; pectoral fin on eyed side 1.6–1.8 in HL. Dorsal fin 57–65 rays; anal fin 45–55 rays; pectoral fin 5–10 rays on eyed side; GR 5–8/7–12; LL scales 91–113. Eyes nearly contiguous. Scales on eyed side weakly ctenoid in adults, cycloid in juveniles; scales on blind side cycloid. Vertebrae 10 + 29–32.

Body on eyed side yellowish brown, with darker blotches; median fins brownish with paler margins; pectoral fin brownish, blackish distally. Blind side of body whitish, with traces of black spots. Transformation larvae and juveniles (68–93 mm SL) with 6 or 7 black blotches at upper and lower edges of body, and series of dark blotches on each side of lateral line, and similar blotches on blind side. Attains 17.5 cm TL.



Poecilopsetta praelonga, 5 cm SL (off E India). Source: Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Sri Lanka; elsewhere, eastern Indian Ocean, Taiwan, Timor Sea and northwestern Australia.

REMARKS Found at 216–700 m.

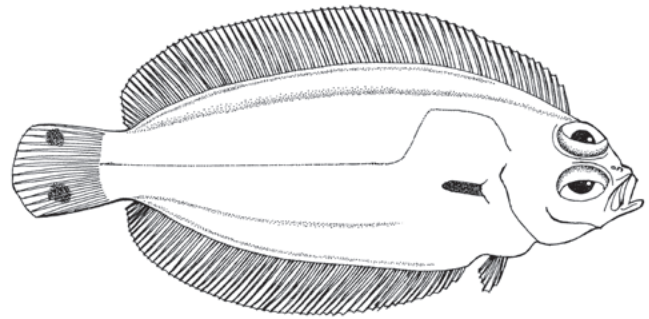
Poecilopsetta vaynei Quéro, Hensley & Maugé 1988

Vayne's flounder

Poecilopsetta vaynei Quéro, Hensley & Maugé 1988: 326,
Fig. 3 (southwestern Madagascar).

Body depth ~2.7 in SL; HL 3.9–4.4 in SL; upper jaw 2.8 in SL; pectoral fin on eyed side 2.7–3.3 in HL. Dorsal fin 65–67 rays; anal fin 55 or 56 rays; pectoral fin on eyed side 8 rays; GR 6 or 7/12; LL scales 72–83. Eyes contiguous. Scales ctenoid on eyed side, cycloid on blind side. Vertebrae 10 + 29.

Body on eyed side uniformly pale brown; 2 black spots on caudal fin; 2 dark spots barely visible on posteriormost dorsal and anal-fin rays; pectoral fin on eyed side darkish on lower edge and distally. Attains at least 13 cm TL.



Poecilopsetta vaynei, 11 cm SL, male holotype (Madagascar).
Drawn from Quéro *et al.* 1988

DISTRIBUTION Known only from the type specimens collected from Madagascar.

REMARKS Taken at 65–70 m.

Poecilopsetta zanzibarensis Norman 1939

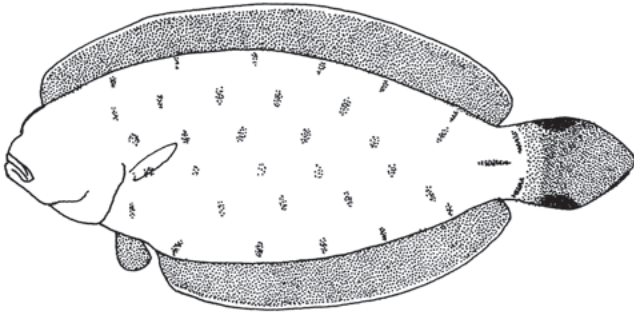
Zanzibar righteye flounder

PLATE 94

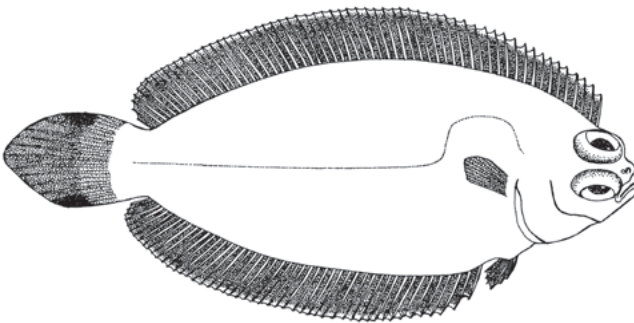
Poecilopsetta zanzibarensis Norman 1939: 102, Fig. 33 (near Zanzibar, Tanzania); Quéro *et al.* 1988.

Body depth 2.3–3 in SL; HL 4–4.9 in SL; upper jaw 3.6–4 in HL; pectoral fin on eyed side 2.2–2.4 in HL. Dorsal fin 60–64 rays; anal fin 50–54 rays; pectoral fin 9–11 rays on eyed side; GR 10–14 on lower limb; LL scales 95–100. Eyes nearly contiguous, lower eye scarcely in front of upper eye. Scales weakly ctenoid on eyed side, cycloid on blind side. Vertebrae 10 + 32 or 33.

Body on eyed side pale brownish, without distinct markings; fins more or less dusky or blackish; dorsal- and anal-fin rays white tipped; pair of conspicuous black spots at middle of upper and lower margins of caudal fin. Blind side yellowish white, with series of small black spots (more conspicuous in juveniles). Attains 16 cm TL.



Poecilopsetta zanzibarensis, 13 cm SL, blind side (S Mozambique).



Poecilopsetta zanzibarensis, 13 cm TL, holotype (Tanzania).
Drawn from Norman 1939

DISTRIBUTION Indian Ocean. WIO: Kenya and Tanzania (Zanzibar) to southern Mozambique, and unconfirmed reports from Saya de Malha Bank (Foroshchuk & Fedorov 1992).

REMARKS Found at 183–457 m.

FAMILY SAMARIDAE

Dwarf flounders

Dannie A Hensley and Kunio Amaoka

Flatfishes with extremely compressed bodies, and eyes on right side of head (dextral); edge of preopercle free, not hidden by skin or scales; jaws small, but upper jaw usually at least twice in HL. Dorsal-fin origin on blind side, and appearing anterior to eyes on eyed side; no pectoral fin on blind side; pelvic fins elongated, base of eyed-side fin somewhat anterior to that of blind-side fin; caudal fin usually 15 or 16 rays (0–12 branched),

and fin not attached to dorsal fin and anal fin. No fin spines. Anus on midventral line, but urinary papilla on eyed side. Gill rakers short and not denticulate, if present. Lateral line on eyed side nearly straight, and lateral line on blind side rudimentary. Scales small.

Some authors consider this group a subfamily of the Pleuronectidae, but samarids differ from pleuronectids in lacking a pectoral fin on the blind side, having the dorsal-fin origin anterior to the eyes, as well as in several osteological characters (Sakamoto 1984; Chapleau 1993). Three genera and 27 species, confined to Indo-Pacific region; 2 genera and 8 species in WIO.

KEY TO GENERA

- 1a Anterior rays of dorsal fin and eyed-side pelvic-fin rays filamentous *Samaris*
- 1b Anterior rays of dorsal fin and eyed-side pelvic-fin rays not elongated *Samariscus*

GENUS *Samaris* Gray 1831

Body elliptical, rather narrow, and strongly compressed. Eyes contiguous or separated by narrow concave space, and not covered by scales; interorbital width similar in both sexes. No rostral or orbital spines in males or females. Mouth small; maxillary extending to below anterior margin of lower eye. Teeth on both jaws small, villiform, in bands, and scarcely enlarged anteriorly. Dorsal fin with greatly elongated and filamentous anterior rays in both sexes; eyed-side pelvic fin with 5 elongated, pinniform (feathery) rays; caudal-fin rays either all unbranched or middle rays branched (Mihara & Amaoka 2004). Gill rakers rudimentary. Scales ctenoid with short ctenii on eyed side, and feebly ctenoid or cycloid on blind side. Five species, 3 in WIO.

KEY TO SPECIES

- 1a First 10–15 rays of dorsal fin elongated, their lengths ~4–5 in HL *S. cristatus*
- 1b First 6–8 rays of dorsal fin somewhat elongated, their lengths <3 in HL 2
- 2a Dorsal fin 59–63 rays; anal fin 44–50 rays; LL scales 50–55 *S. macrolepis*
- 2b Dorsal fin 71–79 rays; anal fin 55–60 rays; LL scales 70–75 *S. costae*

Samaris costae Quéro, Hensley & Maugé 1989

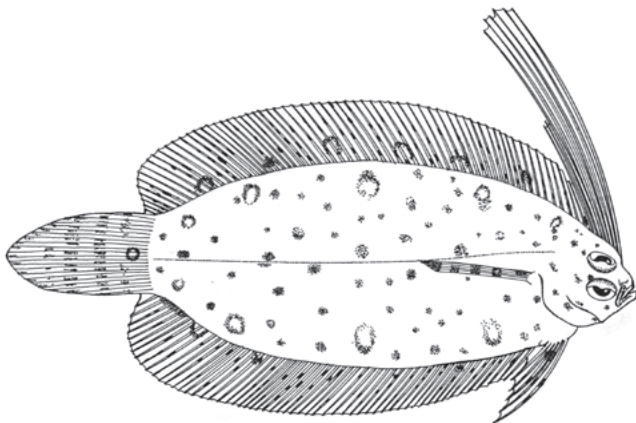
Costa's dwarf flounder

PLATE 95

Samaris costae Quéro, Hensley & Maugé 1989: 105, Fig. 1 (off west coast of Réunion, Mascarenes).

Dorsal fin 71–79 rays; anal fin 55–60 rays; pectoral fin 4 rays. First 7 or 8 rays of dorsal fin elongated, 1st ray 2–2.7 in HL; last 4 or 5 rays of dorsal and anal fins smaller and closer together than preceding rays, and covered by fold of skin on eyed side. Body depth 2.4–2.7 in SL; HL 4.2–4.4 in SL; upper jaw 3.2–3.6 in HL; eyed-side pelvic fin 1–1.1 in HL. Snout shorter than eyes; front edge of upper eye behind vertical at front edge of lower eye. LL scales 70–75. Vertebrae 10 + 32.

Eyed side pale brownish yellow with many dark spots, and 4 clearly visible ocelli along ventral border of body, 4 ocelli along middle of eyed side, and 5 ocelli along dorsal border of body; filamentous rays of dorsal fin white, rest of fin translucent with dark spots and 6 ocelli along base; pectoral fin with 5 dark crossbands and blackish near tip; eyed-side pelvic fin with 4 dark crossbands. Attains 12 cm SL.



Samaris costae, 7 cm SL, male paratype (Réunion).

Drawn from Quéro *et al.* 1989

DISTRIBUTION WIO: South Africa (KwaZulu-Natal), Réunion and southeastern Madagascar.

REMARKS Found on coral-rubble bottom, at 50–227 m.

Samaris cristatus Gray 1831

Crested flounder

PLATE 95

Samaris cristatus Gray 1831: 5 (China); Norman 1934*; SFSA No. 303*; Kotthaus 1977*; SSF No. 260.4*.

Samaris ornatus Von Bonde 1922: 13, Pl. 6 (KwaZulu-Natal, South Africa); Norman 1934*.

Samaris delagoensis Von Bonde 1925: 289 (Maputo Bay, Mozambique); Norman 1934*; Hensley 2001*; Mihara & Amaoka 2004*.

Dorsal fin 73–88 rays; anal fin 49–60 rays; pectoral fin 4 rays. First 10–15 rays of dorsal fin filamentous, and fold of skin present from base of 1st ray across blind side of head to rear end of lower jaw; last 4 or 5 rays of dorsal and anal fins smaller and closer together than preceding rays and covered by fold of skin on eyed side. Body depth 2.5–2.9 in SL; HL 3.7–5.5 in SL; upper jaw 2.6–3.4 in HL; eye diameter 3–4.4 in HL. Snout short, blunt; prominent indentation in front of upper eye. LL scales 63–82.

Eyed side brownish, covered with darker spots and blotches; series of blotches along dorsal and ventral margins of body; filamentous dorsal-fin rays white; median fins brown, pectoral fin darker. Blind side whitish. Attains 22 cm SL.



Samaris cristatus, 14 cm TL (Mozambique).

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (KwaZulu-Natal); elsewhere to Indonesia, South China Sea, Philippines, Taiwan, Japan, northern Australia, Great Barrier Reef and New Caledonia.

REMARKS Inhabits sandy or silty mud bottom, in marine or brackish water, at 20–70 m. Flicks the long dorsal-fin rays when alarmed.

Samaris macrolepis Norman 1927

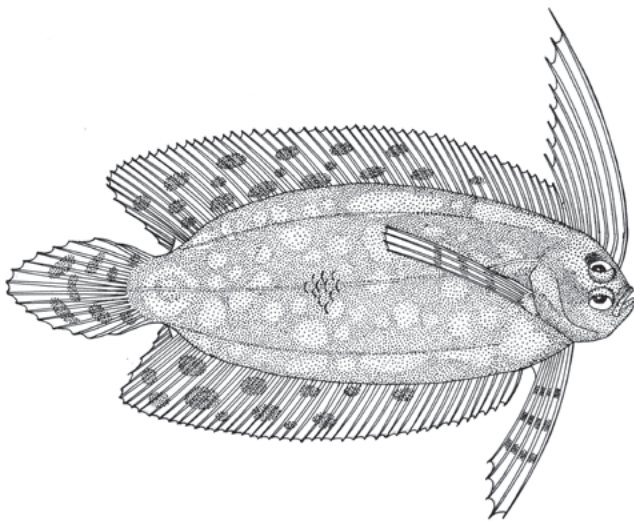
Large-scale crested flounder

PLATE 95

Samaris macrolepis Norman 1927: 45, Pl. 6 (Gulf of Martaban, Myanmar); Hoshino & Amaoka 1998*; Hensley 2001*.

Dorsal fin 59–63 rays; anal fin 44–50 rays; pectoral fin 4 rays. First 6–8 rays of dorsal fin filamentous, 1st ray 1.5–2.5 in HL; last 4 or 5 rays of dorsal and anal fins smaller and closer together than preceding rays and covered by fold of skin on eyed side. Body depth 2.3–2.5 in SL; HL 3.9–4.4 in SL; upper jaw 3–3.3 in HL; eyed-side pelvic fin ~0.8 in HL. Snout shorter than eyes; front edge of upper eye slightly behind or at same level as front edge of lower eye. LL scales 50–55.

Eyed side brownish, mottled and spotted with pale and dark areas; dorsal, anal and caudal fins with brown spots; pectoral fin with 3 narrow crossbars. Attains 11 cm SL.



Samaris macrolepis, 5 cm TL, holotype (Gulf of Martaban). Drawn from Norman 1927

DISTRIBUTION Indo-Pacific. WIO: Mozambique and South Africa (Sodwana Bay); elsewhere, Myanmar (Gulf of Martaban), northwestern Australia and Chesterfield Is.

REMARKS Found on coarse sand, coral rubble, and dead red algae *Lithothamnion*, at 50–177 m.

GENUS *Samariscus* Gilbert 1905

Differs from genus *Samaris* in having both eyes with scales (Sakamoto 1984), no elongated anterior dorsal-fin rays or eyed-side pelvic-fin rays, and middle 11 or 12 caudal-fin rays branched. Twenty species, 5 in WIO.

KEY TO SPECIES

- 1a No lateral line on either side of body; eyed-side pelvic fin 3.2 in HL *S. leopardus*
- 1b Lateral line present on both sides; eyed-side pelvic fin <2.8 in HL 2
- 2a Eyed side of body with 2 or 3 dark rings (about size of eyes) on or just below lateral line *S. triocellatus*
- 2b No dark rings on eyed side below lateral line 3
- 3a Pectoral-fin length at least twice HL *S. longimanus*
- 3b Pectoral-fin length less than twice HL 4
- 4a Upper-jaw length ~2.6 in HL; LL scales 71–78 *S. nielsenii*
- 4b Upper-jaw length 2.9–4 in HL; LL scales 59–70 *S. maculatus*

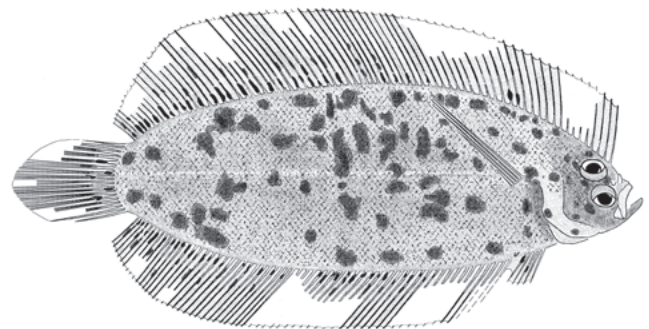
Samariscus leopardus Voronina 2009

Leopard dwarf founder

Samariscus leopardus Voronina 2009: 575, Figs. 1–4 (Saya de Malha Bank).

Dorsal fin 72 rays; anal fin 59 rays; pectoral fin 5 rays. Body depth 3 in SL; HL 4.2 in SL. GR 3/10. Unique in having no lateral line on eyed side. Vertebrae 9 + 33.

Preserved specimen with eyed side of head and body and pectoral fin dark; numerous irregular blackish spots on body and head, and smaller blackish spots on dorsal and anal fins and pelvic fins. Attains at least 12 cm SL.



Samariscus leopardus, 12 cm SL, holotype (Saya de Malha Bank). Source: Voronina 2009

DISTRIBUTION Known only from the holotype collected from Saya de Malha Bank.

REMARKS Taken at 159 m.

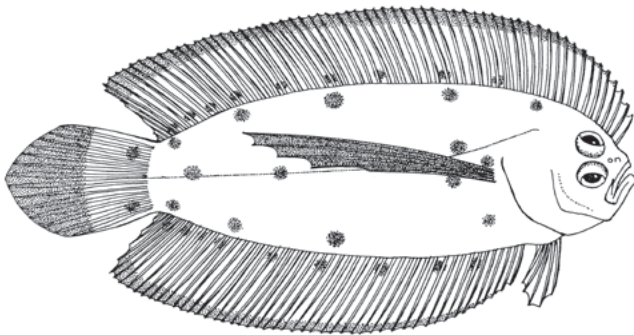
Samariscus longimanus Norman 1927

Longfinned dwarf flounder

Samariscus longimanus Norman 1927: 46, Pl. 7 (west of Sri Lanka); Norman 1934*; Sakamoto 1984.

Dorsal fin 66–71 rays; anal fin 50–54 rays; pectoral fin 5 rays. Body depth 2.6–3 in SL; HL 3.5–3.6 in SL; upper jaw ~3 in HL; pectoral fin ~0.5 in HL. Gill rakers rudimentary. LL scales 55–60. Vertebrae 9 + 29 or 30.

Eyed side greyish brown, with 5 black spots along dorsal edge, 3 or 4 along ventral edge, several around beginning of lateral line, and 1 or 2 on straight part of lateral line; pectoral fin blackish; caudal fin with dusky margin and 2 small dark spots near base. Attains 13 cm SL.



Samariscus longimanus, 13 cm TL, holotype (off Sri Lanka). Drawn from Norman 1934

DISTRIBUTION Known only from type specimens collected from Sri Lanka.

REMARKS Taken from 186–192 m.

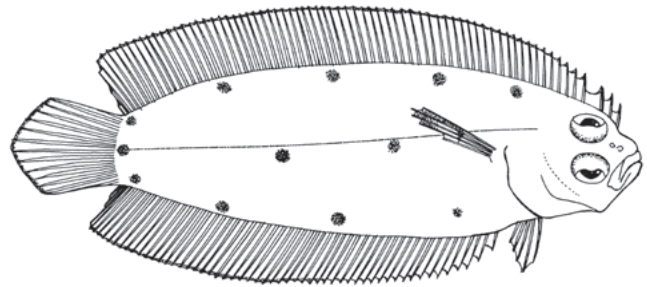
Samariscus maculatus (Günther 1880)

Spotted dwarf flounder

Samaris maculatus Günther 1880: 47, Pl. 21, Fig. D (Kai Is., Arafura Sea, Indonesia).*Samariscus maculatus*: Norman 1927, 1934*; Hensley 2001*.

Dorsal fin 73 rays; anal fin 57 rays; pectoral fin 5 rays. Body depth 3–3.2 in SL; HL ~3.7 in SL; upper jaw ~3 in HL; pectoral fin 1.2–1.3 in HL. No gill rakers. LL scales 62. Vertebrae 9 + 30.

Eyed side pale brownish, with series of 5 spots along dorsal and ventral edges, and 3 spots on lateral line; median fins with irregular blackish spots and blackish edges; pectoral fin variegated black. Attains at least 10 cm TL.



Samariscus maculatus, 10 cm TL (Kai Is.). Drawn from Norman 1934

DISTRIBUTION Indo-Pacific. WIO: Maldives; elsewhere, Kai Is. (Indonesia).

REMARKS Found on sand bottoms, at 80–252 m.

Samariscus nielseni Quéro, Hensley & Maugé 1989

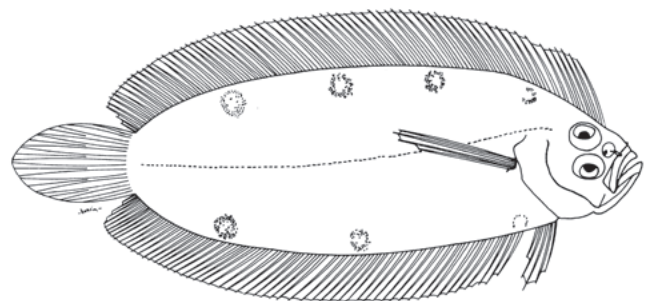
Nielsen's dwarf flounder

PLATE 95

Samariscus nielseni Quéro, Hensley & Maugé 1989: 108, Figs. 2–3 (NW coast of Madagascar); Hensley 2001*.

Dorsal fin 64–70 rays; anal fin 54–56 rays; pectoral fin 4 rays. Body depth ~2.9 in SL; HL 3.7–4 in SL; pectoral fin ~1.1 in HL. GR 1/6. LL scales 71–78. Vertebrae 10 + 31.

Eyed side buff, with 4 large dark spots along dorsal margin, and 2 or 3 spots along ventral margin (rear spots larger and more distinct); pectoral fin dark for entire length between middle 2 rays, other fins pale with irregular dark spots. Attains ~8.5 cm SL.



Samariscus nielseni. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: northwestern Madagascar and South Africa (Aliwal Shoal); elsewhere, New Guinea.

REMARKS Found at 25–150 m.

Samariscus triocellatus Woods 1960

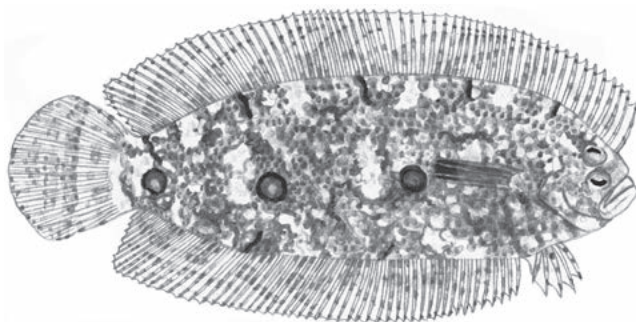
Three-spot dwarf flounder

PLATE 95

Samariscus triocellatus Woods 1960: 66, Fig. 149 (Bikini Atoll, Marshall Is.); Winterbottom 1978; Smith 1980; SSF No. 260.5*; Hensley 2001*.

Dorsal fin 62–70 rays; anal fin 47–56 rays; pectoral fin 4 or 5 rays. Body depth 2.4–3.1 in SL; HL 3.6–4.3 in SL. Total GR 6–8, rudimentary. LL scales 71–76. Vertebrae 9 + 31 or 32.

Eyed side brown, mottled with irregular dark and pale markings; 2 or 3 dark-edged ocelli along lateral line (1st near tip of pectoral fin, and last at caudal-fin base); pectoral fin blackish distally; dorsal and anal fins with minute black spots, and caudal fin with small dark spots. Attains 9 cm SL.



Samariscus triocellatus, 8 cm SL (South Africa).

DISTRIBUTION Indo-Pacific (widespread). WIO: Red Sea to South Africa (Aliwal Shoal, KwaZulu-Natal) and most WIO island groups; elsewhere to Izu Is. (Japan), Australia, New Caledonia, Tonga, Pitcairn Is. and Hawaii.

REMARKS Found on sand near coral reefs, at 3–35 m. Observed to wave its pectoral fin anticlockwise, a behaviour that may act as a type of lure (Anderson *et al.* 1998).

GLOSSARY

denticulate – tooth-like.

pinniform – shaped like a fin.

villiform – having the appearance of velvet or fine bristles of a brush.

FAMILY CYNOGLOSSIDAE

Tonguefishes

Thomas A Munroe

Diverse group of lance- or tongue-shaped flatfishes with eyes on left side of head (sinistral); body highly compressed and tapering to a point posteriorly, with dorsal fin and anal fin confluent with caudal fin. Dorsal fin reaching far forward onto head, usually in advance of rear margin of upper eye; no pectoral fins in adults; pelvic fin with 4 rays, fin(s) located on median line: usually only left fin present, which is connected to anal fin by delicate membrane, but several species of *Cynoglossus* have both pelvic fins. No fin spines. Rear margin of preopercle strongly attached to opercle, covered with skin and scales and without free margin. Eyes small, usually close-set or contiguous. Usually 2 nostrils on each side of head (some species of *Cynoglossus* and all species of *Paraplagusia* with only anterior nostril on eyed side). Mouth small, subterminal, asymmetrical, reaching posteriorly to point between verticals at front and rear margins of lower (non-migrated) eye or slightly behind that eye; jaws moderately curved on eyed side, and notably curved on blind side. Teeth minute and usually better developed on blind-side jaws, some species lacking teeth on eyed-side jaws. Lateral lines 0–3 on eyed side, 0–2 on blind side. Scales generally ctenoid on eyed side of body, and ctenoid or cycloid on blind side of body. Anus and long urogenital papilla on ventral midline just anterior to anal-fin origin; urogenital papilla connected to first ray of anal fin by membrane; digestive and urinary organs not extending to caudal region, but only ovaries and post-urethral portion of urinary bladder extending into caudal region.

Live colours of most species are still unknown or unrecorded. Body of preserved specimens generally brownish or greyish on eyed side, variably marked with spots, blotches or crossbands, and some species also with blotches and spots on fins; most species uniformly whitish or yellowish on blind side of body, but variously sometimes with tiny dots (melanophores), especially at bases of fin rays, or with larger pigmented blotches, but a few deep-sea species darkly pigmented on blind side. The eyed-side background colour may vary within a species depending on the substrate the specimen was collected from, but generally each species has a characteristic colour pattern that can assist in identifications.

Chapleau (1988) corroborated the monophyly of this family based on 27 derived characters. Chapleau (1988) also demonstrated the monophyly of *Paraplagusia* and *Symphurus*; however, he was unable to find defining characters to support the monophyly of *Cynoglossus*, and suggested that the genus may be a composite of several monophyletic entities. The diagnoses of monophyletic genera and their relationships within the family require further study. Species of *Cynoglossus* (Menon 1977) and *Paraplagusia* (Menon 1980; Chapleau & Renaud 1993) have been revised. Various geographic assemblages of species within the species-rich genus *Symphurus* have also been revised (Munroe 1990, 1998) or updated (Munroe 1992; Munroe *et al.* 1995; Munroe & Marsh 1997; Munroe & Amaoka 1998). The species-level taxonomy of *Cynoglossus* remains problematic, and new species of *Symphurus* continue to be discovered, especially from deepwater habitats in the Indo-Pacific (Krabbenhoft & Munroe 2003; Munroe 2006; Lee *et al.* 2009, 2014, 2016).

Generally circumglobal in shallow, warm-temperate, subtropical to tropical marine and estuarine waters, with a smaller number of species occurring in deep waters on the outer continental shelf and upper slope (to ~1 500 m deep), and a few species occurring in freshwater. Benthic, commonly on mud or sand bottom and readily able to bury into the sediment, although some species inhabit a wide variety of other substrates. Many of the species are small, not abundant, and have limited economic importance, with catch statistics for individual species usually not available. Medium-sized species have some commercial importance, especially in coastal artisanal fisheries (Booth & Walmsley-Hart 2000; Munroe 2015), and large numbers of tonguefishes contribute to bycatch in demersal trawl fisheries. About 3 genera (Munroe 2015) and at least 145 species; all 3 genera and ~31 species in WIO at depths of <250 m.

KEY TO GENERA

- | | | |
|----|---|---------------------|
| 1a | One or more lateral lines on eyed side; mouth inferior, with conspicuous overhanging hooked snout | 2 |
| 1b | No lateral line on eyed side; mouth terminal, without conspicuous hooked snout | <i>Symphurus</i> |
| 2a | Eyed-side lips with fringe of labial papillae; 2 or 3 lateral lines on eyed side | <i>Paraplagusia</i> |
| 2b | Eyed-side lips without labial papillae; 1–3 lateral lines on eyed side | <i>Cynoglossus</i> |

GENUS *Cynoglossus* Hamilton 1822

Right (blind-side) pelvic fin connected to anal fin; eyed-side lateral lines 1–3 ; mouth inferior, with conspicuous overhanging hooked snout; teeth only on blind-side jaws; lips not fringed. Most species occur in the Indo-Pacific, but a few occur in the eastern Atlantic off West Africa. Found mostly in estuarine and relatively shallow continental waters, but a few species occur in freshwater, and others on the outer continental shelf, although seldom at >100 m. Menon's (1977) worldwide revision of the genus recognised 49 species; however, this genus remains in need of revision. Menon's (1977) decision that the number of lateral lines is uninformative for species diagnoses may be incorrect, as this feature appears to be an important species-specific character. Also, the taxonomic status of the large number of nominal species placed in synonymy by Menon (1977) needs to be re-evaluated: it is likely that many will be recognised as valid species within species-complexes. About 24 or 25 species in WIO.

Cynoglossus pottii Steindachner 1902, described from two specimens from the Gulf of Suez, was listed as a valid species by Fowler (1956), Goren & Dor (1994) and Golani & Bogorodsky (2010) in checklists for the Red Sea. However, this nominal species was not included in Menon's (1977) revision of the genus, and the location of the types is unknown. Steindachner (1902) described the types of *C. pottii* as having 118–128 dorsal-fin rays, 101–104 anal-fin rays, 2 eyed-side lateral lines with 14 or 15 scale rows between them, 2 blind-side lateral lines, and 114–126 scales in the midlateral LL. Most of these meristics partially overlap with those of *C. dispar* Day 1877 and *C. lachneri* Menon 1977, also found in the region, and which also have 2 lateral lines on each side of the body (*C. dispar* has not been recorded from the Red Sea, but *C. lachneri* has: Goren & Dor 1994). Thus, it is not possible to resolve the status of *C. pottii* at this time. Menon (1977) erroneously placed *C. cleopatridis* Chabanaud 1949 in the synonymy of *C. dollfusi*. The holotype of *C. cleopatridis* is a faded specimen, damaged in its caudal region, thus preventing accurate counts of dorsal-, anal- and caudal-fin rays and eliminating any information based on colour. However, differences between those 2 nominal species in numbers of lateral lines and dorsal-fin rays, as reported in their original descriptions, indicate 2 species are present. Meristic features of *C. cleopatridis* are more similar to those of *C. acaudatus* (with 8 caudal-fin rays), which occurs in coastal waters as far north as Somalia, as well as *C. gilchristi* (with 10 caudal-fin rays), which occurs off Mozambique and Madagascar.

KEY TO SPECIES

- | | |
|--|--|
| <p>1a One lateral line (midlaterally) on eyed side of body <i>C. sinusarabici</i></p> <p>1b Two or 3 lateral lines on eyed side of body (dorsolateral LL may not extend full length of body) 2</p> <p>2a Two lateral lines (midlaterally and dorsolaterally) on eyed side of body (dorsolateral LL may not extend full length of body) 3</p> <p>2b Three lateral lines (midlaterally, dorsolaterally and ventrolaterally) on eyed side of body 18</p> <p>3a No lateral lines on blind side of body 8</p> <p>3b One (midlateral) or 2 (midlateral and dorsolateral) lateral lines on blind side of body 4</p> <p>4a One lateral line on blind side of body; scales cycloid on eyed side, except ctenoid near bases of dorsal and anal fins <i>C. dubius</i></p> <p>4b Two lateral lines on blind side of body; scales ctenoid on eyed side of body 5</p> <p>5a Caudal fin usually 12 rays; anal fin usually <90 rays; 13–16 scales in diagonal row between eyed-side lateral lines; 84–96 scales in eyed-side midlateral LL <i>C. quadrilineatus</i></p> <p>5b Caudal fin usually 10 rays; anal fin usually ≥90 rays; either 10–12 or >16 scales in diagonal row between eyed-side lateral lines; either <90 or >100 scales in eyed-side midlateral LL 6</p> <p>6a Scales 10–12 in diagonal row between eyed-side lateral lines; 74–88 scales in eyed-side midlateral LL, and all or most scales ctenoid (may be cycloid posteriorly) <i>C. attenuatus</i></p> <p>6b Scales >14 in diagonal row between eyed-side lateral lines; ≥95 scales in eyed-side midlateral LL, and scales cycloid 7</p> <p>7a Scales 16–18 in diagonal row between eyed-side lateral lines; no obvious scales on blind side of dorsal- and anal-fin rays (if scales present, usually deeply embedded and difficult to see); inner lining of eyed-side opercle spotted, and blind-side opercle whitish; dorsal fin 113–121 rays; anal fin 92–98 rays <i>C. lachneri</i></p> <p>7b Scales 18–20 in diagonal row between eyed-side lateral lines; distinct row of small cycloid scales on basal 1/3–1/2 of blind side of dorsal- and anal-fin rays; inner lining of opercle on each side of body darkly pigmented; dorsal fin 108–113 rays; anal fin 88–95 rays <i>C. dispar</i></p> | <p>8a Caudal fin usually 8 rays 9</p> <p>8b Caudal fin usually 10 rays 11</p> <p>9a Blind side of dorsal- and anal-fin rays heavily spotted; blind side of body with numerous small red spots; 58–66 scales in midlateral LL <i>C. acaudatus</i></p> <p>9b Blind side of dorsal- and anal-fin rays without heavy spotting; no red spots on blind side of body; ≥70 scales in midlateral LL 10</p> <p>10a Scales 16–21 in diagonal row between eyed-side lateral lines; blind side of dorsal-fin rays and anal-fin rays with row of ctenoid scales along most of ray lengths; no distinct alternating series of dark and pale blotches on dorsal and anal fins, instead nearly every fin ray streaked with pigment much darker than intervening membrane; caudal fin not dark; anal fin 70–83 rays <i>C. puncticeps</i></p> <p>10b Scales 11–15 in diagonal row between eyed-side lateral lines; no ctenoid scales along blind side of dorsal- and anal-fin rays; dorsal and anal fins with distinct series of alternating dark and paler blotches, each blotch spanning several fin rays and the connecting membranes; caudal fin dark; anal fin 82–86 rays <i>C. gilchristi</i></p> <p>11a Scales on blind side of body predominantly cycloid 12</p> <p>11b Scales on blind side of body predominantly ctenoid 13</p> <p>12a Scales 7–9 in diagonal row between eyed-side lateral lines; LL scales ctenoid; 56–70 scales in eyed-side midlateral LL; dorsal fin 116–130 rays; anal fin 85–98 rays; mouth reaches back to beyond vertical at rear margin of lower eye by ~1/4 eye diameter <i>C. arel</i></p> <p>12b Scales 11 or 12 in diagonal row between eyed-side lateral lines; LL scales cycloid; 90–101 scales in eyed-side midlateral LL; dorsal fin 126–138 rays; anal fin 97–114 rays; mouth reaches back to beyond vertical at rear margin of lower eye by ~1/2–3/4 eye diameter <i>C. lingua</i></p> <p>13a Rostral hook long, reaching back to vertical at middle of lower eye; rear edge of mouth closer to branchial opening than to snout tip <i>C. lida</i></p> <p>13b Rostral hook short, usually reaching only to vertical at front of anterior nostril; rear edge of mouth closer to snout tip than to branchial opening 14</p> |
|--|--|

Continued ...

KEY TO SPECIES

- 14a Rear extent of jaws well beyond vertical at rear margin of lower eye 15
- 14b Rear extent of jaws not reaching beyond vertical at rear margin of lower eye 16
- 15a Scales 14–16 in diagonal row between dorsolateral LL and midlateral LL; 80–92 scales in midlateral LL; dorsal, anal and caudal fins blackish *C. macrostomus*
- 15b Scales 11–15 (usually 12 or 13) in diagonal row between dorsolateral LL and midlateral LL; 70–86 scales in midlateral LL; dorsal, anal and caudal fins not distinctively black *C. semifasciatus*
- 16a Scales 57–72 in midlateral LL *C. kopsii* species-complex
- 16b Scales ≥ 78 in midlateral LL 17
- 17a Scales 18–21 in diagonal row between dorsolateral LL and midlateral LL; eyes round, nearly symmetrical, and interorbital space about equal to eye diameter; snout broadly rounded; outer surface of eyed-side opercle with distinct dark blotch on ventrolateral margin, and inner lining of eyed-side opercle lightly spotted or without pigment *C. durbanensis*
- 17b Scales 16–19 in diagonal row between dorsolateral LL and midlateral LL; eyes elliptical, subequal, and interorbital space very narrow ($\sim 1/4$ eye diameter); snout more pointed; outer surface of eyed-side opercle with dark blotch on dorsal half, and inner lining of both opercles darkly pigmented *Cynoglossus sp. incertae sedis*
[previously considered a synonym of *C. puncticeps*]
- 18a Two nostrils on eyed side: obvious anterior nostril tubular and above middle of upper jaw, and posterior nostril less obvious (small, round opening, usually in anterior interorbital space) 23
- 18b Only anterior nostril present on eyed side of snout 19
- 19a Two pelvic fins present: right (blind-side) pelvic fin (usually with 4 rays) on body midline and attached to anal fin; rudimentary left (eyed-side) pelvic fin with 1–3 rays, and fin slightly above anterior portion of ventral LL 20
- 19b Only right (blind-side) pelvic fin present (on body midline and attached to anal fin) 22
- 20a Scales relatively large, with 10–12 in diagonal row between eyed-side dorsolateral LL and midlateral LL 21
- 20b Scales smaller, with 14–18 in diagonal row between eyed-side dorsolateral LL and midlateral LL; 80–95 scales in eyed-side midlateral LL; dorsal fin 116–124 rays; anal fin 92–103 rays *C. zanzibarensis*
- 21a Caudal fin 10 rays; dorsal fin 108–116 rays; anal fin 92–96 rays; blind side of dorsal- and anal-fin rays with row of small scales *C. sealarki*
- 21b Caudal fin 8 rays; dorsal fin 100–106 rays; anal fin 84–85 rays; blind side of dorsal- and anal-fin rays without row of small scales *C. dollfusi*
- 22a Caudal fin usually 10 rays; 3 lateral lines on eyed side, and dorsolateral LL nearly straight and complete; scales relatively small, 14–19 scales in diagonal row between eyed-side dorsolateral LL and midlateral LL; 86–104 scales in eyed-side midlateral LL *C. capensis*
- 22b Caudal fin usually 8 rays; 3 lateral lines on eyed side, and dorsolateral LL undulating and variably incomplete; scales larger, 11 or 12 scales in diagonal row between dorsolateral LL and midlateral LL; 68–77 scales in eyed-side midlateral LL ?*C. itinus*
- 23a Scales on blind side of body strongly ctenoid; 111–120 scales in eyed-side midlateral LL; vertebrae 60–62 *C. marleyi*
- 23b Scales on blind side of body cycloid or weakly ctenoid; usually < 111 scales in midlateral LL; vertebrae ≤ 59 24
- 24a Snout obtusely rounded; maxilla extending well beyond vertical at rear margin of lower eye; dorsal fin 101–110 rays; anal fin 80–89 rays; 75–96 scales in eyed-side midlateral LL; blind side of dorsal- and anal-fin rays with row of cycloid scales on $\sim 1/2$ length of rays *C. carpenteri*
- 24b Snout acutely pointed; maxilla extending to or just slightly posterior to vertical at rear of lower eye; dorsal fin 117–129 rays; anal fin 98–108 rays; 94–112 scales in eyed-side midlateral LL; no row of scales on blind side of dorsal- and anal-fin rays *C. acutirostris*

Cynoglossus acaudatus Gilchrist 1906

Natal tonguefish

PLATE 96

Cynoglossus acaudatus Gilchrist 1906: 162, Pl. 46 (Amatikulu River mouth; Cape Point; Durban, KwaZulu-Natal, South Africa); SSF No. 261.1* [in part: Pl. 134 appears to depict *C. puncticeps*]; Manilo & Bogorodsky 2003.

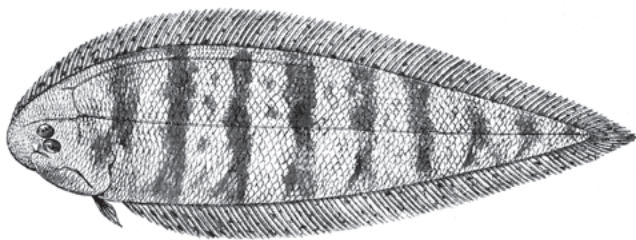
Areliscus natalensis Von Bonde 1922: 23, Pl. 4, Fig. 2 (KwaZulu-Natal, South Africa).

Cynoglossoides ecaudatus: SFSA No. 336*.

Cynoglossus ecaudatus: Menon 1977.

Dorsal fin 108–110 rays; anal fin 86 or 87 rays; caudal fin 8 rays. Single pelvic fin. Two eyed-side lateral lines (dorsolateral LL ending at point between middle and two-thirds length of body), with 9–12 scale rows between them; 58–66 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including LL scales. Body depth greatest (25–31% SL) in anterior third of body, with moderate posterior taper; HL 20–22% SL; snout relatively short, broadly rounded, 22–33% HL; rostral hook short, not reaching vertical through anterior nostril. Maxilla extends to point between verticals at middle and rear margin of lower eye; angle of mouth much nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 12–18% HL, eyes contiguous or nearly so. Vertebrae 52 or 53.

Eyed side yellowish brown, scale outlines darker brown; irregular dark bars, blotches or speckling on body emanating from midlateral LL, and LL pores black; median fins with irregular brown spots nearly reaching margins. Attains 17 cm SL.



Cynoglossus acaudatus, 14 cm TL, holotype of *Areliscus natalensis* (South Africa). Source: Von Bonde 1922

DISTRIBUTION WIO: Somalia to South Africa (KwaZulu-Natal) and Seychelles.

REMARKS Adults occur on inner continental shelf, to at least 50 m deep; juveniles sometimes found in tidepools.

Cynoglossus acutirostris Norman 1939

Beaked tonguefish

Cynoglossus acutirostris Norman 1939: 104, Fig. 35 (Gulf of Aden); Fowler 1956; Menon 1977; Krupp 1987; Goren & Dor 1994; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010.

Dorsal fin 117–129 rays; anal fin 98–108 rays; caudal fin 7–9 (rarely 10) rays. Single pelvic fin. Three eyed-side lateral lines, with 16–21 scale rows between midlateral and dorsolateral lines; 94–112 scales in midlateral LL; no blind-side lateral line. Scales weakly ctenoid on both sides of body, except cycloid on snout and anterior region of head, and scales in anterior and central portions of lateral line usually cycloid (those in posterior portion ctenoid); no row of scales on blind side of dorsal- and anal-fin rays. Body lanceolate, greatest depth (23–31% SL) at about midlength, with moderate posterior taper; HL 26–38% SL; snout long, acutely pointed, its length 38–49% HL; rostral hook short, not reaching vertical through mid-eye. Maxilla extends slightly beyond vertical through rear margin of lower eye; angle of mouth much nearer branchial opening than to snout tip. Two nostrils on eyed side. Eyes moderately large, diameter 6–10% HL; upper eye slightly in advance of lower, separated by narrow interorbital space; upper aspects of eyes covered with scales. Vertebrae 56–59.

Eyed side uniformly whitish to pale greyish brown; peritoneum blackish or brown. Attains 24 cm SL.

DISTRIBUTION WIO: Red Sea (records from 712–1 424 m) and Gulf of Aden (at ~220 m).

Cynoglossus arel (Bloch & Schneider 1801)

Largescale tonguefish

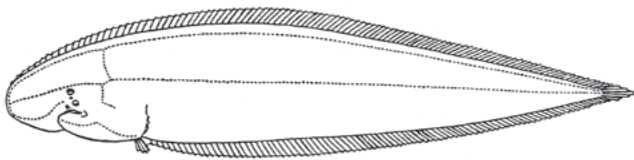
PLATE 96

Pleuronectes arel Bloch & Schneider 1801: 159 (Tharangambadi, India).
Plagusia melampetala Richardson 1846: 281 (Canton, China).
Plagusia grandisquamis Cantor 1849: 1214 (Sea of Penang, Malaysia).
Plagusia macrolepidota Bleeker 1851: 415 (Jakarta, Java, Indonesia).
Plagusia cantoris Bleeker 1853: 78, 153 (Malay Peninsula).
Plagusia oligolepis Bleeker 1855: 445 (Jakarta, Java, Indonesia).
Cantoria pinangensis Kaup 1858: 106 [no locality given].
Arelia kaupii Bleeker 1860: 73 (Bengkulu, Sumatra, Indonesia).
Cynoglossus elongatus Günther 1862: 501 (Penang, Malaysia).
Cynoglossus macrolepidotus: Günther 1862; Fowler 1956.
Cynoglossus arel: Norman 1928; Menon 1977; Ramanathan & Natarajan 1980; Goren & Dor 1994; Randall 1995*;
Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010.

Dorsal fin 116–130 rays; anal fin 85–98 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 7–9 scale rows between them; 56–70 scales in midlateral LL; no blind-

side lateral line. Scales large, ctenoid on eyed side (including those of lateral line); scales cycloid on blind side of body. Body relatively elongate, greatest depth (19–26% SL) in anterior third of body, with gradual posterior taper; HL 19–30% SL; snout obtusely pointed, its length 21–42% HL; rostral hook short, extending to vertical at front edge of anterior nostril. Maxilla extends beyond vertical at rear margin of lower eye by $\sim\frac{1}{4}$ eye diameter; angle of mouth more or less about midway between branchial opening and snout tip. Two nostrils on eyed side. Eye diameter 6–11% HL; eyes contiguous or interorbital space very narrow. Vertebrae 50–57.

Eyed side more or less uniformly brown, except for dark blotch on opercle; both opercle linings darkly pigmented; blind side whitish. Attains 38 cm SL.



Cynoglossus arel, 26 cm TL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman to India and Sri Lanka; elsewhere, Bay of Bengal, Andaman Sea, Indonesia, Taiwan, China and southern Japan.

REMARKS Found at 9–82 m (Randall 1995). Golani & Bogorodsky (2010) noted that there are no voucher specimens to verify reports of this species from the Red Sea.

Cynoglossus attenuatus Gilchrist 1904

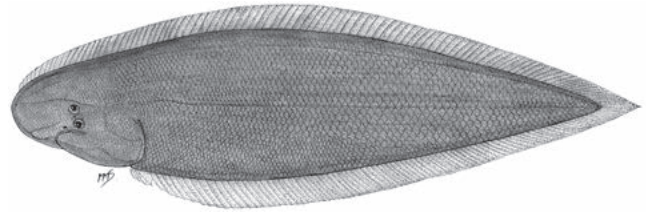
Fourline tonguefish

PLATE 96

Cynoglossus attenuatus Gilchrist 1904: 11, Pl. 29 (off Thukela River mouth, KwaZulu-Natal, South Africa); Menon 1977; SSF No. 261.2*.
Arelia bilineata (non Lacepède 1802): SFSA No. 341* [in part].

Dorsal fin 110–120 rays; anal fin 87–95 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 10–12 scale rows between them; 74–88 scales in midlateral LL; 2 blind-side lateral lines. Scales ctenoid on eyed side of body, except lateral line with cycloid scales posteriorly; scales cycloid on blind side of body. Body depth greatest (21–26% SL) near midlength, with gradual posterior taper; HL 20–22% SL; snout obtusely pointed, its length 36–44% HL; rostral hook short, reaching vertical through anterior nostril. Maxilla extends beyond vertical at rear margin of lower eye; angle of mouth nearer to branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 8–12% HL; eyes nearly contiguous, interorbital space narrow. Vertebrae 54–56.

Eyed side pale to medium brown, with indistinct dark horizontal lines following scale rows, and fin rays darker brown than fin membranes; blind side whitish. Attains 31 cm SL.



Cynoglossus attenuatus, 15 cm TL (N Mozambique). Source: SSF

DISTRIBUTION WIO: Kenya, Mozambique and South Africa (Thukela Bank).

Cynoglossus capensis (Kaup 1858)

Sand tonguefish

PLATE 96

Trulla capensis Kaup 1858: 109 [locality not given: presumably

Cape of Good Hope, South Africa]; SFSA No. 342 [in part: Pl. 11 appears to depict *C. zanzibarensis*].

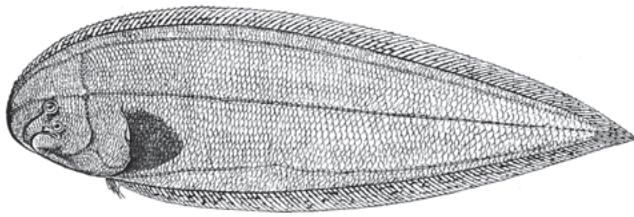
?*Areliscus microphthalmus* Von Bonde 1922: 24, Pl. 4, Fig. 3 (off Umhlabi River, KwaZulu-Natal, South Africa).

?*Cynoglossus microphthalmus*: Menon 1977.

Cynoglossus capensis: Menon 1977; SSF No. 261.3*; Heemstra & Heemstra 2004.

Dorsal fin 103–110 rays; anal fin 81–88 rays; caudal fin 10 rays. Single pelvic fin. Three eyed-side lateral lines, with 14–19 scale rows between dorsolateral and midlateral lines; 86–104 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on eyed side of body, including on lateral line; scales on blind side of body cycloid anteriorly, weakly ctenoid posteriorly. Body depth greatest (23–34% SL) in anterior half of body, with gradual posterior taper; HL 18–26% SL; snout rounded, its length 28–35% HL; rostral hook short, ending well anterior to vertical through front margin of anterior nostril. Maxilla extends to vertical through rear half of lower eye; angle of mouth nearer to snout tip than to branchial opening. One nostril on eyed side. Eye diameter 10–13% HL; eyes contiguous or interorbital space very narrow. Vertebrae 50–52.

Eyed side yellowish brown to brownish grey, with dark specks; LL pores with darker pigment; mouth not black; eyed side of dorsal- and anal-fin rays with series of dark brown spots in 3 rows, and fin membranes with scattered melanophores; caudal fin with brown spots; blind side whitish. Attains 31 cm SL.



Cynoglossus capensis, 14 cm TL, holotype of *Areliscus microphthalmus* (South Africa). Source: Von Bonde 1922

DISTRIBUTION Southern Africa: Namibia in southeastern Atlantic, to South Africa (KwaZulu-Natal) in WIO.

REMARKS Found to at least 110 m deep. *Areliscus microphthalmus* Von Bonde 1922 is considered a junior subjective synonym of *C. capensis* (see SSF No. 261.3). According to Menon (1977), however, the holotype has fewer scales in the midlateral LL (~79) and a broader interorbital space (~5.7% HL) as compared with *C. capensis* (98–104 scales in midlateral LL; interorbital space 1.8–1.9% HL). Barnard (1925) also noted the smaller eyes, wider interorbital area, modally higher dorsal- and anal-fin rays, and fewer LL scales for specimens he identified as *Trulla (Cynoglossus) microphthalmus* (Von Bonde 1922) compared with those of *C. capensis*, but he doubted that these differences among the material studied were sufficient to recognise two species. Further study based on additional material is needed.

Cynoglossus carpenteri Alcock 1889

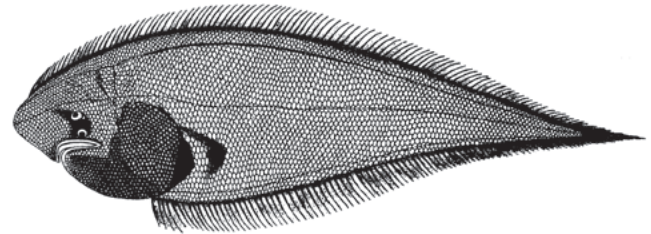
Brown tonguefish

Cynoglossus carpenteri Alcock 1889: 287, Pl. 18, Fig. 1 (Odisha coast, India); Alcock 1890, 1896, 1898, 1899; Boulenger 1901; Regan 1905; Menon 1977; Randall 1995*; Manilo & Bogorodsky 2003.

Dorsal fin 101–110 rays; anal fin 80–89 rays; caudal fin 10 rays. Single pelvic fin. Three eyed-side lateral lines, with 15–19 scale rows between dorsolateral and midlateral lines; 75–96 scales in midlateral LL; no blind-side lateral line. Scales on eyed side of body mostly cycloid, weakly ctenoid posteriorly; scales cycloid on blind side of body; blind side of dorsal- and anal-fin rays with row of cycloid scales on ~½ their lengths. Body depth greatest (24–30% SL) in anterior third of body, with rapid posterior taper; head large, HL 27–34% SL; snout obtusely pointed, its length 31–37% HL; rostral hook short, ending well anterior to vertical through front margin of anterior nostril. Maxilla extends beyond vertical at rear margin of lower eye; angle of mouth nearer to branchial opening than to snout tip.

Two nostrils on eyed side. Eye diameter 6–11% HL; eyes nearly contiguous, interorbital space narrow. Vertebrae 51–55.

Eyed side uniformly brownish, peritoneum black; opercular region black on both sides of body (due to pigment from inner linings of opercles showing through); dorsal and anal fins blackish; blind side whitish. Attains 18 cm SL.



Cynoglossus carpenteri, ~17 cm TL (NE India). Source: Alcock 1889

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf, Gulf of Oman, Arabian Sea and India; elsewhere to Bay of Bengal.

REMARKS Found at 180–423 m (Norman 1928).

Cynoglossus dispar Day 1877

Roundhead tonguesole

Cynoglossus dispar Day 1877: 434, Pl. 96, Fig. 2 (Sindh, Pakistan); Norman 1928; Menon 1977; Manilo & Bogorodsky 2003.

Dorsal fin 108–114 rays; anal fin 88–95 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 18–20 scale rows between them; 102–119 scales in midlateral LL; 2 blind-side lateral lines. Scales ctenoid on eyed side of body, except LL scales cycloid; scales cycloid on blind side; blind side of dorsal- and anal-fin rays with row of small scales. Body depth greatest (24–33% SL) near midlength, with gradual posterior taper; HL 18–21% SL; snout bluntly pointed, its length 16–32% HL; rostral hook short, not reaching vertical through base of anterior nostril. Maxilla extends to or beyond vertical through rear margin of lower eye; angle of mouth much nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 7–10% HL; eyes nearly contiguous, interorbital space narrow. Vertebrae 53 or 54.

Eyed side brownish, with somewhat darker irregular blotches; both opercle linings dark; fins dusky, blackish, or with numerous black spots; blind side whitish. Attains 39 cm SL.

DISTRIBUTION WIO: Pakistan and India.

Cynoglossus dollfusi (Chabanaud 1931)

PLATE 96

- Paraplagusia dollfusi* Chabanaud 1931: 303 (Suez Canal); Fowler 1956; Munroe & Kong 2016.
- Cynoglossus (Trulla) dollfusi*: Gruvel & Chabanaud 1937 [transfer to *Cynoglossus*]; Fowler 1956; Desoutter *et al.* 2001; Munroe & Kong 2016; Munroe 2017.
- Cynoglossus sealarki* (*non* Regan 1908): Chabanaud 1947, 1954; Goren & Dor 1994; Golani & Bogorodsky 2010.
- Cynoglossus cleopatridis* (*non* Chabanaud 1949): Menon 1977.
- Cynoglossus dollfusi* (*sensu* Menon 1977): Dor 1984; Goren & Dor 1994; Golani & Bogorodsky 2010.

Dorsal fin 100–106 rays; anal fin 84 or 85 rays; caudal fin ~8 rays. Pelvic fin present on both sides of body. Three eyed-side lateral lines, separated by 11 or 12 scale rows between midlateral LL and dorsolateral LL; 67–70 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on eyed side of body, including those of lateral line; scales weakly ctenoid on blind side of body, except cycloid on blind side of head. Body depth greatest (~19% SL) in anterior half of body, with gradual posterior taper; HL ~18% SL; snout bluntly pointed, its length ~27% HL; rostral hook short, not ending to vertical at front margin of lower eye. Maxilla extends to vertical through rear half of lower eye; angle of mouth nearer to snout tip than to branchial opening. One nostril on eyed side. Eye diameter ~11–14% HL; interorbital space narrow but distinct.

Eyed side yellowish white to brownish background, with numerous small brownish black irregular marks on scale edges; dorsal and anal fins with numerous small reddish brown spots. Blind side uniformly whitish or yellowish. Attains ~14 cm SL.

DISTRIBUTION WIO: endemic to northern Red Sea.

REMARKS The holotype of *Paraplagusia dollfusi* (= *Cynoglossus dollfusi*) was thought lost (Menon 1977; Desoutter *et al.* 2001). In the original description of *P. dollfusi*, Chabanaud never clearly stated how many lateral lines the type specimen had, but his discussion and comparisons sections suggested that it had 2 lateral lines. However, the illustration of the second specimen of *C. dollfusi* in Gruvel & Chabanaud (1937) clearly shows 3 lateral lines. Both specimens are reported to have relatively few LL scales (70 and 67, respectively), and both have similar numbers of scale rows between midlateral and dorsolateral lines. These and other features indicate they are conspecifics (Munroe 2017). Considerable confusion has surrounded the nomenclature

and status of this species, in part because of the confusion regarding the number of lateral lines reported for the species. This confusion is resolved in studies by Munroe & Kong (2016) and Munroe (2017) through examination of information and specimens presented in several works of Chabanaud (i.e., 1931, 1937, 1947, 1954). Chabanaud's (1947, 1954) re-identifications of the type specimen of *P. dollfusi* and a second specimen identified as *Cynoglossus (Trulla) dollfusi* as *Cynoglossus sealarki* Regan 1908 is incorrect. These two nominal species differ in counts of caudal-fin rays (8 in *C. dollfusi* vs. 10 in *C. sealarki*), and *C. dollfusi* has fewer dorsal- and anal-fin rays and lacks scales on the blind side of the dorsal- and anal-fin rays, which are present in *C. sealarki*. Menon (1977) placed *Cynoglossus cleopatridis* Chabanaud 1947, which features 2 lateral lines on the eyed side and 115+ dorsal-fin rays, into the synonymy of *C. dollfusi*. This decision requires re-evaluation because lateral-line number is an important diagnostic character for species of *Cynoglossus*, and the reported difference in dorsal-fin-ray counts for these nominal species suggests 2 species are represented.

Cynoglossus dubius Day 1873

Carrot tonguefish

Cynoglossus dubius Day 1873: 525 (Gwadar Port, Pakistan); Norman 1928; Menon 1977; Manilo & Bogorodsky 2003.

Dorsal fin 108–114 rays; anal fin 85–91 rays; caudal fin 12 rays. Single pelvic fin. Two eyed-side lateral lines, with 17–21 scale rows between them; 98–104 scales in midlateral LL; 1 blind-side lateral line. Scales cycloid on both sides of body, except ctenoid on eyed side near bases of dorsal and anal fins. Body depth greatest (27–31% SL) in anterior third, with gradual posterior taper; HL 23–26% SL; snout obtusely pointed, its length 40–46% HL; rostral hook short, extending to just beyond mandibular symphysis. Maxilla extends beyond vertical at rear margin of lower eye; angle of mouth nearer to branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 6–8% HL; eyes round, subequal, and separated by interorbital space about equal to eye diameter. Vertebrae 52 or 53.

Eyed side uniformly brown; opercle lining dark on eyed side, spotted on blind side; blind side whitish. Attains 45 cm SL.

DISTRIBUTION WIO: Pakistan to India.

Cynoglossus durbanensis Regan 1921

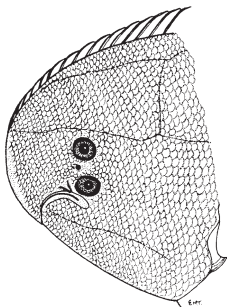
Durban tonguefish

Cynoglossus durbanensis Regan 1921: 2 (Durban, KwaZulu-Natal, South Africa); Menon 1977; SSF No. 261.4*

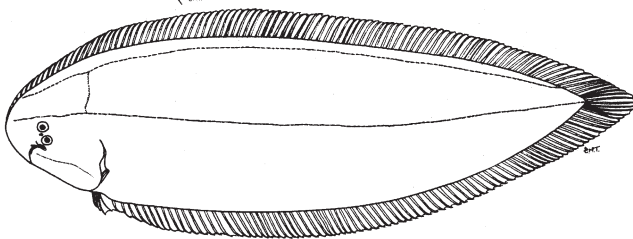
Cynoglossoides durbanensis: SFSA No. 338.

Dorsal fin 98–105 rays; anal fin 78–84 rays; caudal fin 8–10 (usually 10) rays. Single pelvic fin. Two eyed-side lateral lines, with 18–21 scale rows between them; 90–106 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those of lateral line. Body depth greatest (25–31% SL) at about midlength, with gradual posterior taper; HL 17–21% SL; snout rounded, its length 23–34% HL; rostral hook reaches back only to vertical in front of anterior nostril. Maxilla extends to point between verticals through middle and rear of lower eye; angle of mouth closer to snout tip than to gill opening. Two nostrils on eyed side. Eye diameter 8–11% HL; interorbital space narrow, subequal to vertical eye diameter. Vertebrae 48–50.

Eyed side uniformly olive-green to medium brown, with prominent blotch on lower margin of opercle; fin rays streaked with dark brown, fin membranes paler but with scattered melanophores. Blind side whitish. Attains 20 cm SL.



Cynoglossus durbanensis, 13 cm TL, and head of same specimen (South Africa). Source: SSF



DISTRIBUTION WIO: Kenya to South Africa (KwaZulu-Natal) and Madagascar.

REMARKS Found at 8–200 m.

Cynoglossus gilchristi Regan 1920

Ripplefin tonguefish

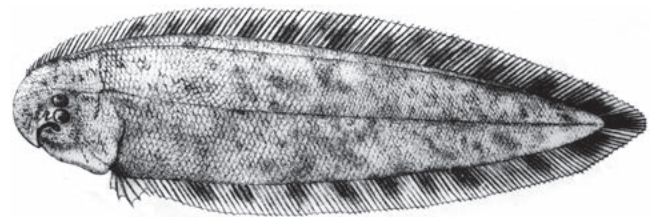
Cynoglossus brachycephalus Gilchrist 1904: 12, Pl. 30 (off Umhlanga River mouth, KwaZulu-Natal, South Africa).

Cynoglossus gilchristi Regan 1920: 222 (Umhlanga River, KwaZulu-Natal, South Africa) [based on 1 specimen and *Cynoglossus brachycephalus* Gilchrist 1904)]; Smith & Smith 1963; Menon 1977; SSF No. 261.5*; Goren & Dor 1994; Golani & Bogorodsky 2010.

Cynoglossoides gilchristi: SFSA No. 337*.

Dorsal fin 104–110 rays; anal fin 82–86 rays; caudal fin 8 rays. Single pelvic fin. Two eyed-side lateral lines (dorsolateral LL ending ~13–27 fin rays from end of dorsal fin), with 11–15 scale rows between lateral lines; 74–98 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those of lateral line. Body depth greatest (27–35% SL) in anterior half, with gradual posterior taper; HL 18–24% SL; snout rounded, its length 26–32% HL; rostral hook reaching or nearly reaching vertical through anterior nostril. Maxilla extends to between verticals between middle and rear of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 8–18% HL; eyes contiguous or interorbital space narrow. Vertebrae 50.

Eyed side uniformly brown, sometimes with irregular dark spots (especially on abdomen) and horizontal black lines following scale rows; dorsal and anal fins with dark streaks and blotches; caudal fin with darker blotch distally. Attains 16 cm SL.



Cynoglossus gilchristi, holotype of *C. brachycephalus* (South Africa). Source: Gilchrist 1904

DISTRIBUTION WIO: Mozambique, South Africa (KwaZulu-Natal) and Madagascar.

REMARKS Found at ~7–55 m. Golani & Bogorodsky (2010) noted that the single report of this species from the Red Sea is likely based on a misidentification.

?*Cynoglossus itinus* (Snyder 1909)

Speckled tonguefish

PLATE 96

Trulla itina Snyder 1909: 609 (Naha market, Okinawa I., Ryukyu Is., Japan).*Cynoglossus itinus*: Ochiai 1963; Menon 1977.*Cynoglossus punctatus* Shen 1969: 21, Figs. 9–12 (Tolo Harbour, Hong Kong).

Dorsal fin 100–114 rays; anal fin 79–87 rays; caudal fin 8 rays. Single pelvic fin. Three eyed-side lateral lines (dorsolateral LL undulating and variably incomplete), with 11 or 12 scale rows between midlateral and dorsolateral lines; 68–77 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on eyed side, including those of lateral line; scales cycloid on blind side of head, weakly ctenoid on blind side of body. Body depth greatest (25–29% SL) in anterior third, with gradual posterior taper; HL 19–22% SL; snout rounded, its length 25–30% HL; rostral hook short, not extending to vertical through front margin of nostril. Maxilla extends to point between verticals through middle and rear of lower eye; angle of mouth much nearer to snout tip than to branchial opening. One nostril on eyed side. Eye diameter 11–15% HL; interorbital space narrow. Vertebrae 50–52.

Eyed side yellowish white background with irregular fleck marks; blind side uniformly whitish; peritoneum black. Attains ~14 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Madagascar and Comoros; elsewhere to Philippines, South China Sea, Japan and possibly northern Australia.

REMARKS The taxonomic status of most populations currently identified as *C. itinus* requires research.

Cynoglossus kopsii (Bleeker 1851)

Shortheaded tonguesole

PLATE 96

Plagusia kopsii Bleeker 1851: 494 (Rhio, Indonesia).*Cynoglossus praecisus* Alcock 1890: 442 (off Ganjam coast, India).*Cynoglossus versicolor* Alcock 1890: 442 (Ganjam coast off Chilika Lake, Odisha, India).*Cynoglossus kopsii* var. *digamma* [in part] Chabanaud 1951: 273 (Arafura Sea).*Cynoglossus kopsii*: Smith & Smith 1963; Menon 1977; Randall & Anderson 1993; Goren & Dor 1994; Randall 1995*; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010.

Dorsal fin 103–115 rays; anal fin 80–91 rays; caudal fin 10 rays. Single pelvic fin. Three eyed-side lateral lines (dorsolateral LL undulating and variably incomplete), with 7–12 scale rows between midlateral and dorsolateral lines; 57–72 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those on lateral line. Body depth greatest (22–34% SL) in anterior half, with gradual posterior taper; HL 15–25% SL; snout rounded, its length 24–41% HL; rostral hook short, not reaching vertical through anterior nostril. Maxilla extends to point between verticals at middle and rear of lower eye; angle of mouth much nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 11–19% HL; interorbital space narrow. Vertebrae 50–55.

Eyed side pale brownish, generally with irregular dark spots and blotches, and fins with several darkly streaked rays alternating with paler rays; blind side whitish. Attains ~19 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Madagascar and Maldives; elsewhere to Bay of Bengal, Indonesia, Philippines, Taiwan, New Guinea and northern Australia.

REMARKS Inhabits coastal waters, on silty or muddy bottom, at 24–90 m (Randall 1995). Presumably a species-complex; the taxonomic status of populations currently identified as *C. kopsii* requires thorough research. Golani & Bogorodsky (2010) noted that reports of this species from the Red Sea are doubtful and unsupported by voucher specimens.

Cynoglossus lachneri Menon 1977

Twoline tonguefish

PLATE 97

?Cynoglossus hunteri Von Bonde 1925: 293 (off Maputo Bay, Mozambique).*Cynoglossus lachneri* Menon 1977: 40, Pl. 5 (Mombasa fish market, Kenya);

Baissac 1976, 1990; SSF No. 261.6*; Goren & Dor 1994; Randall 1995;

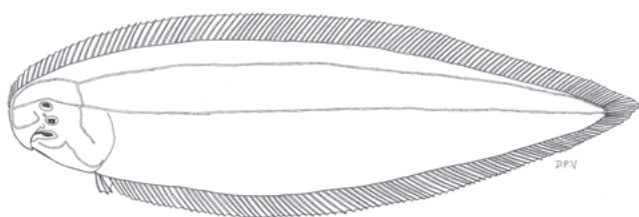
Quéro 1997; Fricke 1999; Manilo & Bogorodsky 2003; Golani &

Bogorodsky 2010.

Dorsal fin 113–121 rays; anal fin 92–98 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 16–18 scale rows between them; 100–117 scales in midlateral LL; 2 blind-side lateral lines (dorsolateral LL sometimes extending only 75–80% body length). Scales ctenoid on eyed side of body, except more weakly ctenoid posteriorly and cycloid on lateral line; scales cycloid on blind side of body. Body depth greatest

(24–27% SL) in anterior half of body, with gradual posterior taper; HL 17–23% SL; snout rounded, its length 28–34% HL; rostral hook short, reaching to vertical well anterior to anterior nostril. Maxilla extends to, or beyond, rear margin of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 7–11% HL; interorbital space subequal to eye diameter. Vertebrae 55–58.

Eyed side uniformly tan to dark brown, sometimes with darker irregular blotches; opercular linings whitish; blind side whitish. Attains 48 cm SL.



Cynoglossus lachneri, 24 cm TL, paratype (Seychelles). Source: SSF

DISTRIBUTION WIO: Red Sea, Gulf of Oman to Mozambique, Madagascar, Comoros, Seychelles, Réunion and Mauritius.

Cynoglossus lida (Bleeker 1851)

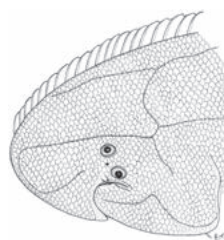
Roughscale tonguefish

PLATE 97

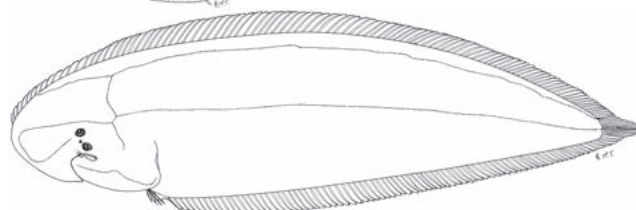
Plagusia lida Bleeker 1851: 413 (Jakarta, Java, Indonesia).
Plagusia polytaenia Bleeker 1854: 529 (Priaman, Sumatra, Indonesia).
Cynoglossus intermedius Alcock 1889: 288 (off Puri, India, Bay of Bengal).
Cynoglossus os Fowler 1904: 556, Pl. 28 (Padang, Sumatra, Indonesia).
Cynoglossus lida: Norman 1928; SFSA No. 340; Menon 1977;
 Ramanathan & Natarajan 1980; SSF No. 261.7*; Manilo & Bogorodsky
 2003; Heemstra & Heemstra 2004.

Dorsal fin 92–113 rays; anal fin 77–88 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 10–15 scale rows between them; 82–95 scales in midlateral LL; no blind-side lateral line. Scales small and ctenoid on both sides of body, including on lateral line. Body depth greatest (22–28% SL) near midlength, with gradual posterior taper; HL 21–26% SL; snout rounded, its length 30–44% HL; rostral hook reaching vertical through middle of lower eye. Maxilla extends to or beyond vertical through rear margin of lower eye; angle of mouth closer to branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 4–9% HL; interorbital space narrow. Vertebrae 47–52.

Eyed side uniformly olive-green to medium brown, with irregular black specks; dark blotch on opercle; fin rays same colour or darker than body, and membranes dusky. Attains 20 cm SL.



Cynoglossus lida, 18 cm SL, and head of same specimen (South Africa). Source: SSF



DISTRIBUTION Indo-Pacific (widespread). WIO: Pakistan to India, Kenya to South Africa (KwaZulu-Natal), northwestern Madagascar, and possibly Red Sea; elsewhere to Bay of Bengal, Malaysia, Indonesia, Taiwan and Philippines.

REMARKS Occurs on inner continental shelf, on sandy or silty bottom, sometimes near reefs or in estuaries, at 3–30 m.

Cynoglossus lingua Hamilton 1822

Long tonguesole

Cynoglossus lingua Hamilton 1822: 32, 365 (Ganges River estuaries, India); Norman 1928.

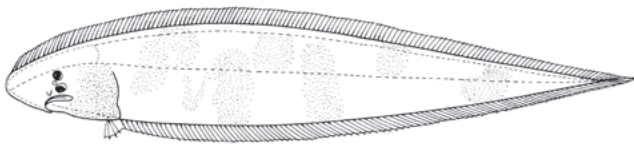
Pleuronectes potous Cuvier 1829: 344 (Visakhapatnam, India).

Plagusia macrorhynchos Bleeker 1851: 413 ([West Java Province], Java, Indonesia) [based on a drawing].

Cynoglossus acinaces Jenkins 1910: 130 (Sundarbans, Khulna District, Bangladesh).

Dorsal fin 126–138 rays; anal fin 97–114 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 11 or 12 scale rows between them; 90–101 scales in midlateral LL; no blind-side lateral line. Scales weakly ctenoid on eyed side of body, but cycloid on head and lateral lines; scales cycloid on blind side of body. Body elongate, its depth greatest (17–22% SL) in anterior third, with gradual posterior taper; HL 21–26% SL; snout pointed, its length 37–45% HL; rostral hook short, extending to vertical through front of lower eye. Maxilla extends well behind vertical through rear margin of lower eye by amount equalling $\sim\frac{1}{2}$ – $\frac{3}{4}$ eye diameter; angle of mouth nearer to branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 5–9% HL; interorbital space narrow, $\sim\frac{1}{2}$ eye diameter. Vertebrae 57–66.

Eyed side brown, with or without darker blotches, and dorsal and anal fins darker posteriorly; eyed-side opercular region blackish, and inner lining of both opercles dark; blind side whitish. Attains \sim 38 cm SL.



Cynoglossus lingua, 28 cm TL. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Gulf of Aden, Persian/Arabian Gulf, Pakistan and India; elsewhere to east coast of India, Bay of Bengal, Malaysia, South China Sea and Philippines.

REMARKS Inhabits shallow coastal areas and estuaries, on muddy or sandy bottom. Reports of this species from the Red Sea (Chabanaud 1937; Goren & Dor 1994; Manilo & Bogorodsky 2003; Golani & Bogorodsky 2010) are based on misidentified specimens (see Desoutter *et al.* 2001; Munroe 2017).

Cynoglossus macrostomus Norman 1928

Malabar tonguesole

PLATE 97

Cynoglossus macrostomus Norman 1928: 204, Fig. 20 (Hooghly River estuary near Calcutta, India); Menon 1977; Manilo & Bogorodsky 2003. *Cynoglossus luctuosus* Chabanaud 1948: 813 (Tannur, Chennai, India).

Dorsal fin 100–106 rays; anal fin 76–84 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 14–16 scale rows between them; dorsolateral LL curves onto dorsal fin a short distance before caudal fin; 80–92 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those on lateral line. Body depth greatest (23–28% SL) in anterior third, with moderate posterior taper; HL 24–31% SL; snout obtusely pointed, its length 21–30% HL; rostral hook short, extending to vertical through front margin of anterior nostril. Maxilla extends well beyond vertical through rear margin of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 5–10% HL; eyes contiguous or interorbital space very narrow. Vertebrae 48–51.

Eyed side pale brownish, with darker brown mottling sometimes forming irregular wavy bands; dorsal fin and anal fin generally darker than body; blind side whitish. Attains ~15 cm SL.

DISTRIBUTION Indian Ocean: west and east coasts of India.

REMARKS Inhabits coastal areas and enters estuaries, to ~22 m deep.

Cynoglossus marleyi Regan 1921

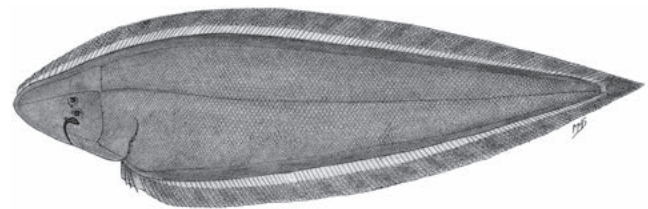
Threeline tonguesole

PLATE 97

Cynoglossus (Trulla) marleyi Regan 1921: 418 (off Umvoti River, KwaZulu-Natal, South Africa); Menon 1977; SSF No. 261.8*. *Areliscus marleyi*: SFSA No. 343*.

Dorsal fin 126–130 rays; anal fin 105–110 rays; caudal fin 10 rays. Single pelvic fin. Three eyed-side lateral lines, with 15–20 scale rows between dorsolateral and midlateral lines; 111–120 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those on lateral line. Body depth greatest (21–26% SL) in anterior third of body, with moderate posterior taper; HL 18–21% SL; snout long, obtusely pointed, its length 38–47% HL; rostral hook reaches point between verticals through base of anterior nostril and middle of lower eye. Maxilla extends to or beyond vertical through rear margin of lower eye; angle of mouth closer to branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 7–9% HL; interorbital space narrow; upper surface of eyes covered with scales. Vertebrae 60–62.

Eyed side uniformly brown, with dark black blotch on opercle; mouth and peritoneum black; dorsal and anal fins with conspicuous black band on distal half of rays and membranes, and fins darker posteriorly; caudal fin black. Attains 35 cm SL.



Cynoglossus marleyi, 22 cm TL (N Mozambique). Source: SSF

DISTRIBUTION WIO: northern Mozambique to South Africa (Thukela Bank).

REMARKS Found in relatively deep water, to at least 240 m.

Cynoglossus puncticeps (Richardson 1846)

Speckled tonguesole

PLATE 97

Plagusia puncticeps Richardson 1846: 280 (China, South China Sea) [based on illustration by Reeves]; Goren & Dor 1994.

Plagusia aurolimbata Richardson 1846: 280 (Canton, China).

Plagusia nigrolaberculata Richardson 1846: 280 (Canton, China).

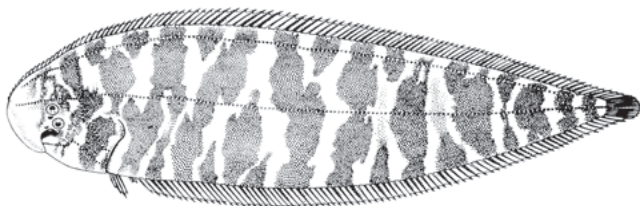
Plagusia brachyrhynchus Bleeker 1851: 414 (Jakarta, Java, Indonesia).

Plagusia javanica Bleeker (ex Kuhl & Van Hasselt) 1851: 414 (Jakarta, Java, Indonesia).

Cynoglossus brevis Günther 1862: 500 (Ganges River, India); Norman 1928.
Cynoglossus lida var. *punctatus*: Jenkins 1910: 30 (India).
Cynoglossus puncticeps: Norman 1928; Menon 1977 [in part];
 Ramanathan & Natarajan 1980; Randall 1995*; Manilo &
 Bogorodsky 2003.
Cynoglossus puncticeps var. *immaculata* Pellegrin & Chevey 1940: 154
 (Bac Lieu, Vietnam).

Dorsal fin 96–109 rays; anal fin 70–83 rays; caudal fin 7–12 rays. Single pelvic fin. Two eyed-side lateral lines, with 16–21 scale rows between them; 78–99 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including on lateral lines, and blind side of dorsal fin and anal fin with row of small scales. Body depth greatest (21–29% SL) at about midlength, with gradual posterior taper; HL 11–23% SL; snout relatively short, rounded to obtusely pointed, its length 24–41% HL; rostral hook short, usually not reaching vertical through anterior nostril. Maxilla extends to point between verticals through middle and rear of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eyes relatively small (diameter 8–11% HL); interorbital space narrow. Vertebrae 44–49.

Eyed side pale to dark brown, covered with irregular (usually incomplete) bands or blotches or small spots; LL pores darkly outlined; dorsal fin and anal fin with black streaks on rays and yellowish membranes; blind side whitish. Attains ~17 cm SL.



Cynoglossus puncticeps. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Indo-Pacific. WIO: Mozambique, Persian/Arabian Gulf, Oman to India; elsewhere to Bay of Bengal, Malaysia, South China Sea, Philippines, Indonesia, northern Australia and New Guinea.

REMARKS Inhabits relatively shallow seas, in 13–137 m (Randall 1995); reported to migrate into estuaries (Ramanathan & Natarajan 1980). The taxonomic status of the populations currently identified as *C. puncticeps* requires research. Golani & Bogorodsky (2010) noted that there are no voucher specimens to verify reports of this species from the Red Sea.

Cynoglossus quadrilineatus (Bleeker 1851)

Fourlined tonguesole

Plagusia quadrilineata Bleeker (ex Kuhl & Van Hasselt) 1851: 412
 (Jakarta, Java; western Sumatra; Muntok, Bangka, Indonesia).

Arelia quadrilineata: Kaup 1858.

Cynoglossus quadrilineatus: Günther 1862; Goren & Dor 1994;
 Kottelat 2013.

Cynoglossus lineolatus Steindachner 1867: 588 (Hong Kong).

Cynoglossus quinquelineatus Day 1877: 432, Pl. 98, Fig. 1 (Chennai, India);
 Norman 1928.

Cynoglossus sindensis Day 1877: 434, Pl. 90, Fig. 6 (Sindh, Pakistan, and
 seas of India.)

Cynoglossus diplasios Jordan & Evermann 1902: 367, Fig. 29 (Taiwan).

Cynoglossus bilineatus: Norman 1928; Fowler 1956; Menon 1977;
 Randall 1995*; Munroe 2001; Manilo & Bogorodsky 2003;
 Golani & Bogorodsky 2010.

Arelia bilineata: Smith & Smith 1963; Baissac 1976.

Dorsal fin 104–114 rays; anal fin 80–88 rays; caudal fin 12 rays. Two eyed-side lateral lines, with 13–16 scale rows between them; 84–96 scales in midlateral LL; 2 blind-side lateral lines. Scales ctenoid on eyed side of body, except cycloid on lateral line; scales cycloid on blind side of body. Body depth greatest (22–29% SL) at about body midpoint, with gradual posterior taper; HL 19–24% SL; snout broadly rounded, its length 32–54% HL; rostral hook short, nearly reaching vertical through anterior border of anterior nostril. Maxilla extending beyond vertical through rear margin of lower eye; angle of mouth slightly nearer branchial opening than to snout tip. Two nostrils on eyed side. Eye diameter 6–12% HL; eyes separated by conspicuous interorbital space. Vertebrae 51–53.

Eyed side brownish, with irregular dark patch on opercular region; blind side whitish. Attains 35 cm SL.

DISTRIBUTION Indo-Pacific. WIO: Oman, Persian/Arabian Gulf, Seychelles, Arabian Sea and Sri Lanka; elsewhere to Indonesia, Taiwan, Japan, New Guinea and Australia.

REMARKS Found on mud and sand bottoms, at ~13–400 m (Randall 1995). Golani & Bogorodsky (2010) noted there are no voucher specimens to verify reports of this species from the Red Sea. Historically, at least since Norman's (1928) study of the flatfishes of India, *Plagusia quadrilineata* Bleeker 1851 has been erroneously considered a junior subjective synonym of *Achirus bilineatus* Lacepède 1802 by most authors. Both names have been applied to the same species (fourlined tonguesole) now assigned to the genus *Cynoglossus*. However, use of *Achirus bilineatus* Lacepède 1802 for a species of *Cynoglossus* is based on a misinterpretation by many authors of Lacepède's (1802) intention when constructing this name. According to Kottelat (2013), *A. bilineatus* Lacepède 1802 was not proposed

as a name for a new species of tonguesole (now placed in *Cynoglossus*), but rather was erected as a new combination for *Pleuronectes bilineatus* Bloch 1787, a fringe-lipped tonguesole now placed in the genus *Paraplagusia*. Therefore, *Achirus bilineatus* Lacepède 1802 properly belongs to the synonymy of *Paraplagusia bilineata* (Bloch 1787) as a replacement name for that nominal species, and not as a name available for a species in the genus *Cynoglossus*. Clarification of this nomenclatural confusion by Kottelat (2013) reveals that *Cynoglossus quadrilineatus* (Bleeker 1851) is the oldest available name for the species referred to here as the fourlined tonguesole.

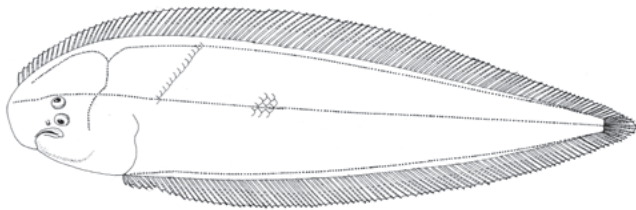
Cynoglossus sealarki Regan 1908

PLATE 97

Cynoglossus sealarki Regan 1908: 235, Pl. 26, Fig. 1 (Saya de Malha Bank); Norman 1928; Menon 1977; Foroshchuk & Fedorov 1992.

Dorsal fin 108–116 rays; anal fin 92–96 rays; caudal fin 10 rays. Two pelvic fins; eyed-side pelvic fin rudimentary, with 1–3 (usually 2 or 3) rays. Three eyed-side lateral lines, with 10–12 scale rows between dorsolateral and midlateral lines; 64–70 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on eyed side of body, including those of lateral line; scales on blind side of body cycloid anteriorly, ctenoid posteriorly; blind side of dorsal fin and anal fin with cycloid scales along $\sim\frac{1}{2}$ length of rays. Body depth greatest (23–25% SL) in anterior half, with gradual posterior taper; HL 18–22% SL; snout rounded, its length 31–35% HL; rostral hook short, extending to vertical through anterior nostril. Maxilla extends to vertical through middle of lower eye; angle of mouth nearer to snout tip than to branchial opening. One eyed-side nostril. Eye diameter 9–13% HL; interorbital space narrow. Vertebrae 57.

Eyed side uniformly brown; blind side whitish. Attains \sim 19 cm SL.



Cynoglossus sealarki, 19 cm TL (Saya de Malha Bank). Drawn from Regan 1908

DISTRIBUTION WIO: southern Mozambique and Saya de Malha Bank.

REMARKS Usually found at >225 m. Golani & Bogorodsky (2010) noted that reports of this species from the Red Sea are not supported by voucher specimens. Specimens from the

Red Sea, originally described as *C. dollfusi* and then later re-identified as *C. sealarki* (Chabanaud 1947, 1954), are not this species: they are *C. dollfusi*.

Cynoglossus semifasciatus Day 1877

Bengal tonguesole

Cynoglossus semifasciatus Day 1877: 436, Pl. 97, Fig. 5 (seas at Chennai, India); Norman 1928; Menon 1977; Ramanathan & Natarajan 1980; Manilo & Bogorodsky 2003.

Cynoglossus brevirostris Day 1877: 437, Pl. 97, Fig. 6 (Chennai, India); Norman 1928.

Dorsal fin 93–107 rays; anal fin 73–83 rays; caudal fin 10 rays. Single pelvic fin. Two eyed-side lateral lines, with 11–15 scale rows between them, and dorsalmost line ending a short distance before caudal fin; 70–86 scales in midlateral LL; no blind-side lateral line. Scales strongly ctenoid on both sides of body, including on lateral line. Body depth greatest (24–32% SL) in anterior half, with moderate posterior taper; HL 19–30% SL; snout rounded or obtusely pointed, its length 21–33% HL; rostral hook short, extending to vertical through front margin of anterior nostril. Maxilla extends to vertical through rear margin of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 5–13% HL; eyes nearly contiguous, interorbital space narrow. Vertebrae 47–50.

Eyed side pale brown, with numerous irregular vertical bands, and fins uniformly dark; blind side whitish. Attains \sim 12 cm SL.

DISTRIBUTION Indo-Pacific and Indian Ocean. WIO: west coast of India and Sri Lanka; elsewhere, east coast of India, Bay of Bengal and Gulf of Thailand.

REMARKS Found in coastal areas, to \sim 18 m deep.

Cynoglossus sinusarabici (Chabanaud 1931)

PLATE 97

Dollfusichthys sinusarabici Chabanaud 1931: 304 (Gulf of Suez, Red Sea); Chabanaud 1932, 1934, 1937.

Cynoglossus sinusarabici: Menon 1977; Goren & Dor 1994; Golani & Bogorodsky 2010.

Dorsal fin 99–101 rays; anal fin 78 or 79 rays; caudal fin 8 rays. Single pelvic fin. One eyed-side lateral line (midlaterally), with \sim 11 scale rows between lateral line and dorsal-fin base; 54–60 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including on lateral line.

Body depth greatest (23–26% SL) in anterior third, with moderate posterior taper; HL 19–21% SL; snout rounded, its length 26–32% HL; rostral hook short, not reaching posteriorly to vertical through anterior nostril. Maxilla extends to vertical through rear half of lower eye; angle of mouth nearer to snout tip than to branchial opening. Two nostrils on eyed side. Eye diameter 13–18% HL; eyes contiguous. Vertebrae 48–50.

Eyed side reddish brown, with numerous irregular darker markings on head and body, and LL scales with brownish black pigment; eyed side of dorsal and anal fins brown, with numerous small white or brown spots on rays and membranes, and distal edges of fins whitish (small brown spots also on blind side of fins); peritoneum black; blind side whitish. Attains ~14 cm SL.

DISTRIBUTION WIO: Red Sea and Suez Canal; Lessepsian migrant to Mediterranean Sea.

REMARKS Found in coastal areas, to at least 138 m deep.

Cynoglossus zanzibarensis Norman 1939

Redspotted tonguesole

PLATE 97

Cynoglossus capensis (non Kaup 1858): Boulenger 1900.

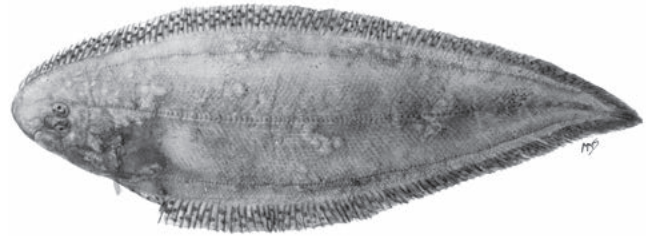
Trulla capensis (non Kaup 1858): Barnard 1925; SFSA No. 342 [in part: colour plate].

Cynoglossus (*Trulla*) *zanzibarensis* Norman 1939: 105, Fig. 36

(near Zanzibar, Tanzania); Menon 1977; SSF No. 261.9*; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004*.

Dorsal fin 116–124 rays; anal fin 92–103 rays; caudal fin 10 rays. Two pelvic fins; eyed-side fin rudimentary, slightly dorsal to midline, with 1–3 (usually 2) rays. Three eyed-side lateral lines, with 14–18 scale rows between dorsolateral and midlateral lines; 80–95 scales in midlateral LL; no blind-side lateral line. Juveniles (<15 cm SL) with ctenoid scales on both sides of body, including on lateral line. Adults (>20 cm SL) with ctenoid scales on eyed side of body, and progressively weaker ctenoid scales posteriorly; blind side of body with cycloid scales anteriorly, ctenoid scales posteriorly; blind side of dorsal fin and anal fin with row of cycloid scales on ~½ length of rays. Body depth greatest (21–28% SL) in anterior half, with gradual posterior taper. HL 21–24% SL; snout rounded to bluntly pointed, its length 27–35% HL; rostral hook short, ending well anterior to vertical through front margin of nostril. Maxilla extends to point between verticals through middle and rear of lower eye; angle of mouth nearer to snout tip than to branchial opening. One nostril on eyed side. Eyes large (diameter 8–13% HL), contiguous, and nearly symmetrically placed. Vertebrae 54–60.

Eyed side uniformly medium to dark brown, dorsoposterior border of gill cover darker; both opercular linings whitish, but some faint spots sometimes present on eyed-side lining; dorsal and anal fins with 2 rows of red to reddish brown or orange spots (brownish black in preserved specimens); peritoneum black; blind side whitish. Body of juveniles sandy brown, with pale blotches. Attains 32 cm SL.



Cynoglossus zanzibarensis, 30 cm TL (South Africa). Source: SSF

DISTRIBUTION WIO: Kenya to South Africa, Tanzania (Zanzibar) and Madagascar.

REMARKS Adults occur on sandy bottom on continental shelf, at ~150–430 m; juveniles sometimes found at shallower depths. Common off south Cape coast of South Africa and the most abundant cynoglossid by mass (Booth & Walmsley-Hart 2000) and considered one of the best-eating soles.

GENUS *Paraplagusia* Bleeker 1865

Left pelvic fin connected to anal fin; 2 or 3 lateral lines on eyed side. Mouth inferior, with conspicuous overhanging hooked snout; teeth only on right (blind-side) jaws; lips on eyed side with fringe, and labial papillae branched or unbranched; 1 (anterior) nostril on eyed side. Four synapomorphies define this genus (Chapleau 1988; Chapleau *et al.* 1991): 1) a short triangular basihyal attached to dorsal margin of 1st basibranchial; 2) fringed lips on eyed side; 3) teeth on 3rd infrapharyngobranchial wide and blunt; and 4) ventral arm of erisma (the fused, first 2 proximal pterygiophores) very long. Menon (1980) regarded the number of eyed-side lateral lines to vary intraspecifically, as did Chapleau & Renaud (1993). However, based on unpublished data for Australian species of *Paraplagusia*, where the number of lateral lines is species-specific, this character needs further investigation for species occurring beyond that region. Occur mostly in shallow warm-temperate to tropical seas of Indo-Pacific, from East Africa to Indo-Malay Archipelago, southern Japan, western and eastern Australia and New Caledonia (Chapleau & Renaud 1993).

As with species of *Cynoglossus*, members of *Paraplagusia* are curiously absent from the New World. This genus is in need of revision. At least 2 species in WIO (Menon 1980; Chapleau & Renaud 1993), but the diversity is likely higher.

KEY TO SPECIES

- 1a Scales in midlateral LL 75–96; eyed side of body uniformly pale to medium brown, without distinct markings; total vertebrae 46–49 (usually 48 or 49) *P. bleekeri*
- 1b Scales in midlateral line 100–117; eyed side of body pale brown to whitish and with distinctive pale ocelli; total vertebrae 50–54 (usually 51 or 52) *P. bilineata*

Paraplagusia bilineata (Bloch 1787)

Fringelip tonguefish

PLATES 97 & 98

Pleuronectes bilineatus Bloch 1787: 29, Pl. 188 [lectotype].

Achirus bilineatus Lacepède 1802: 6 (China; East Indies [Indonesia]) [replacement name: Kottelat 2013].

Plagusia blochii Bleeker 1851: 411 (Malay Archipelago) [replacement name: Kottelat 2013].

Plagusia marmorata var. *africana* Gilchrist 1906: 163, Pl. 47 (KwaZulu-Natal, South Africa); Norman 1928.

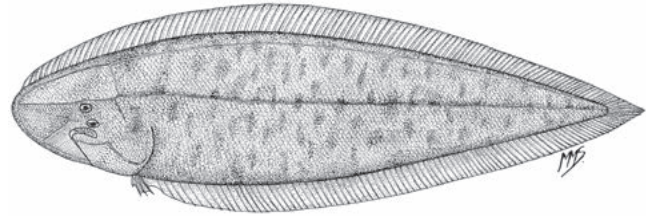
Plagusia robinsoni Regan 1919: 203, Fig. 6 (Durban, KwaZulu-Natal, South Africa).

Paraplagusia bilineata: Norman 1928 [in part]; Smith & Smith 1963; SFSa No. 335*; Menon 1980 [in part]; SSF No. 261.10* [in part]; Baissac 1990; Chapleau & Renaud 1993 [in part]; Goren & Dor 1994; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004; Golani & Bogorodsky 2010.

Dorsal fin 99–110 rays; anal fin 75–86 rays; caudal fin 8 rays. Two eyed-side lateral lines, with 16–19 rows of scales between them; 100–117 scales in midlateral LL; no blind-side lateral line. Scales ctenoid on both sides of body, including those of lateral line. Body elongate, greatest depth (23–28% SL) near midlength, with moderate anterior and posterior taper; HL 19–26% SL; snout obtusely pointed, its length 31–52% HL; rostral hook reaching beyond vertical at rear margin of lower eye by <1 eye diameter. Maxilla extends to vertical at rear margin of lower eye; labial papillae numerous, with long and distinct branches. Eyes small, diameter 5–12% HL; interorbital width narrow, ~¾ eye diameter. Vertebrae 49–54.

Eyed side tannish to darker brown, marbled with dark wavy anastomosing lines enclosing pale ocelli of various sizes; eyed-side opercular lining dark brown; eyed side of dorsal fin

and anal fin pale brown, with paler marbled blotches; isthmus spotted on both sides of body; blind side whitish or yellow. Attains 25 cm SL.



Paraplagusia bilineata, 19 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (KwaZulu-Natal), Madagascar, Seychelles and Mascarenes; elsewhere to Indonesia, Philippines, Taiwan, southern Japan, New Guinea, northern Australia and Solomon Is.

REMARKS It is likely that a number of closely related species from different regions in the Indo-Pacific are presently being identified as *Paraplagusia bilineata*. The taxonomic status of these nominal species needs further study.

Paraplagusia bleekeri Kottelat 2013

Bleeker's tonguefish

PLATE 98

Plagusia blochii [sometimes as *blochi*] Bleeker 1851: 411 (Malay Archipelago) [replacement name for *Pleuronectes bilineatus* Bloch 1787; new name mistakenly thought by many authors to represent a new species description]; Norman 1928; Ochiai 1963; Menon 1980; Chapleau & Renaud 1993; Munroe 2001.

Paraplagusia bleekeri Kottelat 2013: 765 ('many localities' [Indonesia]).

Dorsal fin 97–105 rays; anal fin 74–82 rays; caudal fin 8 rays. Two eyed-side lateral lines, with 13–16 rows of scales between them; no blind-side lateral line. Scales ctenoid on both sides of body, including those of lateral line; 75–96 scales in midlateral LL; interorbital region scaly; sometimes blind-side scales only weakly ctenoid. Body elongate, greatest depth anterior to body midpoint (18–28% SL), with moderate anterior and posterior taper; HL 24–27% SL; snout pointed, its length 34–46% HL; rostral hook reaching beyond vertical through rear margin of lower eye by <1 eye diameter. Maxilla extending to vertical at rear margin of lower eye; labial papillae numerous, with long, distinct branches. Eyes small (diameter 8–11% HL); interorbital width narrow, subequal to eye diameter. Vertebrae 46–49.

Eyed side uniformly pale to medium brown, head behind eyes and abdomen darker; scale centres paler than scale

margins, but otherwise without distinct markings; eyed sides of dorsal and anal fins pale yellowish, fin rays pale brown; blind side whitish or yellow. Attains 22 cm SL.

DISTRIBUTION Indo-Pacific. WIO: southern Oman to India; elsewhere to Malay Archipelago, Indonesia, Philippines, Taiwan, Japan and New Guinea.

REMARKS According to Kottelat (2013), *Plagusia blochii* was proposed by Bleeker (1851) as a new replacement name for *Pleuronectes bilineatus* Bloch 1787 and was not an original description of a species of cynoglossid flatfish. However, subsequent authors, since Norman's (1928) study of flatfishes of India, have misinterpreted Bleeker's proposed replacement name for *Pleuronectes bilineatus* Bloch; instead, they considered the replacement name to represent the name of a second, distinct species of *Paraplagusia*. Kottelat (2013) provided detailed information on why this interpretation is incorrect. He concluded that since Bleeker's *Plagusia blochii* is a new replacement name for *Pleuronectes bilineatus* Bloch 1787, it is an objective synonym of that species and cannot be used for any other species of *Paraplagusia*. This decision renders the second species without a name. Kottelat (2013: 765) remedied this situation by naming this second species *Paraplagusia bleekeri*. Almost all previous references citing *Plagusia blochii* Bleeker 1851 likely refer to *Paraplagusia bleekeri* Kottelat. Kottelat (2013) suggests that several nominal species likely are confused under the name *Plagusia blochii* of previous authors. The taxonomic status of these nominal species needs further study.

GENUS *Symphurus* Rafinesque 1810

Mouth more or less terminal; no lateral line on either side of body; dorsal-fin origin usually between verticals through front and rear margins of upper eye; only left pelvic fin present, connected to anal fin (membrane torn in many individuals); 2 nostrils on eyed side. Chapleau (1988) provided a list of synapomorphies that characterise the genus, including: absence of an eyed-side lateral line or sensory canals; anterior portion of supraoccipital replaced by cranial fontanelle; eyed-side lateral ethmoid greatly reduced in size, without osseous attachment to the interorbital complex dorsally nor to the eyed-side lateral ethmoid and vomer ventrally. Munroe (1992) noted that *Symphurus* is the only genus of cynoglossid characterised by a single proximal dorsal-fin pterygiophore inserted into the first interneural space.

Members are similar morphologically, with widely overlapping fin-ray and vertebral counts (Munroe 1992). Of diagnostic value are the numbers of abdominal vertebrae (3 + 6 or 3 + 7) and total vertebrae, and the number of proximal dorsal-fin pterygiophores inserting into the anteriormost interneural spaces, known as the ID pattern, which can only be determined from radiographs or dissection. All species have a single pterygiophore inserted into the first interneural space (a unique arrangement among the Cynoglossidae and related taxa). The species differ in number of proximal dorsal-fin pterygiophores inserting into interneural spaces two and three. ID-pattern formulae reflect the numbers of pterygiophores inserting into successive interneural spaces, beginning with the first interneural space; the formulae for Indian Ocean tonguefishes, with the numbers of species possessing each given in parentheses, are: 1-2-2-2-2 (9) and 1-2-2-1-2 (5). When used in combination with fin-ray counts, this ID pattern can facilitate identification of individual specimens.

Worldwide in temperate, subtropical and tropical seas (Munroe 1992), except polar seas. In the Indo-Pacific, a small number of species occur in shallow-water habitats, while most inhabit deeper waters (~200–1 000 m) on the continental shelf and upper slope, with a few ranging to depths of ~1 500 m (Munroe 1992; Munroe & Amaoka 1998). Species in the Atlantic (Munroe 1990, 1998) and eastern Pacific (Munroe *et al.* 1995; Munroe & McCosker 2001) generally occur in both shallow and deepwater habitats (to ~1 000 m). Most are poorly known as they are rarely collected; further study requires additional specimens. At least 85 species, 14 in WIO, but possibly only 5 species (one undescribed) at depths of <250 m.

KEY TO SPECIES

- 1a Eyed side uniformly whitish, yellowish white or pale brown, with a distinct pattern of reddish brown freckles (no bands); caudal fin usually 14 rays; hypurals 5 2
- 1b Eyed side uniformly pale to dark brown, with or without bands, but without a distinct pattern of reddish brown freckles; caudal fin usually 12 rays; hypurals 4 3
- 2a Blind side with numerous small melanophores on body overlying dorsal- and anal-fin pterygiophores; rear region of peritoneum spotted; eyed side either uniformly pigmented or with indistinct narrow crossbands; 16–18 horizontal scale rows on head behind lower (non-migrated) eye *Symphurus* sp.

Continued...

KEY TO SPECIES

- 2b Blind side without numerous small melanophores along body overlying dorsal- and anal-fin pterygiophores; rear region of peritoneum black (usually conspicuously visible through abdominal wall on both sides of body); eyed side with 3 or 4 darkly pigmented wide crossbands; 22–25 horizontal scale rows on head behind lower (non-migrated) eye ... *S. trifasciatus*
- 3a Prominent dark spot overlying eyed-side abdominal cavity; dorsal fin <90 rays; anal fin <80 rays; vertebrae 48 *S. monostigmus*
- 3b No prominent dark spot overlying eyed-side abdominal cavity; dorsal fin >90 rays; anal fin >80 rays; vertebrae >52 4
- 4a Dorsal fin <105 rays; anal fin <90 rays; vertebrae 54; ~95–105 scales in longitudinal series *S. sayademalensis*
- 4b Dorsal fin >105 rays; anal fin >90 rays; vertebrae 58; ~130 scales in longitudinal series *S. maldivensis*

Symphurus maldivensis Chabanaud 1955

Maldives tonguefish

Symphurus marmoratus (non Fowler 1934): Norman 1939.

Symphurus maldivensis Chabanaud 1955: 369 (Maldives, 04°45'36" N, 72°52'12" E); Chabanaud 1956; Munroe 1992; Adams *et al.* 1998.

Dorsal fin 107 rays, fin origin at vertical through front of upper eye; anal fin 96 rays; caudal fin ~14 rays. LSS ~130. Body moderately elongate, greatest depth (~26% SL) in anterior third, with gradual posterior taper; head short (HL ~19% SL); snout obtusely pointed, short (~20% HL); eyes relatively small (diameter ~12% HL). Rear margin of jaws reaching point between verticals through middle and rear of lower eye. Lower head lobe (~12% SL) smaller than upper head lobe (~13% SL). Upper and lower opercle lobes about equal (~29% HL). ID pattern (for pterygiophores inserting into successive interneural spaces) 1-2-2-2-2; 5 hypurals; 3 + 6 abdominal vertebrae, 58 total vertebrae.

Eyed side and median fins yellowish white, with distinct pattern of reddish brown freckles and marbling and 4 indistinct bands on body (the first just behind opercle); eyed-side opercle heavily spotted; black peritoneum evident through abdominal wall; blind side uniformly whitish. Attains at least 11 cm TL.

DISTRIBUTION Known only from the holotype collected from Maldives.

REMARKS Taken at 256–295 m.

Symphurus monostigmus Munroe 2006

Onespot tonguefish

PLATE 98

Symphurus monostigmus Munroe 2006: 231, Fig. 1 (off Gypsy Hill, KwaZulu-Natal, South Africa).

Dorsal fin 86 rays, fin origin at point between verticals through anterior margin of pupil and middle of upper eye; anal fin 73 or 74 rays; caudal fin 14 rays. LSS ~92. Body moderately elongate, greatest body depth (~33% SL) in anterior third, with gradual posterior taper; head relatively short (HL ~20% SL); snout bluntly rounded, short (~17% HL); eyes small (diameter ~14% HL), round, nearly contiguous, and with small inconspicuous pupil (pupil 28–32% eye diameter). Rear margin of jaws reaches point between verticals through anterior margin of pupil and middle of lower eye. Upper head lobe (~18% SL) larger than lower head lobe (~12% SL). Upper opercle lobe much wider than lower opercle lobe. ID pattern (for pterygiophores inserting into successive interneural spaces) 1-2-2-2-2; 5 hypurals; 3 + 6 abdominal vertebrae, 48 total vertebrae.

Eyed side yellowish white, with numerous reddish brown freckles (especially along dorsal and ventral contours, and coalesced into several darker blotches on dorsal and ventral margins of posterior half of body); conspicuous irregular dark spot overlying anteroventral body cavity on eyed side; no conspicuous spots or ocelli on dorsal fin or anal fin; posterior region of peritoneum black; blind side uniformly yellowish white. Attains at least 5 cm SL.

DISTRIBUTION Known only from two type specimens (males) collected from South Africa.

REMARKS Taken on inner continental shelf, at 65–110 m.

Symphurus sayademalensis Chabanaud 1955

Symphurus sayademalensis Chabanaud 1955: 369 (Saya de Malha Bank); Chabanaud 1956; Munroe 1992.

Dorsal fin 100 or 101 rays, fin origin anterior to or at vertical through front of upper eye; anal fin 87 or 88 rays; caudal fin 14 rays. LSS ~100. Body moderately elongate, its greatest depth (26–28% SL) in anterior third, with gradual posterior taper; head short (HL 17–18% SL); snout obtusely rounded, short (~18% HL); eyes relatively small (10–11% HL) and with small pupil, nearly contiguous and about equal in position. Rear margin of jaws at point between verticals through anterior margin of pupil and middle of lower eye. Upper head lobe (~12% SL) slightly wider than lower head lobe (~11% SL).

Lower opercle lobe (~31% HL) slightly wider than upper opercle lobe (~33% HL), and extends further back than upper lobe. ID pattern (for pterygiophores inserting into successive interneural spaces) 1-2-2-2-2; 5 hypurals; 3 + 6 abdominal vertebrae, 54 total vertebrae.

Eyed side freckled; peritoneum black; blind side uniformly whitish. Attains ~12 cm SL.

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Seldom-collected deepwater species, known from >227 m.

Symphurus trifasciatus (Alcock 1894)

Threeband tonguefish

Aphoristia trifasciata Alcock 1894: 132 [18], Pl. 7, Fig. 4 (Bay of Bengal);

Alcock 1895*, 1896, 1899.

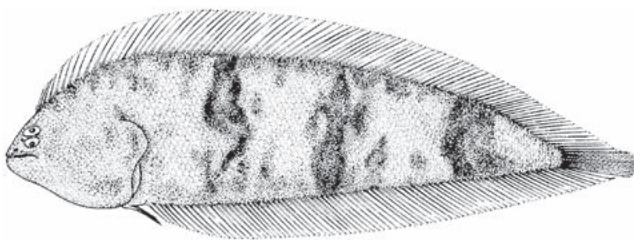
Symphurus trifasciatus: Norman 1928; Chabanaud 1955, 1956;

Munro 1955; Munroe 1992; Munroe & Marsh 1997*;

Manilo & Bogorodsky 2003.

Dorsal fin 85–92 rays, fin origin between verticals through middle and rear of upper eye; anal fin 71–80 rays; caudal fin 12 rays. LSS 76–85; 22–25 scales on head behind lower eye. Body elongate, its greatest depth (24–27% SL) in anterior third, with gradual posterior taper; head relatively large (HL 24–27% SL), its width and length subequal; snout obtusely pointed, relatively short (14–26% HL); eyes relatively small (diameter 9.5–11% HL), spherical, upper eye slightly in advance of lower eye; interorbital space narrow. Rear margin of jaws reaching vertical at rear margin of lower eye. Lower head lobe distinctly wider than upper head lobe. Lower opercle lobe much narrower than upper opercle lobe. ID pattern (for pterygiophores inserting into successive interneural spaces) 1-2-2-2-2; 4 hypurals; 3 + 6 abdominal vertebrae, 47–50 total vertebrae.

Eyed side olive-brown, with 3 or 4 darker brown wide crossbands; eyed-side opercle with diffuse blotch, and rear margin of lining darkly pigmented; dorsal and anal fins dark brown along ~½–¾ length of rays; peritoneum black; blind side uniformly whitish. Attains ~12 cm SL.



Symphurus trifasciatus, 9 cm SL, lectotype (Bay of Bengal).

Source: Munroe & Marsh 1997

DISTRIBUTION Indian Ocean. WIO: Gulf of Oman, India, Sri Lanka and Gulf of Mannar; elsewhere to east coast of India (Chennai).

REMARKS Found on fine sand and mud bottom, in relatively deep water, at ~220–740 m.

Symphurus sp.

Symphurus microrhynchus (non Weber & De Beaufort 1929): Munroe 1992; Munroe & Marsh 1997.

Dorsal fin 87–92 rays, fin origin at or slightly behind vertical through rear margin of upper eye; anal fin 72–78 rays; caudal fin 12 rays. LSS 77–94; 16–18 scales on head behind lower eye. Body moderately elongate, its greatest depth (~26% SL) in anterior third, with gradual posterior taper; head moderately short (HL ~23% SL); snout somewhat rounded, short (~17% HL); eyes relatively small (diameter ~10% HL), round, subequal, upper eye slightly in advance of lower, and interorbital space narrow and scaly. Rear margin of jaws reaches point between verticals through middle and rear of lower eye. Lower head lobe (~11% SL) slightly narrower than upper head lobe (~12.5% SL). Lower opercle lobe usually wider than upper lobe. ID pattern (for pterygiophores inserting into successive interneural spaces) 1-2-2-2-2; 4 hypurals; 3 + 6 abdominal vertebrae, 46–50 total vertebrae.

Eyed side yellowish to medium brown, with 5 or 6 relatively narrow darker brown, but faint, continuous crossbands; dark melanophores at bases of anteriormost dorsal-fin rays; dorsal and anal-fin rays streaked with brown; caudal fin sometimes with dark band; opercular linings unpigmented; dorsalmost aspect of peritoneum dark, otherwise peritoneum lightly pigmented or spotted; blind side uniformly whitish. Attains ~7 cm SL.

DISTRIBUTION WIO: Tanzania (Tumbatu I., Zanzibar).

REMARKS Known from sandy bottom, in relatively shallow waters, at 6–82 m. Munroe & Marsh (1997) considered *Symphurus microrhynchus* to be a widespread Indo-Pacific species, including specimens from Zanzibar. New data based on a larger series of specimens from several different localities indicate the presence of a species-complex of at least 5 species (Lee & Munroe, unpublished data). The East African population at Zanzibar is likely an undescribed species with similar attributes to *S. microrhynchus* and related species found in other regions of the Indo-Pacific. More specimens are needed to resolve the status of this population (Lee & Munroe, unpublished data).

GLOSSARY

cranial fontanelle – basically a ‘hole in the skull’.

erisma (ventral arm of) – a thin bone with two ‘arms’ that lies in the middle between the skull and anteriormost dorsal interneural spines and below the rostral cartilage.

infrapharyngobranchial – a tooth plate on bones in the pharynx (throat) of a fish, behind the gills.

junior subjective synonym – junior synonym: a younger name for a species named earlier; subjective synonym: two species/names that do not have the same type specimen.

proximal dorsal-fin pterygiophore – the fin rays are supported by two bones, a small distal pterygiophore and a large proximal pterygiophore.

supraoccipital bone – a median bone at the upper rear surface of the skull, frequently bearing an expanded crest (supraoccipital process).

synapomorphies – shared, derived characters, indicating common ancestry.

FAMILY SOLEIDAE

Soles

Martine Desoutter-Meniger and François Chapleau

Flatfishes with eyes on right side of head (dextral), and strongly compressed elongate or oval body. Preopercle without free margin, covered by skin and scales. Dorsal fin extending far forward on head, its origin above or before eyes or on front of snout; dorsal fin and anal fin separate from or joined to caudal fin; pectoral fin on eyed side absent or longer than fin on blind side; pelvic fins sometimes asymmetrical, free or joined to anal fin. No fin spines. Mouth small and asymmetrical, terminal or slightly inferior; teeth small, villiform, better developed on blind-side jaws. Lateral line on both sides of body. Scales moderately large, generally ctenoid, sometimes modified into skin flap fringed with sensory filaments; LL scales counted from above upper end of gill opening to caudal-fin base. No ribs; no postcleithrum. Variations in colour can occur with habitat.

Benthic and neritic, occurring in all oceans except the western Atlantic. Some species are of considerable economic importance. The taxonomy of this family needs revision, as the genera and species are currently not well-differentiated. At least 29 genera and ~192 species; at least 15 genera and 42 species in WIO.

KEY TO GENERA

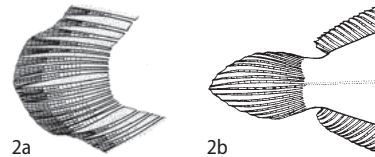
- 1a Snout forming distinct fleshy hook over mouth; caudal fin completely separate from dorsal fin and anal fin *Heteromycteris*



- 1b Snout not forming distinct hook; caudal fin either separate from or joined to dorsal fin and anal fin 2

- 2a Dorsal fin and anal fin joined to caudal fin 3

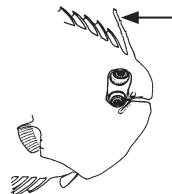
- 2b Dorsal fin and anal fin separate from caudal fin, or sometimes joined to it by thin membrane 8



- 3a Opercle membrane of both sides joined to upper rays of pectoral fin; head and body pale, with several dark crossbars extending onto dorsal fin and anal fin 4

- 3b Opercle membrane not joined to upper rays of pectoral fin ... 6

- 4a First ray of dorsal fin elongate and with villi *Aesopia*



- 4b First ray of dorsal fin not elongate 5

- 5a Posteriormost dorsal- and anal-fin rays attached by thin membrane for about half length of caudal fin *Pseudaesopia*

- 5b Posteriormost dorsal- and anal-fin rays totally confluent and attached to caudal fin for its entire length *Zebrias*

- 6a Eyed-side pectoral fin at least half HL, and distinctly longer than blind-side pectoral fin *Austroglossus*

- 6b Pectoral fins subequal 7

- 7a Body oblong, its depth 2.3–4.4 in SL; pectoral fins equally developed *Dagetichthys*

- 7b Body disc-shaped, its depth 1.8–2.2 in SL; eyed-side pectoral fin with 7 or 8 rays, blind-side fin with 5 rays *Brachirus*

Continued...

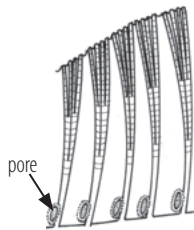
KEY TO GENERA

8a No pectoral fins 9



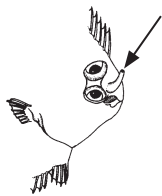
8b Pectoral fins present 10

9a Dorsal fin and anal fin (both sides of body) with pore at base of almost every ray *Pardachirus*



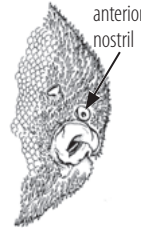
9b No pores at bases of dorsal- and anal-fin rays *Aseraggodes*

10a Anterior nasal tube of eyed side long, reaching middle of lower eye *Soleichthys*



10b Anterior nasal tube of eyed side short, not reaching middle of lower eye 11

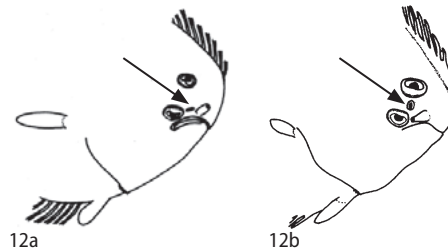
11a Anterior nostril of blind side cup-like or bulb-like, surrounded by bare area 12



11b Anterior nostril of blind side tubular 13

12a Posterior nostril of eyed side set just behind anterior nostril, just above jaw; pectoral fins longer than pelvic fins *Synapturichthys*

12b Posterior nostril of eyed side more dorsal than anterior nostril, in front of interorbital space; pectoral fins shorter than pelvic fins *Barnardichthys*



13a Pectoral fins with all unbranched rays *Bathysolea*

13b Pectoral fins with all or some branched rays 14

14a LL scales 54–78 (WIO species) *Microchirus*

14b LL scales >88 (WIO species) *Solea*

GENUS *Aesopia* Kaup 1858

Eyed-side anterior nostril a short fleshy tube; posterior nostril a short, wide, thin tube at front edge of lower eye. Blind-side anterior nostril a short thin transparent tube, not longer than that of eyed side; posterior nostril a short thin transparent tube, hidden among villi and scales at end of trough extending dorsally from rictus. First dorsal-fin ray thickened, elongated and free distally, with dermal villi; dorsal fin and anal fin joined to caudal fin; pectoral fins small, dorsalmost ray joined to opercular membrane; pelvic fins symmetrical and well-separated from anal fin; all fin rays unbranched. Currently 1 species recognised.

***Aesopia cornuta* Kaup 1858**

Unicorn sole

PLATE 98

Aesopia cornuta Kaup 1858: 98 (British Indies [India, Indian Ocean]); Barnard 1925; Norman 1928*; Kuronuma & Abe 1972*; SSF No. 262.1*; Quérou & Desoutter 1990; Goren & Dor 1994; Sommer *et al.* 1996*; Manilo & Bogorodsky 2003.

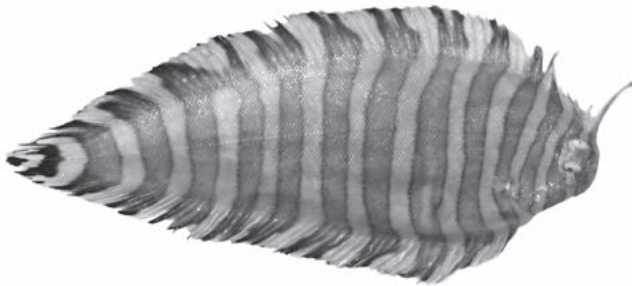
Synaptura cornuta: Day 1877*.

Coryphaesopia cornuta barnardi Chabanaud 1934: 430 (off Amatikulu Hill, KwaZulu-Natal, South Africa).

Coryphaesopia cornuta: SFSA No. 319*.

Diagnosis as for genus. Dorsal fin 69–79 rays; anal fin 57–68 rays; pectoral fins 11–15 rays; pelvic fin 3 or 4 rays; caudal fin 15–17 rays. Body depth 2.7–3 in SL; HL 4.8–6.3 in SL. Snout slightly hooked; lips fleshy with many longitudinal plicae on inner surface. Eyes contiguous; interorbital area naked and slightly raised. Lateral line of eyed side with well-developed supratemporal branch curving behind upper eye. Scales feebly ctenoid on eyed side, cycloid on blind side; LL scales 90–105. Vertebrae 46.

Eyed side greyish or pale brownish background, with 13–16 distinct dark brown and darker-edged bars extending onto medial fins (first bar on snout); caudal fin blackish brown. Blind side whitish; dorsal, anal and caudal fins dark. Attains 25 cm SL.



Aesopia cornuta, 14 cm TL (Seychelles). © Alvheim © IMR/ASCLME

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (KwaZulu-Natal), Madagascar, Seychelles and India; elsewhere to Indonesia, southern Japan and northern Australia.

REMARKS Found in coastal waters, on sand or mud bottom, to at least 100 m deep.

GENUS *Aseraggodes* Kaup 1858

Caudal fin clearly separate from dorsal fin and anal fin; no pectoral fins; pelvic fins short, with 5 rays, symmetrical and separate from anal fin; dorsal- and anal-fin rays unbranched. Eyes small, without scaly eyelid, but interorbital space scaly. Posterior nasal tube a short narrow slit in lip groove before lower eye. Lateral line on both sides of body with short supratemporal branch. Often misspelled as *Aserraggodes* or *Asseraggodes*. About 53 species (Randall *et al.* 2013), 13 in WIO.

KEY TO SPECIES

- | | | |
|----|--|------------------------|
| 1a | Anal fin 39–45 rays; dorsal fin 58–67 rays | 2 |
| 1b | Anal fin 47–53 rays; dorsal fin 67–76 rays | 6 |
| 2a | LL scales 84 (including scales anterior to upper end of gill opening); blind-side anterior nostril tube long and thin; dorsal-, anal- and pelvic-fin rays branched | <i>A. guttulatus</i> |
| 2b | LL scales 51–64; blind-side anterior nasal tube short and thick; dorsal-, anal- and pelvic-fin rays unbranched | 3 |
| 3a | Caudal fin 14–16 rays, and fin long, 2.9–3.2 in SL; eyed-side anterior nasal tube long, reaching past front edge of lower eye | <i>A. steinitzi</i> |
| 3b | Caudal fin 18 rays | 4 |
| 4a | Anal fin 39 rays; vertebrae 32 | <i>A. kruppi</i> |
| 4b | Anal fin 40–45 rays; vertebrae 33–36 | 5 |
| 5a | Peduncle present; vertebrae 33 or 34; eyed side with white or dark brown spots | <i>A. martine</i> |
| 5b | No peduncle; vertebrae 34 or 35; eyed side uniformly tan | <i>A. sinusarabici</i> |
| 6a | Peduncle very short; vertebrae 36–38 | 7 |
| 6b | No peduncle (rear of anal-fin base slightly behind base of lowermost caudal-fin ray); vertebrae 34–36 | 8 |
| 7a | Caudal fin long, 2.8–4.2 in SL | 10 |
| 7b | Caudal fin short, 4.2–4.7 in SL | <i>A. heemstrai</i> |
| 8a | Caudal-fin length 3.9–4.9 in SL; 9 dorsal pterygiophores in front of 4th neural spine; vertebrae 34–36 | 9 |
| 8b | Caudal-fin length ~3.6 in SL; 10 or 11 dorsal pterygiophores in front of 4th neural spine; vertebrae 37 | <i>A. andersoni</i> |
| 9a | Last rays of dorsal fin and anal fin overlap bases of upper and lower caudal fin rays; pelvic-fin length ~2.8 in HL, and fin not reaching past base of 2nd ray of anal fin; caudal fin ~4.9 in SL; snout length ~2.5 in HL; LL scales 77; vertebrae 34 | <i>A. jenny</i> |
| 9b | Last dorsal- and anal-fin rays with small gap before bases of caudal-fin rays; pelvic fin ~1.8 in HL, and fin reaching past base of 3rd ray of anal fin; caudal fin 3.9–4 in SL; snout length 2.9–3.1 in HL; LL scales 70–74; vertebrae 35 or 36 | <i>A. brevirostris</i> |

Continued ...

KEY TO SPECIES

- 10a Anterior nostril of eyed side a tube barely reaching or overlapping front of lower eye 11
- 10b Anterior nostril of eyed side a tube reaching rear of lower eye *A. macronasus*

- 11a Head large, HL 2.6–3.4 in SL; dorsal- and anal-fin rays unbranched; maxilla reaches to below rear of lower eye; no cirri on membrane ridge of dorsal- and anal-fin rays 12
- 11b Head smaller, HL 4.2–4.6 in SL; dorsal- and anal-fin rays branched; maxilla not reaching past vertical at mid-lower eye; membrane ridge of most dorsal- and anal-fin rays with cirri *A. diringeri*

- 12a LL scales 67–70 *A. cyaneus*
- 12b LL scales 76–84 *A. umbratilis*

Aseraggodes andersoni Randall & Bogorodsky 2013

PLATE 98

Aseraggodes andersoni Randall & Bogorodsky in Randall, Bogorodsky & Mal 2013: 6, Fig. 1 (seaward reef at east end of North Malé I., Maldives).

Dorsal fin 68 rays; anal fin 49 rays; pelvic fin 5 rays; caudal fin 18 rays; LL scales 71. Body depth 2.4 in SL; HL 4.1 in SL; caudal-fin length 3.6 in SL, and fin strongly rounded. Eyed-side anterior nostril reaching lower eye when laid back. No peduncle. Vertebrae 37.

Eyed side pale brown, with numerous bluish white blotches, scattered small dark brown spots, and 3 rows of large brown blotches (at bases of dorsal fin and anal fin, and along lateral line); large orange-red area over abdomen and back of head; median fins with row of large dark brown spots at bases and small spots peripherally. Attains at least 2 cm TL.

DISTRIBUTION Known only from the holotype (immature male) collected from Maldives.

REMARKS Taken in surge zone at 1–1.5 m.

Aseraggodes brevirostris Randall & Gon 2006

PLATE 98

Aseraggodes brevirostris Randall & Gon 2006: 170, Fig. 1 (Anjouan I., Comoro Is.).

Dorsal fin 67–71 rays; anal fin 51 rays; pelvic fin 5 rays; caudal fin 18 rays, and fin not short; LL scales 69–71.

Body depth 2.4–2.6 in SL; HL ~4.5 in SL. Eyed-side anterior nostril reaching lower eye. No peduncle. Vertebrae 36.

Eyed side pale yellowish brown, with many small dark brown spots and short lines, and large, irregular, dark brown blotches in 3 rows. Blind side yellowish. Attains at least 4 cm TL.

DISTRIBUTION Known only from two type specimens collected from Comoros.

REMARKS Taken at 6–18 m.

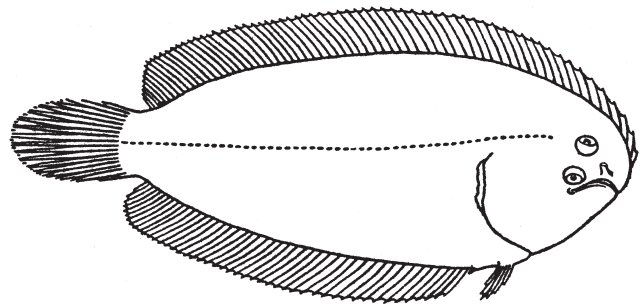
Aseraggodes cyaneus (Alcock 1890)

Blue sole

Solea cyanea Alcock 1890: 439 (off Ganjam and Vizagapatam coasts, India). *Aseraggodes cyaneus*: Weber 1913*; Norman 1928*; Weber & De Beaufort 1929; Chabanaud 1930; Gloerfelt-Tarp & Kailola 1984*; Quéro & Desoutter 1990; Manilo & Bogorodsky 2003.

Dorsal fin 67–76 rays; anal fin 47–53 rays; pelvic fins 5 rays; caudal fin 18 rays; pelvic fins joined together, but separate from urinary papillae. Body depth 2.2–2.6 in SL; HL 2.6–3.4 in SL. LL scales 74–84; interorbital space scaly, concave, its width less than eye diameter. Tubular anterior nostril short, not reaching lower eye. Vertebrae 38.

Body brownish to dark, with darker large round to oval spots, arranged in 4 or 5 irregular transverse series, and in 3 irregular longitudinal rows (1 row along lateral line, other 2 rows along bases of dorsal and anal fins). Attains ~13 cm SL.



Aseraggodes cyaneus, 7 cm SL. Source: Norman 1928

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Arabian Sea and Mozambique; elsewhere to east coast of India, Bay of Bengal, Timor Sea and Philippines.

REMARKS Occurs on soft bottom, at 70–271 m.

Aseraggodes diringeri (Quéro 1997)

Reef sole

PLATES 98 & 99

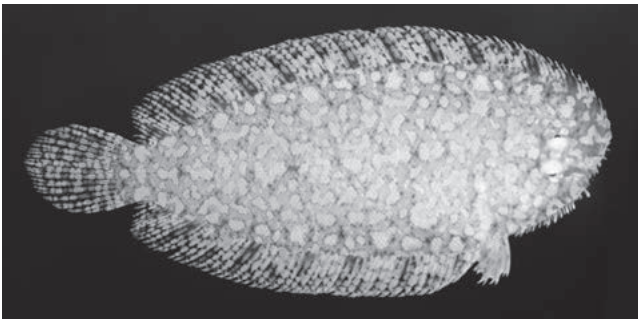
Parachirus diringeri Quéro 1997: 320, Fig. 1 (Cape Homard, Réunion, Mascarenes).

Aseraggodes cyaneus (non Alcock 1890): Winterbottom *et al.* 1989*.

Aseraggodes diringeri: Randall & Gon 2006*.

Dorsal fin 68–76 rays; anal fin 47–52 rays; pelvic fins 5 rays; caudal fin 18 rays. Body depth 2.3–2.6 in SL; HL 4.2–4.6 in SL. LL scales 75–87, including ~11 scales in front of upper end of gill opening; interorbital space scaly, its width ~½ eye diameter. Anterior nostril reaches front of lower eye. Vertebrae 35–38.

Eyed side brown, with many small dark brown spots or short lines, and 3 rows of large dark brown spots; fin rays pale yellowish brown, some with brown spots and some with white spots. Attains 11 cm SL.



Aseraggodes diringeri, 4 cm SL (Comoros). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Kenya to South Africa (Sodwana Bay), Comoros, Seychelles, Mauritius, Réunion and Chagos.

Aseraggodes guttulatus Kaup 1858

Reclusive sole

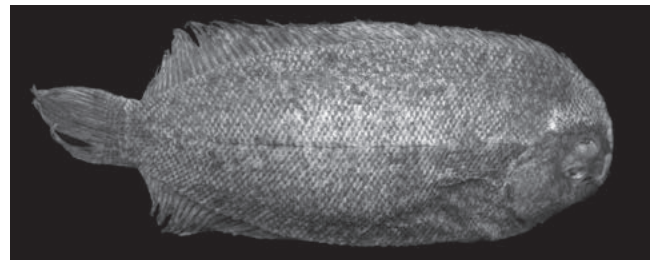
Aseraggodes guttulatus Kaup 1858: 103 (Réunion, Mascarenes);

Chabanaud 1930, 1931; Quéro 1997; Fricke 1999 [as *Asseragodes*];

Randall & Gon 2006*.

Dorsal fin 64 rays; anal fin 42 rays; pelvic fins 5 rays; caudal fin 18 rays; LL scales 70. Body depth 2.4 in SL; HL 4.3 in SL. Anterior nostril of eyed side a short thick tube not reaching front of lower eye. Vertebrae 34.

Head and body of preserved specimen brownish grey. Attains at least 8 cm SL.



Aseraggodes guttulatus, 8 cm SL, holotype (Réunion).

Source: Randall & Gon 2006 (by M Hauteceour)

DISTRIBUTION Known only from holotype from Réunion.

Aseraggodes heemstrai Randall & Gon 2006

Natal sole

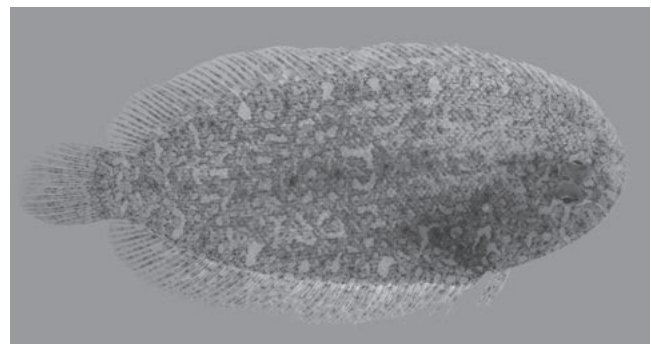
PLATE 99

Aseraggodes heemstrai Randall & Gon 2006: 177, Figs. 6–7 (Clives Reef,

Aliwal Shoal, KwaZulu-Natal, South Africa); Randall *et al.* 2013.

Dorsal fin 67–75 rays; anal fin 46–52 rays; pelvic fins 5 rays; dorsal- and anal-fin rays branched except for a few anterior rays; caudal fin 18 rays; LL scales 70–78. Body depth 2.3–2.5 in SL; HL 4.1–4.4 in SL; eye diameter 4.6–5.1 in HL; interorbital width 26–33 in HL; peduncle 10–18 in HL. Tubular anterior nostril reaching front of lower eye. Vertebrae 36–38.

Eyed side brown, scales dark-edged; head and body with numerous irregular dark-edged white spots (most smaller than eye diameter, but largest white spots more irregularly arrayed in 3 rows: below dorsal fin, above anal fin, and along lateral line) and numerous small scattered black spots; some specimens with irregular faint blackish blotches, alternating with large white spots of the 3 rows; fin rays with small brown spots and larger white spots, fin membranes transparent. Attains ~8 cm SL.



Aseraggodes heemstrai, 6 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: endemic to South Africa, from Sodwana Bay to Protea Bank, off Shelly Beach, KwaZulu-Natal.

REMARKS Found on sandy areas near coral and rocky reefs, at 15–39 m.

Aseraggodes jenny Randall & Gon 2006

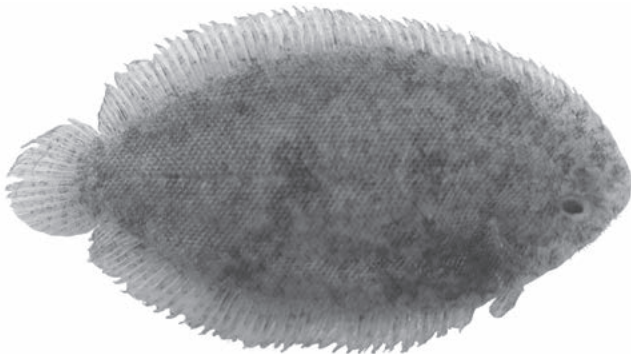
Wide sole

PLATE 99

Aseraggodes jenny Randall & Gon 2006: 182, Fig. 8 (off Flic-en-Flac, Mauritius, Mascarenes).

Dorsal fin 66 rays; anal fin 49 rays; caudal fin 18 rays; pelvic fins 5 rays; fin rays branched except for anterior 14 dorsal-fin rays and lowermost caudal-fin rays; LL scales 77. Body depth 2.3 in SL; HL 4.4 in SL; eye diameter 5.5 in HL; interorbital width almost equal to eye diameter, and 6.2 in HL. Anterior nasal tube longer than eye diameter, reaches past front edge of lower eye. No peduncle. Vertebrae 34; 11 dorsal pterygiophores anterior to 4th neural spine.

Head and body pale brown, densely mottled with dark brown and 2 irregular blackish areas. Attains at least 5 cm SL.



Aseraggodes jenny, ~6 cm SL, holotype (Mauritius). © Gon © NRF-SAIAB

DISTRIBUTION Known only from the holotype collected from Mauritius.

REMARKS Taken at 8–15 m.

Aseraggodes kruppi Randall & Bogorodsky 2013

PLATE 99

Aseraggodes kruppi Randall & Bogorodsky in Randall, Bogorodsky & Mal 2013: 7, Fig. 2 (coral patch near small island off Qunfudhah, Saudi Arabia, Red Sea).

Dorsal fin 58 rays; anal fin 39 rays; pelvic fin 5 rays; caudal fin 18 rays; LL scales 68 (including 8 anterior to upper end of gill opening). Body depth 2.6 in SL; HL 3.65 in SL; peduncle depth 6.4 in SL; caudal-fin length 3.7 in SL, and fin rounded. Tubular eyed-side anterior nostril just reaching lower eye when laid back. Thirteen lappet-like cirri on ventral margin of head. Vertebrae 32.

Eyed side pale yellow with dark markings; head and body with variously shaped white blotches; median-fin rays yellowish, spotted with dark brown and white; basal halves of dorsal fin and anal fin each with row of irregular large white blotches; cirri on ventral margin of head white. Preserved specimens pale beige, brown-edged scales, 3 rows of diffuse dark brown blotches on body, and fins unmarked. Attains 6 cm SL.



Aseraggodes kruppi, 6 cm SL (Red Sea). © SV Bogorodsky

DISTRIBUTION Known only from the holotype from Red Sea.

REMARKS Taken on sand patch of reef, at ~2–2.5 m.

Aseraggodes macronasus

Randall & Bogorodsky 2013

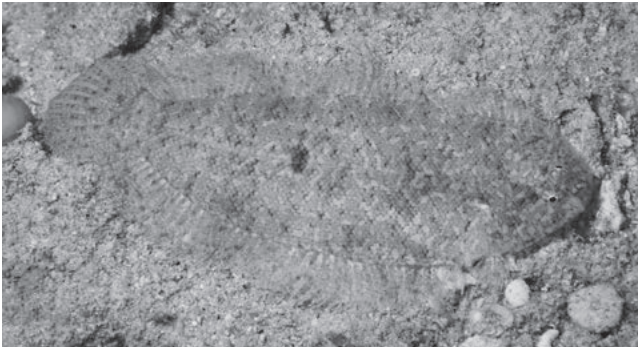
PLATE 99

Aseraggodes macronasus Randall & Bogorodsky in Randall, Bogorodsky & Mal 2013: 10, Figs. 4–6 (Dahab, Egypt, Gulf of Aqaba, Red Sea).

Dorsal fin 63–69 rays; anal fin 45–50 rays; pelvic fin 5 rays; caudal fin 18 rays; LL scales 66–72. Body depth 2.7–2.8 in SL; HL 4.1–4.5 in SL; peduncle length 13–14.5 in HL; caudal-fin length 2.8–3.9 in SL. Tubular eyed-side anterior nostril very long, 3.6–4.1 in HL. Ventral margin of head with fine cirri. Vertebrae 35 or 36.

Eyed side yellowish grey, scales narrowly dark-edged, and body and fins covered with small bluish grey spots; 1 small white spot on opercular flap (red of gill filaments showing through); 2 brown blotches on lateral line; dorsal fin and anal

fin with yellowish rays and some faint dark spots; caudal fin similar, but with small dark brown spots on basal scaled part of fin; pupil dark green. Attains at least 6 cm SL.



Aseraggodes macronasus (Red Sea). © SV Bogorodsky

DISTRIBUTION Known only from three type specimens collected from Red Sea.

REMARKS Taken over sand and rubble, at 5–5.5 m.

Aseraggodes martine Randall & Bogorodsky 2013

PLATE 99

Aseraggodes martine Randall & Bogorodsky in Randall, Bogorodsky & Mal 2013: 13, Figs. 7–9 (lagoon off Andrott I., Lakshadweep Is., India).

Adults: dorsal fin 65–67 rays; anal fin 42 or 43 rays; pelvic fins 5 rays; caudal fin 18 rays; LL scales 66–69. Body depth 2.4–2.5 in SL; HL ~4.4 in SL; peduncle short, 9–14 in HL; caudal-fin length ~4.4 in SL, and fin strongly rounded. Tubular anterior nostril as long as upper-eye diameter. Ventral margin of head with 23 lappet-like cirri. Vertebrae 33 or 34; 15 or 16 dorsal pterygiophores anterior to 4th neural spine.

Eyed side pale yellowish brown, and scales dark-edged, except within numerous dark-edged irregularly shaped pale spots; fin rays blotched and spotted greenish yellow, especially basally; white lappet-like cirri anteriorly and ventrally on margin of head. Preserved specimens yellowish white, with scattered small blackish flecks, most from dark outer edges of scales, dusky spot on lateral line, and faint longitudinal orangish band below base of dorsal fin and anal fin. Attains at least 6 cm SL.

DISTRIBUTION WIO: Seychelles and Lakshadweep.

REMARKS Known only from three specimens: two adults (including holotype) collected at 1–10 m on sand bottom in island lagoon at Lakshadweep, and 20.5-mm-SL juvenile collected over sand and gravel next to reef off Port Glaud, Les Trois Dames, Mahé I., Seychelles.

Aseraggodes sinusarabici Chabanaud 1931

Suez sole

PLATE 99

Aseraggodes sinusarabici Chabanaud 1931: 296 (Gulf of Suez, Egypt, Red Sea); Clark *et al.* 1968; Dor 1984; Manilo & Bogorodsky 2003; Randall & Gon 2006*; Randall *et al.* 2013.

Dorsal fin 60–68 rays; anal fin 40–45 rays; caudal fin 18 rays; dorsal- and anal-fin rays unbranched, but most caudal-fin rays branched; LL scales 62–72. Body depth 2.3–2.7 in SL; HL 3.4–4.1 in SL; eye diameter ~7 in HL, interorbital area scaly, its width ~17 in HL. Mouth cleft below vertical at middle of upper eye; lips not fringed. Tubular anterior nostril short, situated near front of upper eye. No peduncle. Vertebrae 34–36; 10 or 11 dorsal pterygiophores before 4th neural spine.

Eyed side nearly uniformly pale brown (without pale markings); fins pale yellowish. Preserved specimens densely dotted with brown, and some larger dots especially on fins. Attains at least 8 cm SL.



Aseraggodes sinusarabici, 8 cm SL (Gulf of Suez). © SV Bogorodsky

DISTRIBUTION WIO: Red Sea (Gulf of Suez and Djibouti).

REMARKS Known only from 11 adult type specimens from Gulf of Suez, and 1 juvenile collected at Djibouti. The species description here is based only on the type specimens; Clark *et al.* (1968) obtained additional specimens from the Red Sea but did not describe them.

Aseraggodes steinitzi Joglekar 1971

Dahlak sole

Aseraggodes steinitzi Joglekar 1971: 166, Figs. 1–3 (Cundabilu, Dahlak Archipelago, Eritrea, Red Sea); Randall & Gon 2006; Randall *et al.* 2013.

Dorsal fin 58–62 rays; anal fin 39–41 rays; caudal fin 14–16 rays; pelvic fins united posteriorly; dorsal-, anal- and pelvic-fin rays unbranched, most caudal-fin rays branched; LL scales 51–64. Body depth 2.4–2.5 in SL; HL 3.6–4.1 in SL. Tubular eyed-side anterior nostril long, and posterior nostril short, near front edge of lower eye. Lips not fringed.

Eyed side pale brown, with irregular brown blotches. Attains at least 36 mm SL.



Aseraggodes steinitzi, 30 mm SL, paratype (Red Sea). KK Bineesh © CMFRI

DISTRIBUTION Known only from type specimens from the Red Sea.

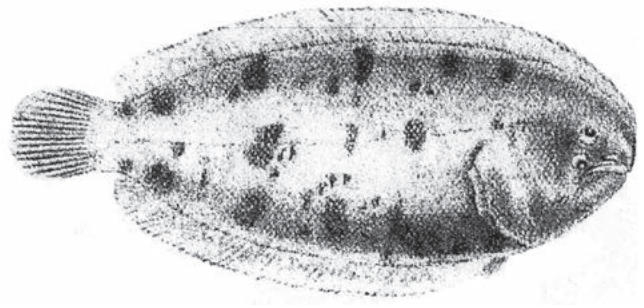
Aseraggodes umbratilis (Alcock 1894)

Solea umbratilis Alcock 1894: 131 [17], Pl. 7, Fig. 3 (Bay of Bengal); Alcock 1895*.

Aseraggodes umbratilis Randall & Gon 2006: 189 [lectotype].

Dorsal fin 67–73 rays; anal fin 47–51 rays; LL scales 76–84. Body depth 2.3–2.5 in SL; HL 2.9–3.4 in SL. Anterior nostril of eyed side very short, not reaching edge of lower eye. Lateral line with supratemporal branch. Peduncle present but extremely short. Vertebrae 37 or 38.

Eyed side brown, with 3 rows of dark brown blotches (rows dorsal, ventral, and along lateral line); fin rays brown, and membranes dark brown. Attains ~8 cm SL.



Aseraggodes umbratilis (Bay of Bengal). Source: Alcock 1895

DISTRIBUTION Northern Indian Ocean. WIO: Arabian Sea; elsewhere, Bay of Bengal.

REMARKS Known from 70–271 m.

GENUS *Austroglossus* Regan 1920

Dorsal fin and anal fin confluent with caudal fin; pectoral fins well-developed, eyed-side fin longer; pelvic fins small and symmetrical. Mouth strongly curved on blind side; lips not fringed. Eyed-side anterior nostril short and tubular, posterior nostril between front of eyes. Lateral line straight on both sides of body. Scales tiny, ctenoid. Two relatively large-sized species, both endemic to southern Africa in WIO.

KEY TO SPECIES

- | | | |
|----|--|----------------------|
| 1a | Right (eyed-side) pectoral fin distinctly longer than head; HL 5.5–7 in SL | <i>A. pectoralis</i> |
| 1b | Right (eyed-side) pectoral fin shorter than head; HL 4.4–5 in SL | <i>A. microlepis</i> |

Austroglossus microlepis (Bleeker 1863)

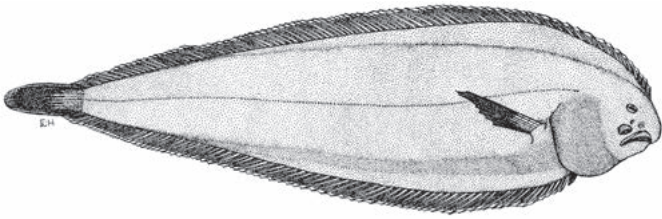
West-coast sole

PLATE 100

Synaptura microlepis Bleeker 1863: 456 (Cape of Good Hope, South Africa). *Austroglossus microlepis*: SFSA No. 326; O'Toole 1977*; Brownell 1979*; SSF No. 262.2*; Heemstra & Heemstra 2004.

Dorsal fin 82–100 rays; anal fin 65–78 rays; pectoral fins 10 rays, and eyed-side fin shorter than head; LL scales 170–180. Body depth 3–3.7 in SL; HL ~5 in SL. Vertebrae 55–57.

Head and body brownish, with small dark specks, and sometimes with faint dark or pale bars on body. Attains 75 cm TL.



Austroglossus microlepis, 15 cm SL (South Africa).

DISTRIBUTION Southern Africa: northern Namibia in southeastern Atlantic, to South Africa (False Bay) in WIO.

REMARKS Occurs at ~100–400 m, on muddy bottom. An important commercial species, generally taken as bycatch of hake fisheries.

Austroglossus pectoralis (Kaup 1858)

East-coast sole

PLATE 100

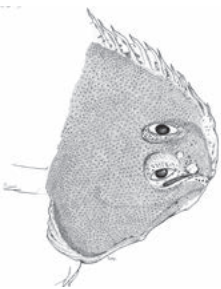
Synaptura pectoralis Kaup 1858: 96 (Cape of Good Hope, South Africa).

Austroglossus pectoralis: Regan 1920*; Barnard 1925; Menon 1984*;

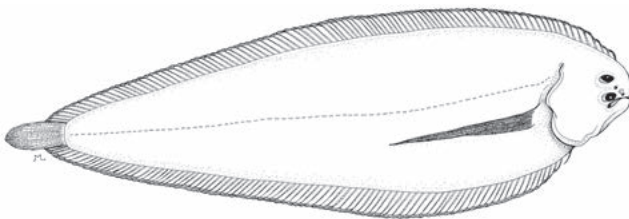
SSF No. 262.3*; Heemstra & Heemstra 2004*.

Dorsal fin 90–110 rays; anal fin 80–95 rays; pectoral fins 10 rays, and eyed-side fin distinctly longer than head; pelvic fins rudimentary, with 4 rays; LL scales 150–170. Body depth 3.2–3.8 in SL; HL 5.5–7 in SL. Mouth small, curved; lips not fringed. Vertebrae 58.

Head and body reddish brown, with small darker spots at base of scales; eyed-side pectoral fin blackish. Attains 60 cm TL.



Austroglossus pectoralis, 26 cm TL, and head of same specimen (South Africa). Source: SSF



DISTRIBUTION Endemic to southern Africa: South Africa (Cape Peninsula) to southern Mozambique in WIO.

REMARKS Occurs at ~10–120 m, on sandy or silty bottom. A valuable food fish, once abundant, but catches have declined in recent years.

GENUS *Barnardichthys* Chabanaud 1927

Body oblong; dorsal and anal fins separate from caudal fin, but basal half of last dorsal- and anal-fin rays joined to peduncle; pectoral fins equally developed, with 5 or 6 branched rays; pelvic fins with 5 branched rays, fins equally developed, longer than pectoral fins; upper and lower caudal-fin rays unbranched. Eyed-side anterior nostril a fleshy cone with constricted pore at tip, and posterior nostril between eyes; blind-side anterior nostril bulb-shaped, surrounded by bare area of skin, and posterior nostril a short fleshy tube opening into bare channel dorsal to rictus. One species.

Barnardichthys fulvomarginata (Gilchrist 1904)

Lemon sole

PLATE 100

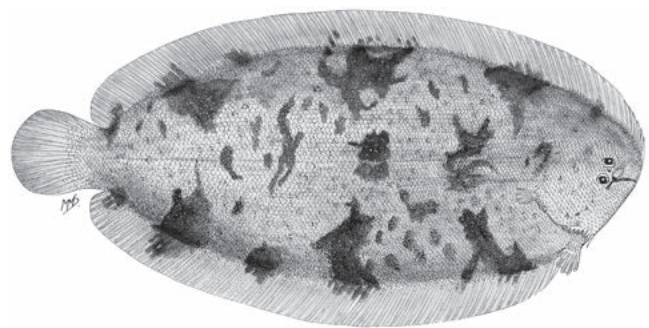
Solea fulvomarginata Gilchrist 1904: 13, Pl. 33 (False Bay, South Africa);

SSF No. 262.13*; Heemstra & Heemstra 2004.

Barnardichthys fulvomarginatus: Vachon *et al.* 2008*.

Diagnosis as for genus. Dorsal fin 72–81 rays; anal fin 57–63 rays; pectoral fins 5 or 6 rays; pelvic fins 5 rays; caudal fin 19 or 20 rays; LL scales 90–100. Body depth 2.3–2.6 in SL; HL 4.7–5.6 in SL. Jaws apparently toothless; lower jaw on eyed side with skin flap. Vertebrae 41 or 42.

Eyed side brownish yellow, more intensely yellow on median fins; large dark patches extending from bases of dorsal fin and anal fin and along lateral line. Blind side whitish. Attains 29 cm SL.



Barnardichthys fulvomarginata, 20 cm TL (South Africa). Source: SFA

DISTRIBUTION Endemic to South Africa, from False Bay to Transkei region in WIO.

REMARKS Occurs in shallow water, often near shore.

GENUS *Bathysolea* Roule 1916

Dorsal-fin origin on head before vertical at front of upper eye; pectoral fins rudimentary, rays unbranched. Eyed side anterior nostril a fleshy tapered tube arising from mid-upper jaw and not quite reaching lower eye; posterior nostril a thin tube lying against front edge of lower eye and directed ventrally. Blind-side anterior nostril not enlarged, but a small pore with small papilla on fleshy disc, above front end of upper jaw; posterior nostril a thin tube on anterior edge of bare trough running dorsally from rictus. Supratemporal branch of lateral line indistinct. Scales ctenoid, small and rectangular. Dark pigmentation on eyed-side lips and in mouth, gill and abdominal cavities. Revised by Desoutter & Chapleau (1997). Four species, 1 in WIO.

Bathysolea lagarderae Quéro & Desoutter 1990

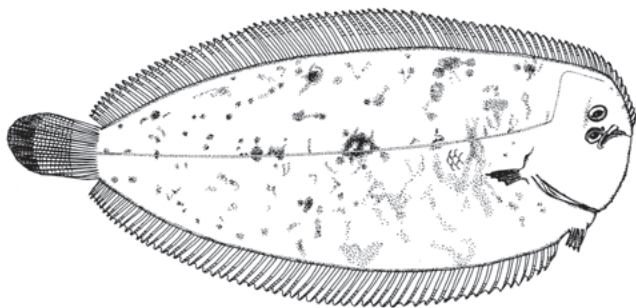
Madagascar sole

Bathysolea lagarderae Quéro & Desoutter 1990: 107,

Fig. 1 (off western Madagascar); Desoutter & Chapleau 1997*.

Dorsal fin 75–81 rays; anal fin 59–64 rays; pectoral fins 3 or 4 rays on eyed side, 1–4 rays on blind side; pelvic fins 5 rays, and fins separate from anal fin; caudal fin 18 rays, and fin entirely free from dorsal fin and anal fin. Body depth 2.3–2.6 in SL; HL 4.3–5.1 in SL. LL scales 79–89; eyes, dorsal fin and anal fin all scaly. Vertebrae 43 or 44.

Body pale brown, with variable number of darker blotches along midline and dorsal and anal fins. Attains 12 cm SL.



Bathysolea lagarderae, 12 cm SL (Kenya).

DISTRIBUTION WIO: Kenya and Madagascar.

REMARKS Known only from the type specimens, collected at ~310 m off Madagascar, and from five specimens trawled at ~280 m off Kenya. Retention of this species in *Bathysolea* is provisional because its supracranial morphology is more similar to species outside the genus than to other *Bathysolea* species (and genera of Soleidae are generally ill-defined).

GENUS *Brachirus* Swainson 1839

Body oval; dorsal fin and anal fin contiguous with caudal fin; pectoral fins well-developed or secondarily reduced; both pelvic fins free from anal fin or right (eyed-side) fin connected to anal fin. Snout slightly hooked. Eyes contiguous or separated by scaly space. Scales ctenoid. About 14 species, 1 in WIO.

Brachirus orientalis (Bloch & Schneider 1801)

Oriental sole

PLATE 100

Pleuronectes orientalis Bloch & Schneider 1801: 157 (Tharangambadi, India).

Synaptura cinerascens Günther 1862: 482 (Sri Lanka).

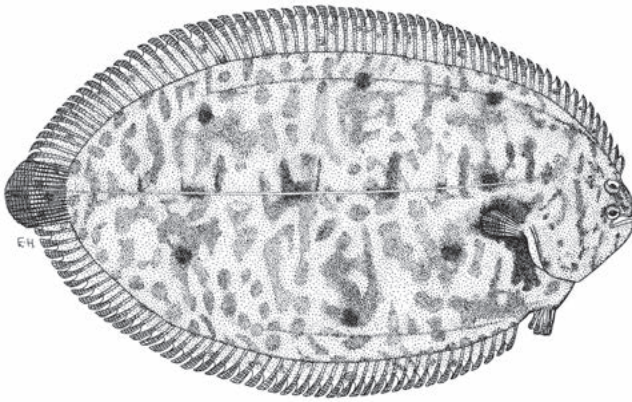
Brachirus orientalis: Norman 1928*; Munroe 2001*;

Manilo & Bogorodsky 2003.

Euryglossa orientalis: Menon 1984*; Randall 1995*.

Dorsal fin 61–69 rays; anal fin 44–48 rays; pectoral fins 7 or 8 rays on eyed side, 5 rays on blind side, and both fins well-developed; pelvic fins 5 rays; caudal fin 16 rays. Body depth 1.8–2.2 in SL; HL 4.2–5.3 in SL. Mouth terminal and slightly curved; blind-side jaws with tiny teeth. Lateral line with slightly curved supratemporal branch, ending just in front of upper eye. Scales strongly ctenoid on eyed side, weakly ctenoid or cycloid on blind side; some head scales on blind side modified into cutaneous sensory processes; LL scales 75–85; interorbital space scaly. Vertebrae 36.

Body grey or brown, with darker blotches or irregular spots; short dark narrow vertical bars crossing lateral line; median-fin margins yellow; eyed-side pectoral fin dark. Attains 33 cm SL.



Brachirus orientalis, 30 cm SL (Persian/Arabian Gulf).

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea, Arabian Sea to Mozambique, Madagascar, Seychelles, Mauritius, India and Sri Lanka; elsewhere to east coast of India, Bay of Bengal, Malay Peninsula, Philippines, China, Japan and northern Australia.

REMARKS Found on shallow sandy or muddy bottom. Marketed fresh or dried-salted.

GENUS *Dagetichthys* Stauch & Blanc 1964

Dorsal fin and anal fin confluent with caudal fin; both pectoral fins well-developed; pelvic fins small, equal and symmetrical, with 2–4 rays. Front of snout with bony process; lower lip fringed; urohyal hockey-stick-shaped. Gill rakers rudimentary. Lateral line on both sides of body with visible supratemporal branch. Scales small, ctenoid on eyed side and cycloid or feebly ctenoid on blind side. Species of this genus were previously assigned to *Synaptura*, an invalid genus. Six species, 3 in WIO.

KEY TO SPECIES

- 1a Caudal-fin rays 12; no cirrus between nostrils on eyed side *D. commersonii*
 1b Caudal-fin rays 16–18; cirrus present between nostrils on eyed side 2



- 2a Caudal-fin rays 17 or 18; no white spots on body *D. marginatus*
 2b Caudal-fin rays 16; body with white spots *D. albomaculatus*

Dagetichthys albomaculatus (Kaup 1858)

Whitespotted sole

PLATE 100

Synaptura albomaculata Kaup 1858: 96 (Coromandel coast, India);

Chabanaud 1938*; Talwar & Jhingran 1991; Manilo & Bogorodsky 2003.

Brachirus albomaculata: Norman 1928.

Dagetichthys albomaculata: Vachon *et al.* 2008*; Kottelat 2013.

Dorsal fin 70–77 rays; anal fin 53–63 rays; pectoral fins 6–8 rays; pelvic fins 2 or 3 rays; caudal fin 16 rays. Body elongate, its depth 3–3.8 in SL; HL 4.9–6 in SL. Mouth small; lower lip fringed. Small cirrus between nostrils on both sides of body. LL scales 118–140; scales on head and body equally sized; head scales on blind side modified into cutaneous sensory processes. Vertebrae 43–46.

Body brownish, with 2–5 rows of widely separated white spots; median fins blackish distally on both sides, with narrow white margin; eyed-side pectoral fin blackish, rear margin pale. Attains 30 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman (Chabanaud 1938, but locality may be erroneous) and southern India; elsewhere to east coast of India, Andaman Sea, Indonesia and Malaysia.

REMARKS Common in coastal waters and estuaries of India, where it is of commercial interest in some areas. Kottelat (2013) cites an inland record from Myanmar.

Dagetichthys commersonii (Lacepède 1802)

Hairylipe sole

PLATE 100

Pleuronectes commersonii Lacepède 1802: 599, 654 (Mauritius,

Mascarenes) [figured as *commersonnien* in Lacepède 1801: Pl. 12, Fig. 2; cf. Munroe & Desoutter 2001].

Synaptura commersonii: Chabanaud 1938*; Menon 1984

[as *commersoniana*]; Talwar & Jhingran 1991; Randall 1995;

Munroe 2001* [as *commersonii*]; Munroe & Desoutter 2001*;

Manilo & Bogorodsky 2003.

Dagetichthys commersonii: Vachon *et al.* 2008*; Kottelat 2013.

Dorsal fin 69–83 rays; anal fin 58–67 rays; pectoral fins 6–8 rays; pelvic fins 2–4 rays; caudal fin 12 rays. Body depth 3.2–4.4 in SL; HL 4.7–6.4 in SL. Lower jaw of eyed side with 8–13 cirri. LL scales 124–172; head scales on eyed side larger than on body, and those on blind side modified into cutaneous sensory processes. Vertebrae 45–47.

Eyed side reddish brown, blind side paler; median fins with pale edge and submarginal dark band; eyed-side pectoral fin dark. Attains 32 cm TL.

DISTRIBUTION Indian Ocean. WIO: Seychelles, Mauritius, India and Sri Lanka; elsewhere to east coast of India, Indonesia, Malay Archipelago, Taiwan and northern Australia.

REMARKS Reports by Menon in Fischer & Bianchi (1984) of this species from the Persian/Arabian Gulf and Red Sea to Arabian Sea are unsubstantiated (Randall 1995) yet it is listed as in Red Sea by Goren & Dor (1994). Sold in markets as fresh, frozen or dried-salted.

Dagetichthys marginatus (Boulenger 1900)

White-margin sole PLATES 100 & 101

Synaptura marginata Boulenger 1900: 11, Pls. 2–3, Fig. 1 (Algoa Bay, Eastern Cape, South Africa); Chabanaud 1938*; Menon 1984*; SSF No. 262.14*.

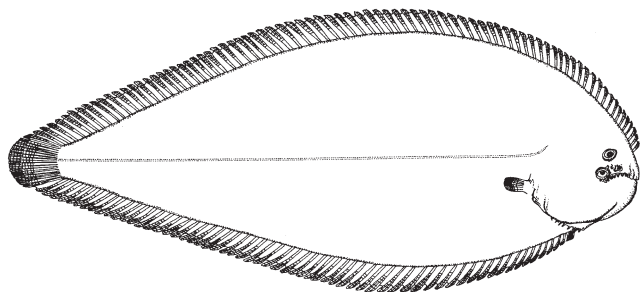
Synaptura ciliata Gilchrist 1904: 14, Pl. 34 (Durban Harbour, KwaZulu-Natal, South Africa).

Synaptura barnardi Smith 1931: 148, Pl. 16 (Great Fish Point, Eastern Cape, South Africa).

Dagetichthys marginata: Vachon *et al.* 2008.

Dorsal fin 70–81 rays; anal fin 54–64 rays; pectoral fins 7 or 8 rays; pelvic fins 2 or 3 rays; caudal fin 17 or 18 rays. Body depth 2.3–3.5 in SL; HL 4.2–5.3 in SL. No cirrus between nostrils of eyed side. Lower lip on eyed side with 8 or 9 finger-like villose papillae. LL scales 89–124; scales on eyed side strongly ctenoid with short filaments. Vertebrae 42–46.

Body dark brown with darker specks; dorsal fin and anal fin speckled with dark spots and edged with white; eyed-side pectoral fin blackish with white edge. Attains 50 cm TL.



Dagetichthys marginatus, 22 cm SL (South Africa).

DISTRIBUTION WIO: endemic to southern Africa: Mozambique to South Africa (Hermanus, Western Cape).

REMARKS An excellent food fish; often speared in summer by people wading in estuaries and in the sea. Reports of *Synaptura marginata* from Japan (Ochiai 1963; Nakabo 2000, 2002) are misidentifications.

GENUS *Heteromycteris* Kaup 1858

Snout distinctly hooked down over mouth; blind-side anterior nostril a fleshy tube with fringed valve and inner papillae. Dorsal fin and anal fin separate from caudal fin; dorsal-fin origin near tip of snout; pectoral fins absent or rudimentary; pelvic fins asymmetrical, eyed-side fin median and joined to anal fin, its base longer than blind-side fin base. Fin rays unbranched. This genus is in need of revision. Six species, 2 in WIO.

KEY TO SPECIES

- | | | |
|----|---|--------------------|
| 1a | Body pale grey-brown, with 3 poorly defined dark spots along lateral line | <i>H. capensis</i> |
| 1b | Body brown, with numerous pale lines and 5 complex ocelli along dorsal fin, anal fin and lateral line | <i>H. oculus</i> |

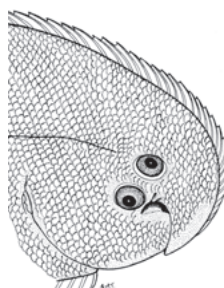
Heteromycteris capensis Kaup 1858

Cape sole PLATE 101

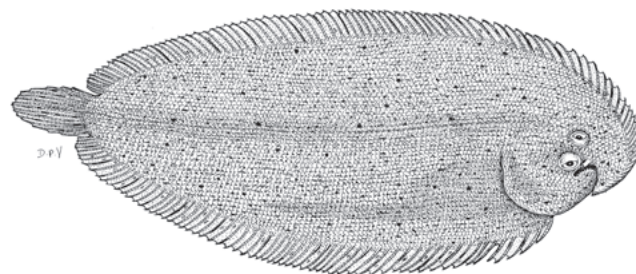
Heteromycteris capensis Kaup 1858: 103 (Cape Province, South Africa); SSF No. 262.5*; Bianchi *et al.* 1993*.

Dorsal fin 95–109 rays; anal fin 64–77 rays; caudal fin 19 or 20 rays; pelvic fins 5 rays; LL scales 80–94. Body depth 2.5–2.8 in SL; HL ~4 in SL. Eyed-side anterior nostril a tapered tube reaching posterior nostril at front of lower eye.

Body pale greyish brown, with dark specks, and 3 poorly defined dark spots along lateral line. Attains 15 cm TL.



Heteromycteris capensis, head of 6-cm-SL specimen; 8 cm SL (both South Africa). Source: SSF (head); Whitfield 1998



DISTRIBUTION Endemic to southern Africa: Namibia (Walvis Bay) in southeastern Atlantic, to Mozambique (Maputo) in WIO.

Heteromycteris oculus (Alcock 1889)

Eyed sole

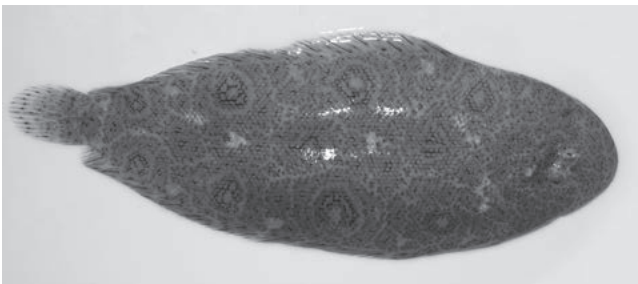
PLATE 101

Solea oculus Alcock 1889: 285, Pl. 18, Fig. 3 (west of Puri, Odisha coast, India, Bay of Bengal).

Heteromycteris oculus: De Bruin *et al.* 1994*; Munroe 2001*.

Dorsal fin 91–100 rays; anal fin 60–64 rays; caudal fin 18 rays; pelvic fins 5 rays; LL scales 91–94. Body depth 2.5–2.8 in SL; HL 3.8–4.1 in SL.

Body brown, with numerous pale lines surrounding irregular darker spots or rings; 5 complex ocelli along dorsal fin and anal fin, and 1 on lateral line at caudal-fin base; median fins with blackish spots and stripes. Attains 15 cm TL.



Heteromycteris oculus, 13 cm SL (SW India). KK Bineesh © CMFRI

DISTRIBUTION Indo-Pacific. WIO: southwestern India and Sri Lanka; elsewhere to east coast of India and South China Sea.

REMARKS Too small to be of commercial importance, but flesh excellent to eat.

GENUS *Microchirus* Bonaparte 1833

Dorsal fin and anal fin separate from caudal fin; dorsal-fin origin on head before vertical at front of upper eye; pectoral fin of eyed side well-developed, blind-side fin smaller; pelvic fins symmetrical; all fin rays branched. Eyed-side anterior nostril tube reaches lower eye; blind-side anterior nostril not enlarged. Lateral line with indistinct S-shaped supratemporal branch. Scales more or less rectangular. Seven species, 1 in WIO.

Microchirus ocellatus (Linnaeus 1758)

Foureye sole

PLATE 101

Pleuronectes ocellatus Linnaeus 1758: 269 [Suriname: in error].

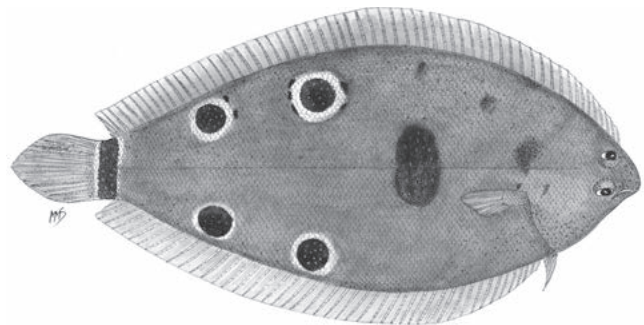
Solea quadriocellata Von Bonde 1922: 20, Pl. 2, Fig. 2 (off Umdloti River, KwaZulu-Natal, South Africa).

Monochirus ocellatus: SSF No. 262.7*.

Microchirus ocellatus: Quéro & Desoutter 1990; Desoutter 1994*.

Dorsal fin 61–77 rays; anal fin 48–58 rays; pectoral fins 6–8 rays on eyed side, 5–7 rays on blind side; pelvic fins 5 rays. Body depth 2.4–2.9 in SL; HL 3.9–4.9 in SL. Lips not fringed; interorbital space concave. Scales ctenoid; LL scales 54–78; dorsal fin, anal fin, and eyes scaly. Vertebrae 35–38.

Eyed side of body mottled brownish, median fins dark posteriorly; 4 black ocelli placed symmetrically, each with white or yellow ring and paler centre; large blackish blotch at anterior third of lateral line, and another across peduncle. Attains 20 cm TL.



Microchirus ocellatus, 10 cm TL (South Africa). Source: SSF

DISTRIBUTION Mediterranean Sea, eastern Atlantic (Spain to Gulf of Guinea); WIO: South Africa (KwaZulu-Natal) and Madagascar.

REMARKS Rare; found at ~30–300 m.

GENUS *Pardachirus* Günther 1862

Dorsal fin and anal fin not confluent with caudal fin; dorsal fin 62–82 rays; anal fin 44–63 rays; caudal fin 18 rays; pelvic fins separate, 5 rays each, left fin slightly smaller than right fin; no pectoral fins. Fin rays branched; dorsal- and anal-fin rays scaly; prominent pore (on each side of body) at base of nearly all dorsal-, anal- and pelvic-fin rays, these pores communicate

with series of paired glands that produce a milky toxin. Eyed-side anterior nostril a short fleshy tube reaching lower eye when deflected; posterior nostril a wide channel opening ventrally at front of lower eye. Blind-side anterior nostril a short, thin, transparent, finger-like tube with constricted orifice just dorsal to upper lip; posterior nostril bulbous, thin and transparent, dorsoposterior to anterior nostril. Gill openings narrow; gill rakers rudimentary. Scales small, cycloid or weakly ctenoid.

The toxic (distasteful) mucus of *P. marmoratus* was first reported by Clark & Chao (1973) and the morphology of the toxin-producing glands was described by Clark & George (1979); the toxin is lethal to fishes, and may be used for capturing prey, as well as for deterring predators. Revised by Randall & Johnson (2007). Seven species, 4 in WIO.

KEY TO SPECIES

- 1a Dorsal fin 62–73 rays; anal fin 48–57 rays; scales smooth: cycloid in adults, weakly ctenoid in juveniles 2
- 1b Dorsal fin 71–82 rays; anal fin 53–63 rays; scales rough, ctenoid 3

- 2a Eyed-side pelvic fin not joined to genital papillae; scales extend onto dorsal- and anal-fin rays well past scaly basal sheath; head and body covered with minute dark brown spots, and several scattered, irregular, black-edged pale spots, some in adults with clusters of small gold spots *P. marmoratus*
- 2b Eyed-side pelvic fin joined to genital papillae; no scales on dorsal- and anal-fin rays beyond scaly basal sheath; body and fins covered with pale round spots, many larger than eyes, and often including a small dark brown spot *P. pavoninus*

- 3a LL scales 80–82; scales strongly ctenoid (posterior scales of eyed side with 7–9 large ctenii); eyed side of body brown to dark brown, with large, irregular, black-edged pale spots *P. morrowi*
- 3b LL scales 85–101; scales cycloid or weakly ctenoid (posterior scales with 10–15 small ctenii); eyed side pale brown, with large round to oval, dark-edged, brown spots *P. balius*

Pardachirus balius Randall & Mee 1994

Piebald sole

PLATE 101

Pardachirus balius Randall & Mee 1994: 343, Pls. 1–2 (southern Oman, Arabian Sea); Randall 1995*; Manilo & Bogorodsky 2003; Randall & Johnson 2007.

Dorsal fin 71–82 rays; anal fin 55–63 rays; caudal fin 18 rays. Body depth 2.6–2.8 in SL; HL 4.7–4.9 in SL. Dorsal-fin origin anterior to interorbital space. Mouth strongly curved; lips fleshy, finely and densely plicated on inner surfaces; band of villiform teeth on blind-side jaws. Scales cycloid; LL scales 85–101. Vertebrae 41 or 42.

Body pale brown, with large randomly dispersed and irregularly shaped darker blotches, and clusters of small dark blotches between these. Attains 22 cm TL.

DISTRIBUTION WIO: Gulf of Oman to Somalia and Arabian Sea.

Pardachirus marmoratus (Lacepède 1802)

Moses sole

PLATE 101

Achirus marmoratus Lacepède (ex Commerson) 1802: 658, 660, Pl. 12, Fig. 3 [labelled with French vernacular name] (Mauritius, Mascarenes); Norman 1928.

Pardachirus marmoratus: Clark & George 1979*; Bauchot & Bianchi 1984*; Dor 1984; SSF No. 262.9*; Quérou & Desoutter 1990; Goren & Dor 1994; Randall 1995*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004; Randall & Johnson 2007; Bogorodsky *et al.* 2014.

Dorsal fin 63–74 rays; anal fin 48–55 rays. Body depth 2.2–2.5 in SL; HL 4.2–4.6 in SL; interorbital width slightly less than eye diameter. Dorsal-fin origin anterior to interorbital space. Mouth curved, cleft reaching opposite front of lower eye. Scales feebly ctenoid; LL scales 83–102. Vertebrae 37–39.

Body pale brown to olive-grey, covered with minute brown spots and slightly larger irregular brown rings, on head, body and fins; 2–5 dark brown spots on body also contain yellow flecks and irregular lines. Attains 26 cm TL.



Pardachirus marmoratus (Mauritius). MM Smith © NRF-SAIAB

DISTRIBUTION WIO: Pakistan, Persian/Arabian Gulf, Red Sea, Somalia to South Africa (KwaZulu-Natal), Madagascar, Comoros, Seychelles, Mauritius, southwestern India and Sri Lanka.

REMARKS Found in sandy areas near coral reefs, to ~25 m deep.

Pardachirus morrowi (Chabanaud 1954)

Persian carpet sole

PLATE 102

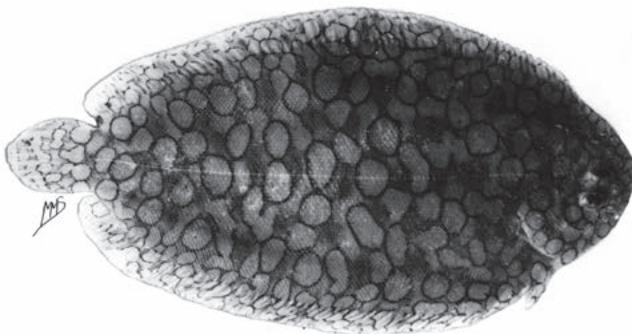
Aseraggodes morrowi Chabanaud 1954: 800, Pls. 24–25, Fig. 2a (Shimoni, Kenya).

Asseraggodes morrowi: Smith & Smith 1963.

Pardachirus morrowi: SSF No. 262.10*; Randall & Mee 1994*; Randall & Johnson 2007.

Dorsal fin 73–81 rays; anal fin 53–62 rays. Body depth 2.5–2.9 in SL; HL 4.2–5 in SL. Lips not fringed. Anterior nostril tube reaching lower eye. No supratemporal branch of lateral line. Scales strongly ctenoid; head scales on blind side modified into sensory filaments; LL scales 89–104. Vertebrae 41 or 42.

Body brown, with numerous irregularly shaped pale brown and dark-edged circular markings, smaller on median fins than on body. Attains 18 cm TL.



Pardachirus morrowi, 8 cm TL (Kenya). Source: SSF

DISTRIBUTION WIO: Kenya to South Africa (KwaZulu-Natal), Aldabra and Madagascar.

REMARKS Known to ~20 m deep.

Pardachirus pavoninus (Lacepède 1802)

Peacock sole

PLATE 102

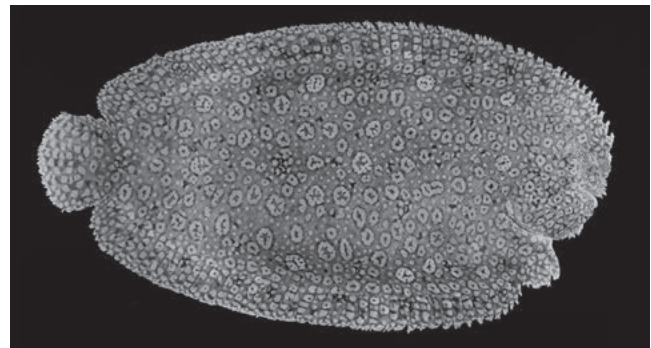
Achirus pavoninus Lacepède 1802: 658, 660 [no locality given: probably Indonesia].

Aseraggodes ocellatus Weed 1961: 293, Fig. 1 (north of Sweat Bay, Trincomalee, Sri Lanka).

Pardachirus pavoninus: Clark & George 1979; Randall & Johnson 2007*; Kottelat 2013.

Dorsal fin 62–73 rays; anal fin 48–57 rays. Body depth 2.4–2.8 in SL; HL 4–5 in SL; caudal-fin length 5.5–6.4 in SL. Eyed-side pelvic fin larger and slightly anterior to blind-side fin; fin joined to genital papillae at base of 1st ray of anal fin and reaching base of 2nd ray. Lips not fringed. Scales cycloid in adults, weakly ctenoid in juveniles; scaly sheath of dorsal fin and anal fin covering ~2/3 length of rays (no scales on rays beyond sheath); LL scales 77–99, including 8–10 scales forward of upper end of gill opening. Vertebrae 38–41.

Eyed side pale to dark grey-brown, with numerous small white or orange-yellow spots, scattered small black blotches, and many conspicuous more or less round dark-edged pale spots, which may encompass 1 or more small dark spots; fins with smaller dark-edged pale spots. Attains 25 cm TL.



Pardachirus pavoninus, 24 cm SL (Japan). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Madagascar, Mascarenes and Sri Lanka; elsewhere to Andaman Sea and Nicobar Is., Thailand, Indonesia, Malaysia, Singapore, South China Sea, southern Japan, northern Australia, Great Barrier Reef, New Caledonia, Fiji and Tonga.

REMARKS Found in a variety of habitats: mangroves, coral reefs, rubble areas, sandy bottom near reefs, and trawled from soft bottom, at 20–52 m.

GENUS *Pseudaesopia* Chabanaud 1934

Eyes contiguous. Caudal fin only partially confluent with dorsal fin and anal fin: posteriormost fin rays of dorsal fin and anal fin extending only as far as basal half of caudal fin, and attached by thin membrane along their entire lengths to adjacent caudal-fin rays. Eyed-side pectoral fin usually 9–14 rays (one species outside WIO with 6–10 rays); 1st ray attached to opercular membrane, all rays simple. Pelvic fins small, equal and symmetrical, with usually 4 or 5 rays. Eyed side of body with transverse bands from snout to caudal-fin base. Six species, 3 in WIO.

KEY TO SPECIES

- 1a Pelvic fins 4 rays; LL scales >75 2
- 1b Pelvic fins usually 5 rays;
LL scales usually <74 *P. synapturoides*
- 2a Interorbital scales present; eyed-side pectoral fin normal,
2.1–3.3 in HL; 13 singular darkly demarcated bands
on body *P. cochinensis*
- 2b No interorbital scales; eyed-side pectoral fin rudimentary,
3.3–5.5 in HL; 24 or 25 dark bands on body, often
in pairs *P. regani*

Pseudaesopia cochinensis (Rama-Rao 1967)

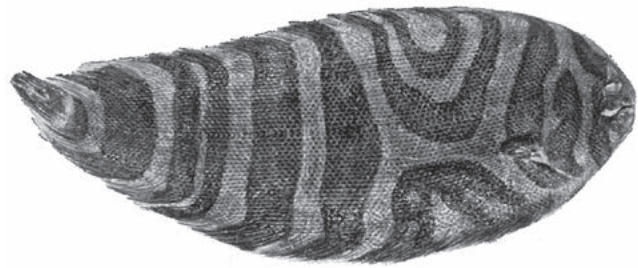
Zebrias cochinensis Rama-Rao 1967: 99, Fig.1 (off Vypeen I., Kochi, India);
Manilo & Bogorodsky 2003.

Zebrias (Nematozebras) keralensis Joglekar 1976: 68,
Fig. 1 (Alappuzha, Kerala, India).

Pseudaesopia cochinensis: Stephens 2011.

Dorsal fin 65–76 rays; anal fin 56–63 rays; pectoral fins 11–14 rays on eyed side, 11–13 rays on blind side; pelvic fins 4 rays, and genital papillae free from fins; caudal fin 17 or 18 rays [14 given in original description]. LL scales 74–85 [90 in original description]; interorbital scales present. Body oblong, its depth 2.3–2.6 in SL; HL 4.7–5.2 in SL; eyed-side pectoral-fin length 2.1–3.3 in HL, with upper 4 or 5 rays of comparable length, more ventral rays decreasing gradually in length. Eyed-side anterior nasal tube just reaching posterior nasal tube when flattened. Vertebrae 41–43.

Body pale brown, with ~12 or 13 singular darkly demarcated deep brown bands extending onto dorsal fin and anal fin (holotype with abnormal banding pattern); dark bands crossing opercle usually join ventrally; caudal fin dark, with pale spots and paler thin stripe distally. Attains 16 cm TL.



Pseudaesopia cochinensis, 15 cm TL, holotype (SW India).

Source: Rama-Rao 1967

DISTRIBUTION WIO: Pakistan to southwestern India.

REMARKS Known from 16–34 m.

Pseudaesopia regani (Gilchrist 1906)

South African zebra sole

PLATE 102

Synaptura zebra (*non* Bloch 1787): Gilchrist 1902.

Synaptura regani Gilchrist 1906: 160, Pl. 45 (off Umhlanga River,
KwaZulu-Natal, South Africa).

Aesopia regani: Barnard 1925.

Zebrias (Pseudaesopia) regani: Chabanaud 1934.

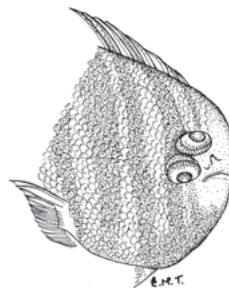
Zebrinus regani: Dor 1970.

Zebrias regani: Menon 1984; SSF No. 262.16*; Goren & Dor 1994.

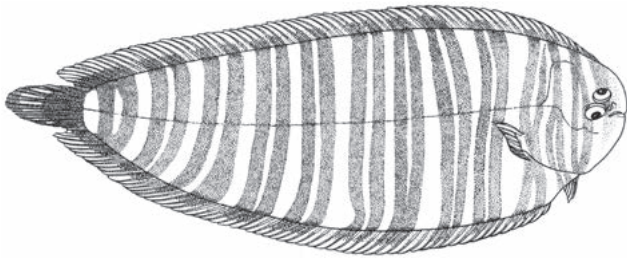
Pseudaesopia regani: Stephens 2011.

Dorsal fin 68–72 rays; anal fin 55–61 rays; pectoral fins 9–11 rays; pelvic fins 4 or (rarely) 5 rays; caudal fin 18 rays; LL scales 76–84. Body depth 2.5–3.3 in SL; HL 5.3–5.5 in SL; eyed-side pectoral fin 3.3–5.5 in HL. Eyes contiguous, without tentacles. Genital papillae free from pelvic fins. Vertebrae 42–45.

Body pale brown, with 24 or 25 dark transverse bands, usually in pairs and extending onto dorsal fin and anal fin; caudal fin blackish with white spots. Attains 15 cm TL.



Pseudaesopia regani, 10 cm TL, head (South Africa). Source: SSF



Pseudaesopia regani, 10 cm TL (South Africa). Pattern drawn from Gilchrist 1906

DISTRIBUTION WIO: Red Sea, South Africa (KwaZulu-Natal) and Madagascar.

REMARKS Found in shallow water.

Pseudaesopia synapturoides (Jenkins 1910)

Indian zebra sole

PLATE 102

Solea synapturoides Jenkins 1910: 28, Pl. 3, Fig. 4 (Ganjam District, India, Bay of Bengal).

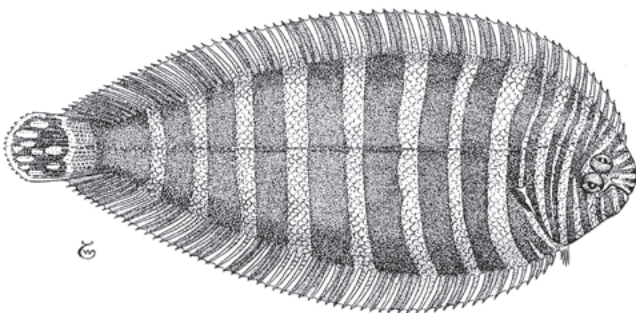
Zebrias synapturoides: Norman 1928*; Chabanaud 1934; Menon 1984*; Randall 1995*; Carpenter *et al.* 1997*; Manilo & Bogorodsky 2003.

Zebrias quagga (non Kaup 1858): Kuronuma & Abe 1986.

Pseudaesopia synapturoides: Stephens 2011.

Dorsal fin 65–79 rays; anal fin 54–64 rays; pectoral fins rudimentary, with 9–13 rays (none elongated); pelvic fins usually 5 (rarely 4) rays, and genital papillae free from fins; caudal fin 18 rays [14 in original description]. Body depth 2.4–3.1 in SL; HL 4.8–5.9 in SL; pectoral-fin length 3.3–7.7 in HL. Eyes without tentacles. Scales strongly ctenoid on both sides of body; LL scales 62–82 [~90–93 in original description]; interorbital area scaleless. Vertebrae 42–44.

Body whitish, with 3 dark brown bands on head and another 9–12 bands from opercle margin to caudal fin; bands extend onto dorsal fin and anal fin, and may be singular, paired or a combination of both; caudal fin with yellow spots in centre and dark distally. Attains 15 cm SL.



Pseudaesopia synapturoides, 9 cm SL (India). Source: Norman 1928

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf, India and Sri Lanka; elsewhere to east coast of India and Andaman Sea.

GENUS *Solea* Quensel 1806

Dorsal fin and anal fin separate from caudal fin, but basal half of last dorsal- and anal-fin rays joined by transparent membrane to base of anterior caudal-fin rays; pectoral fins equally developed, with at least 7 rays; pelvic fins equal, with 4 or 5 rays; all fin rays branched, except 2–4 upper and lower rays of caudal fin. Blind-side anterior nostril a short narrow tube, not dilated. Supratemporal branch of lateral line with curved extension along dorsal margin of head. Scales rectangular, ctenoid. At least 8 species, 4 in WIO.

KEY TO SPECIES

- | | | |
|----|--|----------------------|
| 1a | Dorsal fin 57–60 rays; anal fin ~46 rays | <i>S. stanalandi</i> |
| 1b | Dorsal fin 61–79 rays; anal fin usually 47–55 rays | 2 |
| 2a | Head profile rounded; eyed-side scales rectangular, their width more than twice length | <i>S. turbynei</i> |
| 2b | Head profile pointed; eyed-side scales squarish, their width less than twice length | 3 |
| 3a | LL scales usually 109–128 along straight part; body scales with short ctenii, ~½ length of scale | <i>S. elongata</i> |
| 3b | LL scales 92–108; scales with long ctenii, ≥½ length of scale | <i>S. heinii</i> |

Solea elongata Day 1877

Elongate sole

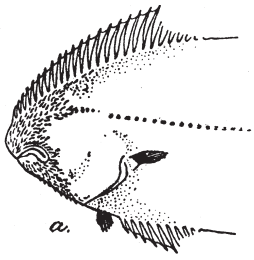
PLATE 102

Solea elongata Day 1877: 426, Pl. 90, Fig. 4 (Chennai, India);

Norman 1928*; Menon 1984*; Randall 1995*; Vachon *et al.* 2008.

Dorsal fin 63–79 rays; anal fin 51–63 rays; pectoral fins 6–9 rays on eyed side, 5–8 rays on blind side; pelvic fins 4 or 5 rays, and fins symmetrical. Body oblong, its depth 2.4–3 in SL; HL 3.7–5 in SL. Snout sharply rounded. Mouth small; lips not fringed. Eyes separated by narrow scaly space; head scales on blind side modified into cutaneous sensory filaments; LL scales 104–128. Vertebrae 37–40.

Body brownish or greyish with irregular spots and irregular vertical bands; black blotch on pectoral fin distally; dorsal fin and anal fin pale with some dusky spots. Attains 30 cm TL.



Solea elongata, blind-side head (India). Source: Norman 1928

DISTRIBUTION Indian Ocean. WIO: Red Sea to Persian/Arabian Gulf, India and Sri Lanka.

REMARKS Of minor interest to fisheries.

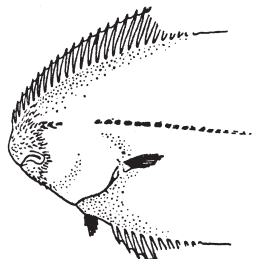
Solea heinii Steindachner 1903

Rough sole

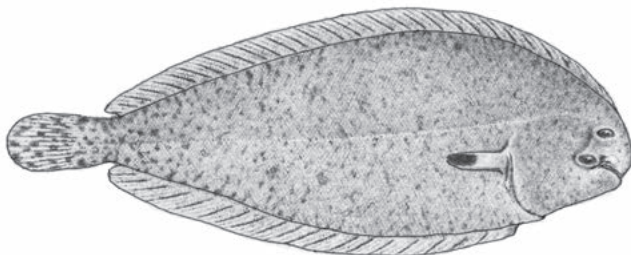
Solea heinii Steindachner 1903: 153, Pl. 1, Fig. 3 (Qishn, Yemen); Norman 1928; Manilo & Bogorodsky 2003; Vachon *et al.* 2008.
Solea sindensis Jenkins 1910: 133 (Karachi market, Pakistan).

Dorsal fin 62–67 rays; anal fin 50–54 rays; pectoral fins 6–8 rays on eyed side, 5–7 rays on blind side; pelvic fins 4 rays. Body depth 2.5–2.8 in SL; HL 4.5–4.9 in SL. Body scales with long ctenii; LL scales 92–105. Vertebrae 36 or 37.

Eyed side brownish, with more or less densely scattered dark spots, dark streaks on median fins, and black spot on distal part of pectoral fin. Attains 10 cm TL.



Solea heinii, blind-side head (India). Source: Norman 1928



Solea heinii, 7 cm SL, syntype (Yemen). Source: Steindachner 1903

DISTRIBUTION Indian Ocean: Arabian Sea (in WIO) and Bay of Bengal.

Solea stanalandi Randall & McCarthy 1989

Pepper sole

PLATE 102

Solea stanalandi Randall & McCarthy 1989: 197, Fig. 1 (Half Moon Bay near Dhahran, Saudi Arabia, Persian/Arabian Gulf); Randall 1995*; Vachon *et al.* 2008.

Dorsal fin 57–60 rays; anal fin 46 rays; pectoral fins 6 or 7 rays; pelvic fins 4 or 5 rays. Body depth 2.4–2.5 in SL; HL 4.1–4.3 in SL. Scales small, ctenoid, except anterior head scales on blind side modified to form fleshy cirri; LL scales 104–106. Vertebrae 35 or 36.

Eyed side pale brown, finely mottled and blotched with blackish pigment; large black spot on eyed-side pectoral fin, and narrower dark spot on blind-side pectoral fin. Attains at least 12 cm TL.

DISTRIBUTION Known only from two type specimens collected from the Persian/Arabian Gulf.

REMARKS Taken from sparse seagrass beds on silty sand.

Solea turbynei Gilchrist 1904

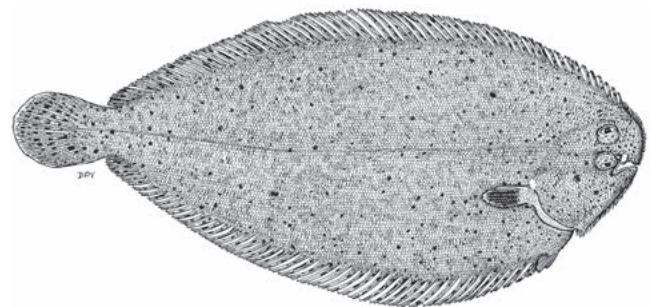
Blackhand sole

PLATE 102

Solea turbynei Gilchrist 1904: 10, Pl. 28 (Mossel Bay and other localities, South Africa); Vachon *et al.* 2005; Vachon *et al.* 2008.
Solea simonensis Von Bonde 1922: 19, Pl. 5, Fig. 1 (Simonstown, False Bay, South Africa).
Solea bleekeri (*non* Boulenger 1898): Barnard 1925; SSF No. 262.12*.

Dorsal fin 61–71 rays; anal fin 46–55 rays; pectoral fins 6–8 rays on eyed side, 5–8 rays on blind side; pelvic fins 5 rays; LL scales 88–117. Body depth 2.4–2.8 in SL; HL 3.8–5.1 in SL. Supratemporal branch of lateral line not clearly visible on eyed side. Vertebrae 34–37.

Body brown, with darker spots and specks; eyed-side pectoral fin with black spot on posterior half. Attains ~18 cm TL.



Solea turbynei, 8 cm SL (South Africa). Source: Whitfield 1998

DISTRIBUTION WIO: South Africa (False Bay) to Mozambique and possibly Tanzania.

REMARKS Abundant in estuaries and on sandy bottom; known to ~60 m deep.

GENUS *Soleichthys* Bleeker 1860

Eyes small and close-set. Dorsal fin and anal fin not joined to caudal fin; both pectoral fins developed: eyed-side fin falciform, blind-side fin short. Anterior nasal tube very long, reaching to middle of lower eye. Mouth small, slightly contorted. Scales on body rough, with strong ctenii; LL scales cycloid and triangular, with several grooves on basal area. Genital papillae on eyed side. Eleven species, 2 in WIO.

KEY TO SPECIES

- | | | |
|----|--|---------------------------|
| 1a | Dorsal fin 87–95 rays; anal fin 77–83 rays | <i>S. dori</i> |
| 1b | Dorsal fin 77–79 rays; anal fin 66–70 rays | <i>S. tubiferus</i> |

Soleichthys dori Randall & Munroe 2008

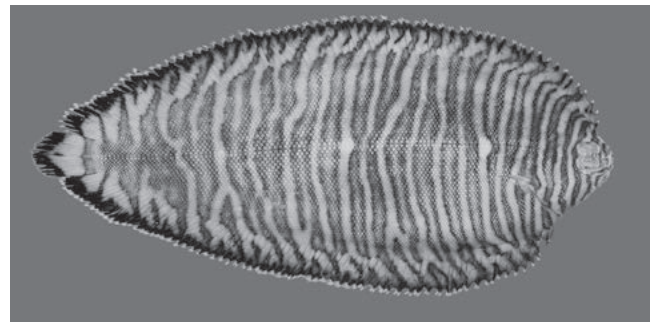
Blue-edged sole

PLATE 103

Soleichthys dori Randall & Munroe 2008: 77, Figs. 1–2 (south of Nuweiba, Sinai, Egypt, Red Sea).

Dorsal fin 87–95 rays; anal fin 77–83 rays; caudal fin 17–19 rays. Body depth 3.1–3.3 in SL; HL 4.5–5.7 in SL. Snout longer than eye diameter. Eyed-side anterior nasal tube nearly reaching rear of lower eye when laid back; eyed-side pectoral fin 3 times longer than blind-side fin, and elongate upper ray 2–2.7 in HL. LL scales 98–115; basal three-quarters of eyed-side pectoral fin scaled, except 2 elongate upper rays scaled only on basal quarter. Vertebrae 50 or 51.

Eyed side pale yellowish background, with ~16 somewhat wavy brown double bars across body, more irregular posteriorly and tending to form broad darker single bars at middle of body, continuing variably onto dorsal fin and anal fin; median fins with bright blue margins, outermost edge pale; head with 6 narrow dark brown bars; distal one-third of caudal fin dark brown and pale blue proximally; inside of mouth black; 3 or 4 white spots on lateral line in pale interspaces in life of bars (usually not evident in preserved specimens). Attains ~11 cm SL.



Soleichthys dori, 10 cm TL, female holotype (Gulf of Aqaba).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: endemic to Red Sea (Gulf of Aqaba and Dahlak Archipelago).

REMARKS Known from sandy bottom, to ~10 m deep.

Soleichthys tubiferus (Peters 1876)

Cross-eyed sole

PLATE 103

Solea tubifera Peters 1876: 444 (Mauritius, Mascarenes);

Randall & Munroe 2008.

Solea borbonica Regan 1905: 393, Pl. 6, Fig. 2 (Réunion, Mascarenes).

Soleichthys borbonica: Quéro 1997*.

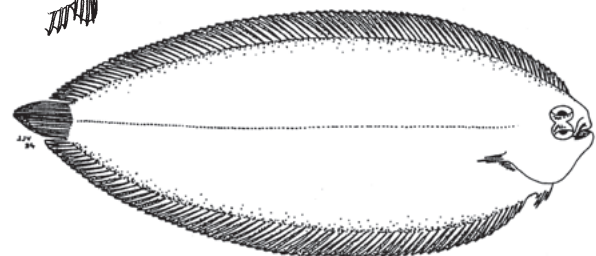
Dorsal fin 77–79 rays; anal fin 66–70 rays; pectoral fins 9 or 10 rays on eyed side, 7 rays on blind side; pelvic fins 4 rays. Body depth ~2.6 in SL; HL ~5.7 in SL. Eyes contiguous. Lateral line straight, without supratemporal branch; LL scales 94–97. Vertebrae 45.

Eyed side grey to greenish brown; edges of dorsal, anal and caudal fins dark brown. Blind side whitish. Attains ~15 cm SL.



Soleichthys tubiferus, head of 13 cm SL specimen (Seychelles).

Soleichthys tubiferus, 10 cm SL, holotype of *Solea borbonica* (Réunion). Source: Quéro 1997



DISTRIBUTION WIO: Madagascar, Seychelles, Réunion and Mauritius.

GENUS *Synapturichthys* Chabanaud 1927

Body oblong; dorsal fin and anal fin separate from caudal fin, but united to peduncle by membrane; pectoral fins equally well-developed; pelvic fins equal, symmetrical, with 5 rays. Blind-side anterior nostril cup-like, edged with short papillae, surrounded by area of bare skin and well-separated from posterior nostril. One species.

Synapturichthys kleinii (Risso 1827)

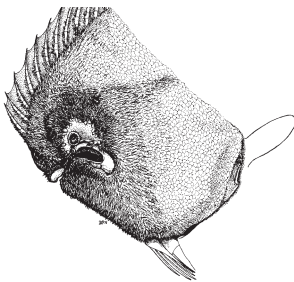
Lace sole

PLATE 103

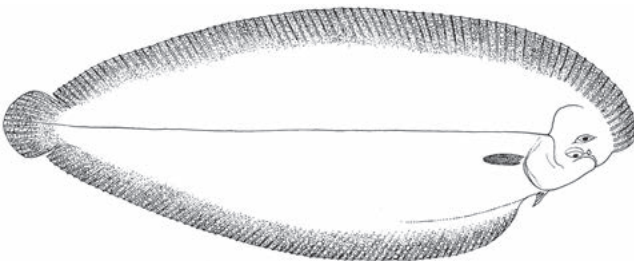
- Rhombus kleinii* Risso 1827: 255 (Nice, France, Mediterranean Sea).
- Solea luctuosa* Valenciennes (ex Guichenot) 1850: 107 [name not available].
- Solea (Pegusa) capensis* Gilchrist 1902: 110, Pl. 9 (Fish Hoek and Muizenberg, False Bay; off Cape St Blaize; Algoa Bay, South Africa).
- Synaptera melanoptera* Gilchrist 1904: 13, Pl. 32 (off East London, Eastern Cape, South Africa).
- Solea alboguttata* Fowler 1929: 251, Fig. 1 (off Durban Bluff, KwaZulu-Natal, South Africa).
- Synapturichthys kleinii*: SSF No. 262.15* [as *kleini*]; Desoutter 1990.

Diagnosis as for genus. Dorsal fin 75–92 rays; anal fin 61–75 rays; pectoral fins 7–10 rays; caudal fin 20 rays; LL scales 102–138. Body depth 2.4–3.3 in SL; HL 3.8–5.3 in SL. Vertebrae 46 or 47.

Body brownish, with irregular darker spots or blotches forming several indistinct bars; median-fin margins blackish; eyed-side pectoral fin paler than body, with white-edged black spot. Attains 40 cm TL.



Synapturichthys kleinii, 26 cm SL, blind-side head (South Africa). Source: SSF



Synapturichthys kleinii, 29 cm TL, holotype of *Solea alboguttata* (South Africa). Source: Fowler 1929

DISTRIBUTION Mediterranean Sea, eastern Atlantic (West Africa), and southern Africa (Cape Peninsula to KwaZulu-Natal, South Africa) in WIO.

REMARKS Found on sandy and muddy bottom, mainly in shallow water. A commercial species.

GENUS *Zebrias* Jordan & Snyder 1900

Dorsal fin and anal fin continuous with caudal fin; posteriormost dorsal- and anal-fin rays extending 59–95% of caudal-fin length; pectoral fins small and asymmetrical, with 4–8 rays (one exception outside WIO), 1st ray attached to opercle membrane and all rays simple; pelvic fins small, equal and symmetrical, with 4 rays. Anterior nostril on eyed side tubular, but not reaching upper eye. Body usually with transverse bands, but 2 species with irregular spots. Ten species, 3 in WIO.

KEY TO SPECIES

- 1a Eyed side with large irregular dark-edged spots *Z. annularis*
- 1b Eyed side with regular dark transverse bands 2
- 2a Dorsal fin 63–66 rays; anal fin 51–54 rays; LL scales 74–75; body with ~13 singular bands, and interspaces of comparable width *Z. captivus*
- 2b Dorsal fin 64–78 rays; anal fin 52–64 rays; LL scales 92–99; body with 10–12 bands (singular and/or paired), and bands wider than interspaces *Z. quagga*

Zebrias annularis (Fowler 1934)

Annular sole

PLATE 103

- Brachirus annularis* Fowler 1934: 346, Fig. 99 (China Sea, near Taiwan).
- Synaptura nebulosa* Chen & Weng 1965: 76, Fig. 52 (Tungkong, southwestern Taiwan).
- Synaptura annularis*: Gonzales *et al.* 1994*.

Dorsal fin 70 or 71 rays; anal fin 57–59 rays; pectoral fins 9 rays on eyed side, 10 rays on blind side, and fins small; pelvic fins 5 rays; caudal fin 18 rays. LL scales 85–105; interorbital space scaly. Body depth 2.5–2.8 in SL; HL 6.1 in SL. Vertebrae 42 or 43.

Body pale orange-tan, with 5–7 large and 6–8 smaller distinct brown-edged annular patches on eyed side; all fins brownish with black margins. Attains 14 cm SL.

DISTRIBUTION Indo-Pacific. WIO: southern India; elsewhere to Taiwan, Japan and northern Australia.

REMARKS Demersal; known to ~271 m deep.

Zebrias captivus Randall 1995

Convict sole

PLATE 104

Zebrias captivus Randall 1995: 243, Fig. 1 (off Bahrain, Persian/Arabian Gulf); Carpenter *et al.* 1997*.

Dorsal fin 62–65 rays; anal fin 52–54 rays; pectoral fins 7 rays; pelvic fins 4 rays; caudal fin 18 rays; LL scales 74–78. Body depth 2.8–2.9 in SL; HL 3.2–4 in SL. Small tentacle on upper part of each eye. Vertebrae 38.

Eyed side with 3 dark bars on head and another 9 dark-edged brown bars on body and extending onto dorsal fin and anal fin (last bar widest), and pale interspaces all of similar width; caudal fin dark, with irregular narrow vertical white band at base, and small yellow spots distally; pelvic fins white. Blind side white. Attains at least 10 cm TL.

DISTRIBUTION Known only from two type specimens from the Persian/Arabian Gulf.

Zebrias quagga (Kaup 1858)

Fringefin zebra sole

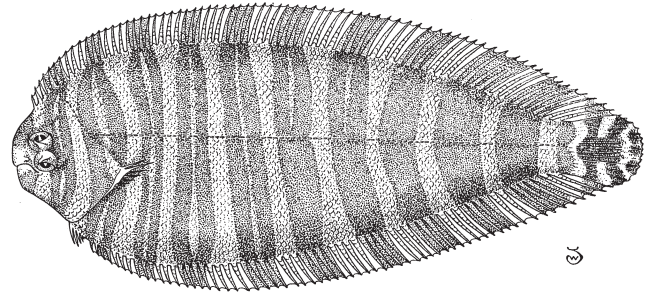
PLATE 104

Aesopia quagga Kaup 1858: 98 (Mumbai, India).

Zebrias quagga: Chabanaud 1934; Menon 1984*; Goren & Dor 1994; De Bruin *et al.* 1995*; Sommer *et al.* 1996*; Manilo & Bogorodsky 2003.

Dorsal fin 66–75 rays; anal fin 56–61 rays; pectoral fins 5 rays; caudal fin 16–18 rays. Body depth 2.5–2.7 in SL; HL 4.8–5.2 in SL. Eyes close-set; short tentacle usually above each eye. Scales ctenoid on both sides of body; LL scales 92–99. Vertebrae 41.

Body pale brownish, with 10–12 dark bars wider than pale interspaces, continued with oblique slant onto dorsal fin and anal fin, and appearing as double bars anteriorly; caudal fin with dark brown median blotch. Attains 17.5 cm TL.



Zebrias quagga, 11 cm TL (Arabian Sea). Source: Norman 1928

DISTRIBUTION Indian Ocean. WIO: Red Sea to Somalia, and to Persian/Arabian Gulf, India and Sri Lanka; elsewhere to east coast of India, Bay of Bengal, Thailand, Malay Peninsula, China and Australia.

REMARKS Found on sand and mud bottom in shallow water. Marketed fresh.

GLOSSARY

villi – fine bristles.

villose papillae – papillae (like taste buds) that look like fine bristles.

ORDER TETRAODONTIFORMES

Keiichi Matsuura

Several families of fishes characterised by separate teeth or teeth fused into 2–4 massive beak-like tooth plates; dorsal-fin spines ≤ 6 , or spinous portion of fin absent; no anal-fin spines; pelvic fins reduced to small spine and 0–2 rays (Triacanthodidae and Triacanthidae), or present as rudimentary bony element at end of pelvis (Balistidae and Monacanthidae), or fin element absent but with pelvis (Triodontidae), or both pelvic fins and pelvis entirely absent (Ostraciidae, Tetraodontidae, Diodontidae and Molidae); caudal fin with ≤ 12 principal rays (except Molidae, which lacks proper caudal fin); mouth usually small, maxilla usually firmly united or fused with premaxilla; opercular bones and branchiostegal rays covered by thick skin or bony hexagonal plates; gill opening restricted to lateral slit; scales usually modified as small spines, shields or bony plates; skull bones without sensory canals; no parietals, nasals and infraorbital bones; posttemporal, if present, simple and fused with pterotic; lower ribs usually absent; vertebrae 16–30; swimbladder present (except in Molidae). The stomach of tetraodontids and diodontids is highly modified to allow inflation to an enormous size.

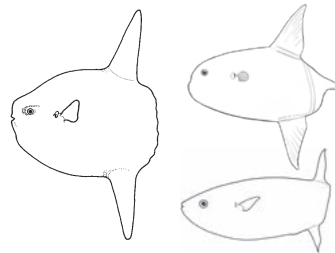
Size range 2.5–7.5 cm TL (monacanthid genus *Rudarius*) to 3.3+ m TL (*Mola mola*). Most marine species of this order occur in shallow waters, but some are found to ~400 m deep. Ten families, all in WIO.

Nelson (2006) recognised 3 suborders in Tetraodontiformes: Triacanthoidei (including only Triacanthodidae), Balistoidei (Triacanthidae, Balistidae, Monacanthidae and Ostraciidae), and Tetraodontoidei (Triodontidae, Tetraodontidae, Diodontidae and Molidae). Miya *et al.* (2003) analysed mitogenomic sequences of 100 species of higher teleosts to show that a sister-group relationship existed between the Caproidae and Tetraodontiformes, and that the caproid–tetraodontiform clade was a sister group to the Lophiiformes. Yamanoue *et al.* (2007, 2008) used the whole mitogenomic sequences to recover a monophyletic Tetraodontiformes as sister to the caproid–tetraodontiform clade. However, the authors failed to find any autapomorphic characters for the Tetraodontiformes.

KEY TO FAMILIES

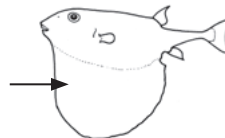
- 1a Teeth fused together and to jaw bones to form sharp-edged dental plates; left and right halves of jaws (dentaries and/or premaxillae) often fused together 2
- 1b Teeth separate, protruding from sockets in jaws; dentaries and premaxillae not fused together 5

- 2a Body orbicular or elongate-oval, compressed, and abruptly truncated posteriorly; caudal fin replaced by thick rudder-like structure without visible fin rays **MOLIDAE**



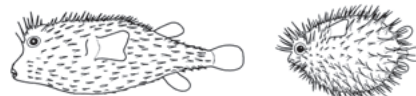
- 2b Body not truncated posteriorly; typical caudal fin present 3

- 3a Large expansible dewlap of skin between end of pelvis and anus; caudal fin with 12 principal rays (10 branched rays) and several small procurrent rays **TRIODONTIDAE**



- 3b No dewlap of skin in front of anus; pelvis absent; abdominal region inflatable; caudal fin with ≤ 11 principal rays and no procurrent rays 4

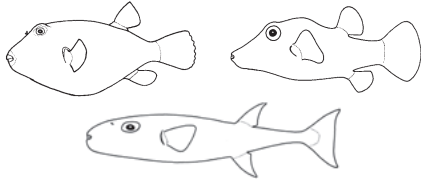
- 4a Single undivided tooth plate in each jaw; premaxilla and dentary pairs fully fused together; skin with large, sharp spines **DIODONTIDAE**



Continued...

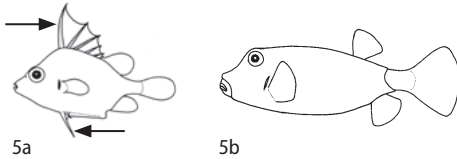
KEY TO FAMILIES

- 4b Tooth plates and jaws with distinct median suture; skin naked or with small spines or prickles **TETRAODONTIDAE**



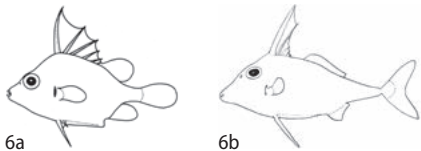
- 5a Pelvic fins present, with 1 long, stout spine and 0–2 smaller soft rays; dorsal fin 6 spines, posterior spines sometimes rudimentary and barely visible **6**

- 5b No pelvic fins; dorsal fin with 2 or 3 spines or spinous portion absent **7**



- 6a Dorsal fin 12–18 rays; base of spinous dorsal fin much longer than soft-rayed base; caudal fin rounded or almost truncate **TRICANTHODIDAE**

- 6b Dorsal fin 20–26 rays; base of spinous dorsal fin much shorter than soft-rayed base; caudal fin deeply forked **TRICANTHIDAE**



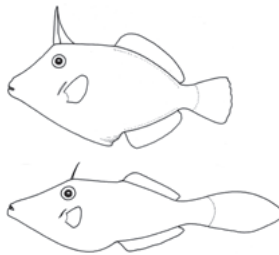
- 7a Body oval to oblong, compressed; 2 dorsal fins, and 1st dorsal fin with at least 1 spine **8**

- 7b Body robust, encased in a hard bony armour of hexagonal plates fused into a solid box; single dorsal fin, with a few soft rays **9**

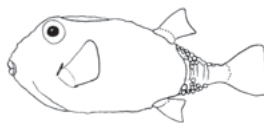
- 8a Body covered with hard, plate-like, bony scales; 2nd spine of dorsal fin $> \frac{1}{2}$ length of 1st spine; upper and lower jaw each with 8 outer teeth **BALISTIDAE**



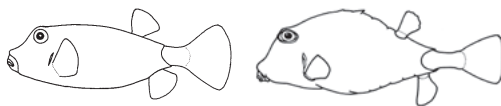
- 8b Body covered with minute scales, each bearing ≥ 1 slender microscopic spinules; 2nd spine of dorsal fin $< \frac{1}{2}$ length of 1st spine; 6 outer teeth in upper jaw, 4 or 6 outer teeth in lower jaw **MONACANTHIDAE**



- 9a Carapace fragmented behind dorsal and anal fins; peduncle with some bony plates separate from main carapace; caudal fin with 9 branched rays **ARACANIDAE**



- 9b Carapace closed behind dorsal and anal fins; no isolated bony plates on peduncle; caudal fin with 8 branched rays **OSTRACIIDAE**



GLOSSARY

autapomorphic characters – characters that are unique to a clade, and not shared with any other clade, such as the teeth fused into a beak and fused to the jaws.

dentaries – the main bones of the lower jaw that carry teeth.

monophyletic – a group of organisms (a clade) comprising the most recent common ancestor and all its descendants.

premaxillae – the main bones of the upper jaw that carry teeth; they lie in front of and below the maxillae.

sister-group – two taxa of equal rank that share a common ancestor.

suture – line where two bones join.

FAMILY TRIACANTHODIDAE

Spikefishes

Keiichi Matsuura

Body deep and laterally compressed; snout short to elongate and tubular. Dorsal fin spines 6, decreasing in size posteriorly: spines 1–2 well-developed, but posterior spines sometimes rudimentary and barely visible (especially in genera with long snouts); dorsal fin 12–18 rays; anal fin 11–16 rays; pelvic fins 1 prominent spine, 0–2 rudimentary rays; caudal fin 12 rays, and fin rounded to truncate. No spine in anal fin; dorsal- and pelvic-fin spines with locking mechanisms, often erected at right angles to body. Mouth small, with relatively few conical to truncate teeth, but teeth sometimes inconspicuous or absent in one jaw; 2 small nostrils in scaleless area in front of eyes. Gill opening a short slit in front of pectoral-fin base. Lateral line inconspicuous. Scales small with upright spiny processes giving rough or shagreen-like quality to the skin.

Small-sized (<25 cm SL), found near bottom, at ~46–600 m or deeper, although one species (*Triacanthodes indicus* from oceanic region of Indian Ocean) is bathypelagic as juveniles and young adults, before becoming benthic as adults. The family was revised by Tyler (1968), and additional species from WIO were subsequently recorded by Tyler (1970, 1983), Hulley (1972), Benbow (1974) and Matsuura (1982). Eleven genera and 23 species, occurring in Atlantic, Indian and western Pacific oceans; 6 genera and 8 species in WIO found at depths of <200 m.

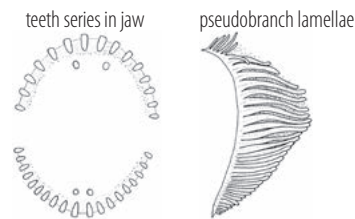
KEY TO GENERA

- 1a Snout equal to or shorter than eye diameter 2
- 1b Snout tubular, much longer than rest of head
..... *Macrorhamphosodes*
- 2a Teeth conical, and sharply pointed to bluntly rounded distally;
lips not especially large or swollen and spongy 3
- 2b Teeth compressed, wider than thick, and truncated distally;
lips large, swollen and spongy *Tydemania*

Continued ...

KEY TO GENERA

- 3a Jaws with major outer series of teeth and 1–6 isolated inner teeth (except inner teeth lacking in some *Triacanthodes ethiops*); pseudobranch lamellae 27–48, the ventralmost at level well below pectoral-fin base
..... *Triacanthodes*



- 3b Jaws with single series of teeth (no inner teeth); pseudobranch lamellae 11–24, the ventralmost at level above lower edge of pectoral-fin base 4
- 4a Dorsal-fin spines gradually decreasing in length, and last spine small but easily seen 5
- 4b Dorsal-fin spines abruptly decreasing in length, much shorter posteriorly than anteriorly: 4th spine protruding through skin and slightly longer than 5th and 6th spines, which either protrude slightly or are completely buried *Bathypylax*
- 5a Gill opening 13–15% SL (2 specimens), reaching to slightly below pectoral-fin base *Mephisto*
- 5b Gill opening 5–8% SL, not reaching below pectoral-fin base *Paratriacanthodes*

GENUS *Bathypylax* Myers 1934

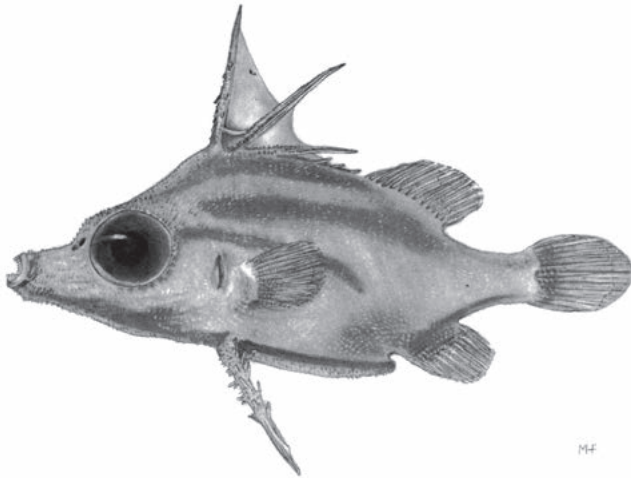
Dorsal-fin spines abruptly decreasing in length from long 1st spine to 4th spine, and 5th and 6th spines protrude slightly through skin or are completely buried. Snout shorter than rest of head and longer than postorbital length (distance from eye to dorsal end of gill opening). Teeth in 1 row in each jaw (no inner teeth). Scale-covered ventral surface of pelvis flat and wide, distinctly tapering to a point posteriorly, and its width between bases of pelvic-fin spines 1.3–3.3 in pelvic-fin length. Three species, 1 in WIO.

Bathyphylax bombifrons Myers 1934

Bathyphylax bombifrons Myers 1934: 10, Fig. 1 (Hong Kong, South China Sea); Tyler 1968*, 1983*; SSF No. 265; Matsuura & Tyler 1997*.

Dorsal fin 6 spines, 13 or 14 rays; anal fin 12 or 13 rays; pectoral fins 13 or 14 rays; pelvic fins 1 spine, 1 ray; GR 20–23; olfactory lamellae 14; pseudobranch lamellae 12–16. Percentage SL: snout length 14.9–15.8%, depth of mid-snout 10.8–13.4%, postorbital length 7.9–8.9%, gill opening 6.1–6.9%, and body depth 35–38%.

Preserved specimens with yellowish tan body, with 3 darkish longitudinal stripes, ventral stripe from rear edge of mid-eye and curving towards anus. Attains 93 mm SL.



Bathyphylax bombifrons, 80 mm SL, holotype (Hong Kong).
Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Indo-Pacific. WIO: Kenya; elsewhere, Hong Kong and New Caledonia.

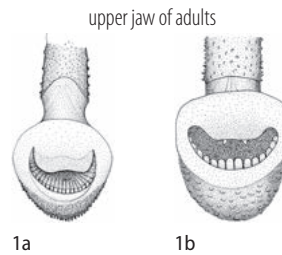
REMARKS Collected in trawls at 113–738 m.

GENUS *Macrorhamphosodes* Fowler 1934

Snout greatly elongated and tubular, much longer than rest of head; mouth twisted to right or left, and much wider than snout behind it. First 3 dorsal-fin spines well-developed, last 3 barely visible. Scale-covered ventral surface of pelvis flat, distinctly tapering to a point posteriorly, and its width between bases of pelvic-fin spines ~5–6 in its length. Two species, both in WIO.

KEY TO SPECIES

- 1a Gill opening extends below middle of pectoral-fin base, its length ~2–2.5 in eye diameter; no teeth in upper jaw of adults, a few barely protruding tooth rudiments in young; teeth in lower jaw >20 in adults, 17–19 in young; teeth truncate in adults, slightly rounded distally in young; pectoral fins 11–13 rays; dorsal fin 12 or 13 rays *M. platycheilus*
- 1b Gill opening not extending below middle of pectoral-fin base, its length ~3.5–4 in eye diameter; 2 well-developed teeth in upper jaw of adults, 4 in young; teeth in lower jaw 12–16, rounded to slightly truncated in adults but sharply pointed in young; pectoral fins (including small uppermost element) 13 or 14 rays; dorsal fin 13–15 rays *M. uradoi*

*Macrorhamphosodes platycheilus* Fowler 1934

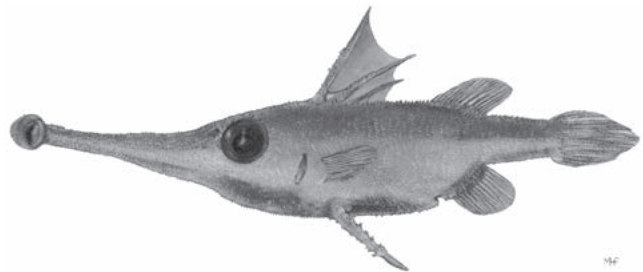
Trumpetsnout

Macrorhamphosodes platycheilus Fowler 1934: 365, Fig. 115 (Luzon I., Philippines); Tyler 1968*, 1983*.

Macrorhamphosodes uradoi [in part]: Kamohara 1937.

Dorsal fin 6 spines (last 3 rudimentary), 12 or 13 rays; anal fin 12 or 13 rays; pectoral fins 11–13 rays; pelvic fins 1 spine, 1 ray; GR 24–29; olfactory lamellae 9–12; pseudobranch lamellae 12–17. Percentage SL: HL 48–56%, snout length 26–41%, eye diameter 9–14%, postorbital length 5.4–9.7%, gill opening 4.1–6.3%, and body depth 19–32%. Gill opening extends below middle of pectoral-fin base, its length ~2–2.5 in eye diameter. Mouth becomes progressively twisted with size.

Body pinkish red; paler below, and darker red dorsally and a stripe extending posteriorly from eyes. Attains 105 mm SL.



Macrorhamphosodes platycheilus, 90 mm SL (Bay of Bengal).
Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Indo-Pacific. WIO: Kenya and South Africa (Algoa Bay, Eastern Cape); elsewhere, Bay of Bengal and Philippines.

REMARKS Collected in bottom trawls at 50–450 m. Feeds on scales of fishes.

Macrorhamphosodes uradoi (Kamohara 1933)

Trumpetsnout

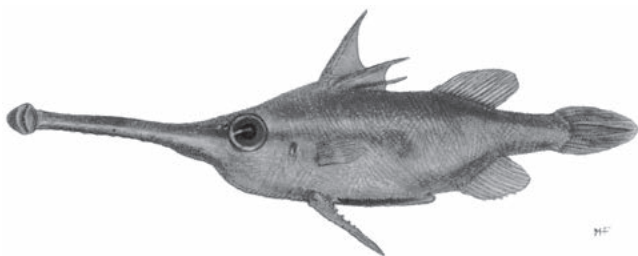
PLATE 104

Halimochirus [sic] *uradoi* Kamohara 1933: 389, 392, Figs. 1–3 (Mimase, Kochi Prefecture, Japan).

Macrorhamphosodes uradoi: Tyler 1968*, 1983*; Hulley 1972*; SSF No. 265.1*.

Dorsal fin 6 spines (last 3 rudimentary), 13–15 rays; anal fin 12–14 rays; pectoral fins 13 or 14 rays; pelvic fins 1 spine, 1 ray; GR 24–27; olfactory lamellae 12–14; pseudobranch lamellae 11–16. Percentage SL: HL 50–55%, snout length 37–40%, eye diameter 7.8–10.2%, postorbital length 5–6.2%, gill opening 1.8–2.3%, and body depth 19–21%. Gill opening not extending below middle of pectoral-fin base, its length ~3.5–4 in eye diameter. Mouth becomes progressively twisted with size.

Body pinkish red; paler below, and darker red dorsally and a stripe extending posteriorly from eyes. Attains 211 mm SL.



Macrorhamphosodes uradoi, 150 mm SL (Japan).

Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION WIO: Kenya, and one record from South Africa (from 400–450 m off Port Elizabeth, Eastern Cape); elsewhere, Taiwan and Japan.

REMARKS Collected in bottom trawls at 50–450 m. Feeds on scales of fishes.

GENUS *Mephisto* Tyler 1966

Dorsal-fin spines gradually decreasing in length from long 1st spine to small but easily seen 6th spine. Snout shorter than rest of head and almost equal to postorbital length (distance from eye to dorsal end of gill opening). Teeth large and conical, in 1 row in each jaw (no inner teeth). Pelvis relatively wide, its width between bases of pelvic-fin spines 2.7–2.8 in pelvic-fin length. Two species, 1 in WIO.

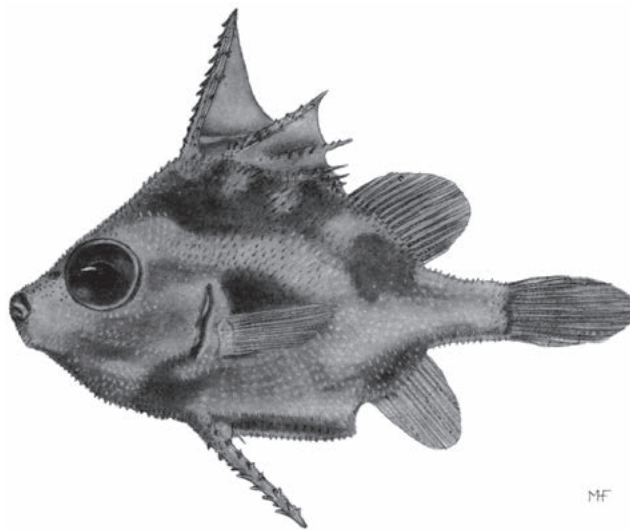
Mephisto fraserbrunneri Tyler 1966

PLATE 104

Mephisto fraserbrunneri Tyler 1966: 3, Fig. 1 (Bay of Bengal); Tyler 1968; Manilo & Bogorodsky 2003; Bemis *et al.* 2020*.

Dorsal fin 6 spines, 16 rays; anal fin 14 rays; pectoral fins 14 rays; pelvic fins 1 spine, 1 ray; GR 19; olfactory lamellae 9 or 10; pseudobranch lamellae 18 or 19. Percentage SL: HL 41–43%, snout length 12–13%, eye diameter 15–17%, postorbital length ~13%, gill opening ~14%, and body depth 52–53%. Gill opening long, extending slightly below ventral edge of pectoral-fin base.

Body pinkish, except for pale silvery area on abdomen and darker pink blotches on dorsal half of body. Attains 127 mm TL.



Mephisto fraserbrunneri, 50 mm SL, holotype (Bay of Bengal).

Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Known only from 28 specimens from Arabian Sea (off Somalia) and Bay of Bengal.

REMARKS Taken in bottom trawls at 176–350 m.

GENUS *Paratriacanthodes* Fowler 1934

Dorsal-fin spines gradually decreasing in length, and 6th spine small but easily seen. Snout shorter than rest of head.
Gill opening 5–8% SL, not reaching below pectoral-fin base.
Teeth large and conical, in 1 row in each jaw (no inner teeth).
Scale-covered ventral surface of pelvis flat, tapering to a point posteriorly, and its width between bases of pelvic-fin spines ~5–6 in pelvic-fin length. Three species, 1 in WIO.

Paratriacanthodes retrospinis Fowler 1934

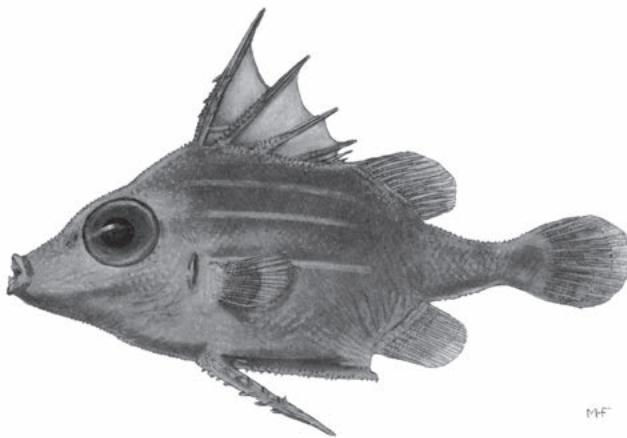
Sawspine spikefish

PLATE 105

Paratriacanthodes retrospinis Fowler 1934: 364, Fig. 114 (Taiwan, China Sea); Tyler 1968*, 1983*; SSF No. 265.2*; Matsuura & Tyler 1997*.

Dorsal fin 6 spines, 15 or 16 rays; anal fin 13 or 14 rays; pectoral fins 13 or 14 rays; pelvic fins 1 spine, 1 ray; GR 17–23; olfactory lamellae 10–13; teeth in upper jaw 10–18; teeth in lower jaw 15–24. Percentage SL: HL 32–45%, snout length 10–14%, eye diameter 14–20%, postorbital length 8–11%, gill opening 3.7–6.7%, and body depth 39–54%. Dorsal- and pelvic-fin spines with enlarged spinules forming three series of 3–5 retrorse barbs; width of ventral surface of pelvis (between bases of pelvic-fin spines) ~3 in pelvic-fin length.

Body reddish pink, with 3 pale lines, and ventral surface from lower jaw to anus silvery blue. Attains 119 mm SL.



Paratriacanthodes retrospinis, 90 mm SL, paratype (Hong Kong).
Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Indo-Pacific. WIO: Mozambique to South Africa (KwaZulu-Natal); elsewhere to South China Sea, Japan, New Caledonia and Fiji.

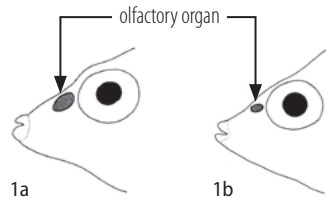
REMARKS Collected in bottom trawls at 100–675 m.

GENUS *Triacanthodes* Bleeker 1857

Dorsal-fin spines gradually decreasing in length. Snout shorter than rest of head. Teeth large and conical, mostly in single series in both jaws, but with 1–6 inner teeth. Pseudobranch lamellae 27–48, the ventralmost at level well below pectoral-fin base. Scale-covered ventral surface of pelvis flat, tapering to a point posteriorly, and its width between bases of pelvic-fin spines ~3–5 in pelvic-fin length. Four species, 2 in WIO.

KEY TO SPECIES

- 1a Length of naked skin over olfactory organ long, 2.2–3.2 in eye diameter and always longer than distance between inner edges of scaleless nasal areas; olfactory lamellae 10–12 *T. indicus*
- 1b Length of naked skin over olfactory organ relatively short, 2.9–5.8 in eye diameter and equal to or slightly less than distance between inner edges of scaleless nasal areas; olfactory lamellae 11–15 (usually >12) *T. ethiops*

*Triacanthodes ethiops* Alcock 1894

Shortsnout spikefish

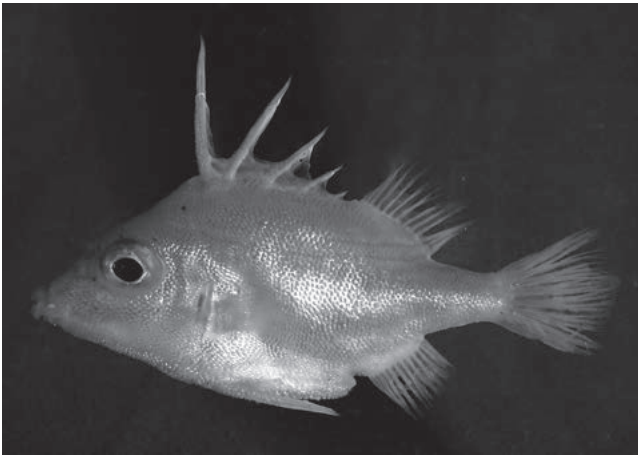
PLATE 105

Triacanthodes ethiops Alcock 1894: 137, Pl. 7, Fig. 6 (Bay of Bengal);
Smith 1949*; Tyler 1968*; SSF No. 265.3*; Matsuura & Tyler 1997*.

Paratriacanthodes myersi Fraser-Brunner 1941: 426, Fig. 3
(Kai Is., Indonesia).

Dorsal fin 6 spines, 15 or 16 rays; anal fin 12 or 13 rays; pectoral fins 13 or 14 rays; pelvic fins 1 spine, 1 or 2 rays; GR 16–19; olfactory lamellae 11–15; pseudobranch lamellae 27–45. Percentage SL: HL 38–44%, snout length 13–17%, eye diameter 16–20%, postorbital length 7.8–11%, gill opening 8–13% and body depth 41–63%. Eye diameter usually slightly larger than snout length; interorbital area flat to slightly concave.

Body generally reddish, paler below, with 3 yellowish principal lines and 2 reddish yellow additional lines (upper line between dorsal-fin base and uppermost principal line; lower line between uppermost and middle principal lines at about midbody, extending posteriorly onto peduncle). Attains 94 mm SL.



Triacanthodes ethiops, ~95 mm SL (S Mozambique).
PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Mozambique and South Africa (KwaZulu-Natal); elsewhere, east coast of India, Indonesia, Philippines, Japan, Australia and New Caledonia.

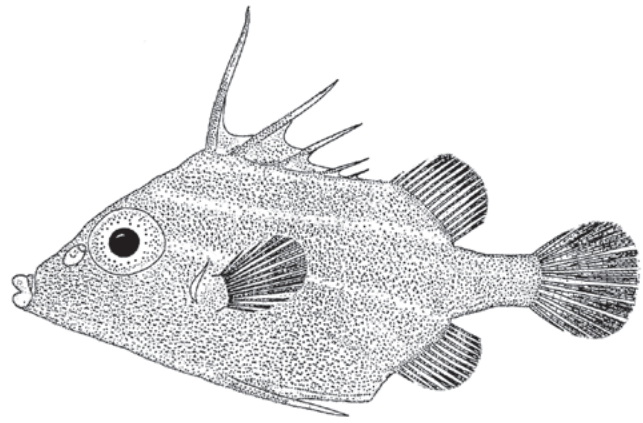
REMARKS Collected in bottom trawls at 180–450 m.

Triacanthodes indicus Matsuura 1982

Triacanthodes indicus Matsuura 1982: 386, Figs. 1–3, 7–8
(Saya de Malha Bank); SSF No. 265.

Dorsal fin 6 spines, 15 or 16 rays; anal fin 13 rays; pectoral fins 13 or 14 rays; pelvic fins 1 spine, 1 or 2 rays; GR 16–20; olfactory lamellae 10–12. Percentage SL: HL 36–41%, snout length 14–17%, eye diameter 13–16%, postorbital length 7.8–9.9%, gill opening 9.4–12%, and body depth 40–46%. Eye diameter slightly less than snout length; interorbital area flat to slightly concave.

Body generally reddish, paler below, with 3 yellowish principal lines and 2 reddish yellow additional lines (upper line between dorsal-fin base and uppermost principal line; lower line between uppermost and middle principal lines at about midbody, extending posteriorly onto peduncle). Attains 117 mm SL.



Triacanthodes indicus, 90 mm SL, paratype (Saya de Malha Bank).
Source: Matsuura 1982

DISTRIBUTION WIO: Saya de Malha Bank.

REMARKS Collected from oceanic region, in bottom trawls at 92–176 m.

GENUS *Tydemania* Weber 1913

First 3 dorsal-fin spines well-developed, last 3 rudimentary and barely visible. Snout shorter than rest of head; lips large, swollen, spongy. Teeth compressed from front to back, wider than thick, and truncated distally, in 1 row in each jaw. Gill opening reaching to lower half of pectoral-fin base. Scale-covered ventral surface of pelvis flat, distinctly tapering to a point posteriorly, and its width between bases of pelvic-fin spines ~4 in pelvic-fin length. One species.

Tydemania navigatoris Weber 1913

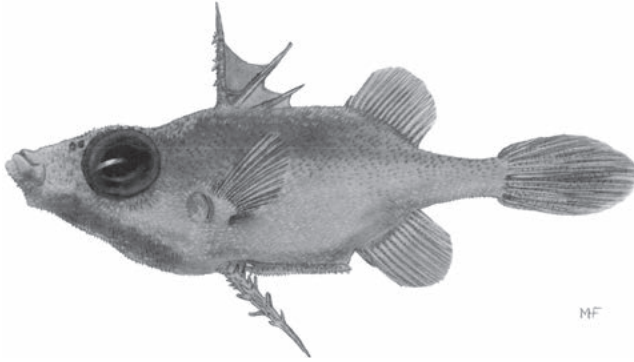
Fleshy-lipped spikefish

PLATE 105

Tydemania navigatoris Weber 1913: 571, Pl. 7, Fig. 4 (Madura Strait, Indonesia); Smith 1958*; Tyler 1968*; SSF No. 265.4*; Matsuura & Tyler 1997*.

Dorsal fin 6 spines, 13–15 rays; anal fin 12–14 rays; pectoral fins 12–14 rays; pelvic fins 1 spine, 0–1 rays; GR 17–23; olfactory lamellae 11–14; pseudobranch lamellae 11–18; teeth in upper jaw 30–40; teeth in lower jaw 32–43. Percentage SL: HL 34–45%, snout length 12–15%, eye diameter 14–17%, postorbital length 7.2–11%, gill opening 4.1–8%, and body depth 31–39%.

Body generally reddish, darker dorsally; some specimens (particularly from Japan) with blue stripe from eye over gill opening and pectoral-fin base to about halfway back on body. Attains 120 mm SL.



Tydemania navigatoris, 80 mm SL (Bay of Bengal).
Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique and South Africa (KwaZulu-Natal); elsewhere, Bay of Bengal, Indonesia, Philippines, Japan and northwestern Australia.

REMARKS Collected in bottom trawls at 50–607 m. Feeds on scales of fishes.

FAMILY TRIACANTHIDAE

Triplespines or tripodfishes

Keiichi Matsuura

Body moderately elongate and strongly compressed; skin moderately thick with numerous minute scales (not easily discernible to the unaided eye), each scale bearing upright spinules and having a rough shagreen-like appearance. Dorsal fin 6 spines, the 1st long (usually only 5 spines visible, 6th rudimentary), 20–26 rays; pelvic fins 1 long spine, which may be locked in extended position, and no visible rays; most dorsal-, anal- and pectoral-fin rays branched; peduncle distinctly tapering to narrow transversely indented region just before caudal-fin base, where peduncle is wider than deep; caudal fin deeply forked. Eyes large. Mouth small and usually terminal; teeth in outer series of ~10 strong incisors in each jaw, plus several molars in inner position (usually 4 in upper jaw and 2 in lower jaw). Gill opening a moderately short vertical slit in front of pectoral-fin base. Lateral line inconspicuous.

Small-sized (<30 cm TL), benthic, usually inhabiting flat, sandy or weed-covered bottoms in shallow coastal or estuarine waters; feed on bottom-dwelling invertebrates. This family revised by Tyler (1968). Four genera and 7 species, in Indo-Pacific; 2 genera and 2 species in WIO.

KEY TO GENERA AND SPECIES

- 1a Scale-covered ventral surface of pelvis much wider anteriorly than posteriorly, distinctly tapered to a point; 2nd spine of dorsal fin long, 16–26% SL; membrane of spiny dorsal fin pale basally between 1st and 2nd spines, but black distally *Pseudotriacanthus strigilifer*
- 1b Scale-covered ventral surface of pelvis almost as wide anteriorly as posteriorly, not distinctly tapered to a point; 2nd spine of dorsal fin moderate, 5.5–16% SL; membrane of spiny dorsal fin very dark or black between 1st and 3rd spines, and usually equally dark or black between 3rd and 5th spines *Triacanthus biaculeatus*

GENUS *Pseudotriacanthus*

Fraser-Brunner 1941

Second spine of dorsal fin $> \frac{1}{2}$ length of 1st spine. Scale-covered ventral surface of pelvis much wider anteriorly than posteriorly, distinctly tapered to a point. Scales with series of high, thin, distally emarginated vertical ridges. One species.

Pseudotriacanthus strigilifer (Cantor 1849)

Long-spined tripodfish

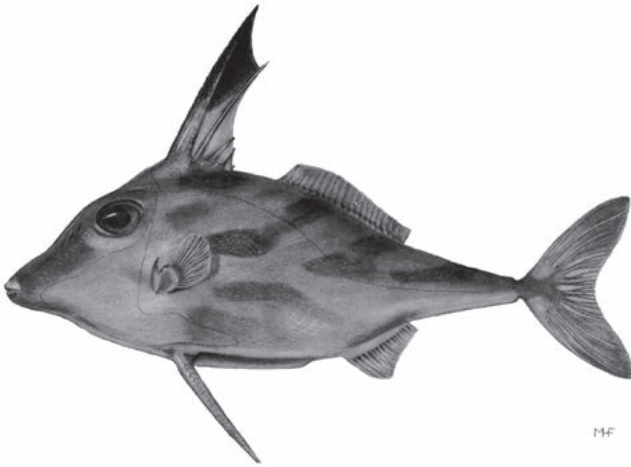
PLATE 105

Triacanthus strigilifer Cantor 1849: 1345 [363], Pl. 9, Figs. 1–2 (Penang, Malaysia).

Pseudotriacanthus strigilifer: Tyler 1968*; Randall 1995*; Matsuura 2001, 2014; Manilo & Bogorodsky 2003.

Dorsal fin 6 spines, 20–24 rays; anal fin 13–17 rays; pectoral fins 12–15 rays; GR 11–15; olfactory lamellae 25–36; pseudobranch lamellae 25–36. Snout length 19–22% SL; 2nd spine of dorsal fin 16–26% SL; postorbital length 5–7% SL.

Body silvery grey, slightly darker dorsally, with scattered yellowish orange blotches; distal two-thirds of 1st spine of dorsal fin dusky; spiny portion of dorsal-fin membrane whitish basally between 1st and 2nd spines, but dark distally; soft dorsal fin, anal fin and pectoral fins pale; caudal fin slightly yellowish. Attains 25 cm TL.



Pseudotriacanthus strigilifer, 13 cm SL (Bay of Bengal).
Source: Tyler 1968, Monographs of the ANSP

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf and Gulf of Oman to India and Sri Lanka; elsewhere to Bay of Bengal, Malaysia, Indonesia, Philippines and Australia.

REMARKS Known from 2–110 m; collected in trawls and gillnets.

GENUS *Triacanthus* Oken 1817

Scale-covered ventral surface of pelvis almost as wide anteriorly as posteriorly, not distinctly tapered to a point. Second spine of dorsal fin ~25–33% length of 1st spine. Scales with low emarginated cruciform ridge. Two species, 1 in WIO.

Triacanthus biaculeatus (Bloch 1786)

Short-nosed tripodfish PLATES 105 & 106

Balistes biaculeatus Bloch 1786: 17, Pl. 148, Fig. 2 (Indian Ocean).
Triacanthus biaculeatus: Tyler 1968*; Randall 1995*; Fricke 1999;
Matsuura 2001, 2014; Manilo & Bogorodsky 2003.

Dorsal fin 6 spines, 21–26 rays; anal fin 17–23 rays; pectoral fins 12–16 rays; GR 14–19; olfactory lamellae 24–40; pseudobranch lamellae 29–50. Snout length 16–20% SL; 2nd spine of dorsal fin 5.5–16% SL; postorbital length 7–10% SL.

Dorsal half of body silvery blue-grey, ventral half silvery grey; large dark blotch on dorsum beneath spiny dorsal fin; interorbital space with wide dark bar connecting eyes; distal one-third of 1st spine of dorsal fin silvery grey, but basal

two-thirds very dark or black; membrane of spiny dorsal fin very dark or black between 1st and 3rd spines, and usually equally dark or black between 3rd and 5th spines; soft dorsal fin, anal fin and pectoral fins yellowish; pectoral-fin axil dark; caudal fin dark yellow. Attains 30 cm TL.



Triacanthus biaculeatus, 15 cm SL (Qatar). © SV Bogorodsky

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf to South Africa (Eastern Cape) and India and Sri Lanka, and Mauritius; elsewhere to Bay of Bengal, Indonesia, Taiwan, China, Korea, southern Japan and eastern Australia.

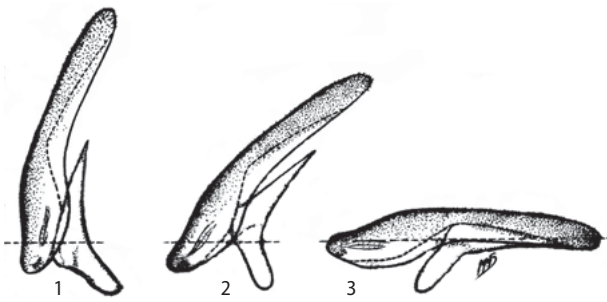
REMARKS Found inshore on flat sandy or mud bottoms, to ~60 m deep. Feeds on benthic invertebrates. Collected in trawls, shore seines and gillnets.

FAMILY **BALISTIDAE**

Triggerfishes

Keiichi Matsuura

Deep-bodied, moderately compressed, and encased in thick tough skin, with large plate-like scales easily discernible as individual units; scales above pectoral-fin bases in many species enlarged, forming a flexible tympanum. Gill opening a short vertical to oblique slit in front of pectoral-fin base. Mouth terminal or slightly supraterminal; teeth strong, 8 incisors in outer series in both jaws. First dorsal fin with 3 spines: 1st spine can be locked in upright position by 2nd spine (the ‘trigger’), and 3rd spine usually very small. Most rays of 2nd dorsal fin, anal fin and pectoral fins branched. Pelvic fins rudimentary, represented by series of 4 pairs of enlarged scales encasing the end of pelvis. Lateral line inconspicuous.



Dorsal-fin spine locking mechanism, 1 erect, 2 partly erect, and 3 depressed. Source: SSF

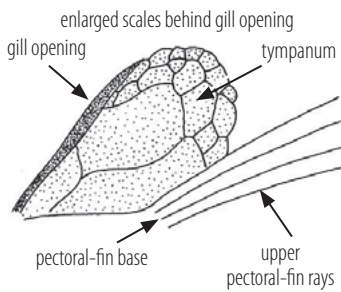
Small- to medium-sized (<80 cm TL); most species are benthic, occurring on coral and rocky reefs, from shoreline to ~100 m deep, though some are primarily pelagic open-water species (e.g., *Canthidermis*). Eggs are demersal and guarded by the female. Highly valued as a food fish in many fisheries, and a bycatch in commercial bottom trawls, but some large individuals can be toxic. Eleven genera and ~40 species; 10 genera and 23 species in WIO.

KEY TO GENERA

- 1a Peduncle distinctly depressed, wider than deep *Abalistes*
- 1b Peduncle compressed 2

- 2a Lateral bony projection below pectoral fin on each side of body (specimens <16 cm SL; see 9a for fish ≥16 cm SL) *Xanthichthys* [IN PART]
- 2b No lateral bony projection below pectoral fins 3

- 3a Scales above pectoral-fin base and just behind gill opening enlarged, forming flexible tympanum 4



- 3b Scales above pectoral-fin base and just behind gill opening not enlarged 9

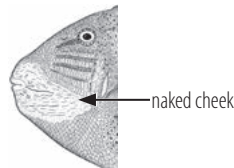
- 4a Prominent groove on snout in front of eye and below nostrils 5
- 4b No groove on snout in front of eyes 10

- 5a Teeth red, and 2 upper teeth canine-like and projecting forward *Odonus*



- 5b Teeth white and not projecting forward 6

- 6a Front of cheek largely naked, and rear part covered with scales smaller than body scales *Pseudobalistes*



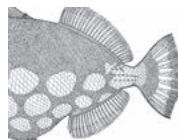
- 6b Cheek entirely covered with scales (except for fold at corner of mouth in *Balistooides viridescens*) 7

- 7a Upper and lower profiles of head prominently convex, giving body distinctive ovoid shape; body uniformly black, deep indigo or blue-green *Melichthys*

- 7b Upper and lower profiles of head not prominently convex, but either concave, straight or slightly convex; body not uniformly black or deep indigo, but variously coloured with blotches and/or lines 8

- 8a Longitudinal scale ridges extend only a short distance forward of peduncle *Balistooides*

- 8b Longitudinal scale ridges extend forward of peduncle at least to middle of body *Sufflamen*



8a



8b

- 9a Cheek with 3–6 naked, longitudinal, somewhat oblique grooves *Xanthichthys* [IN PART]

- 9b Cheek evenly scaly, and without scaleless grooves *Canthidermis*



9a

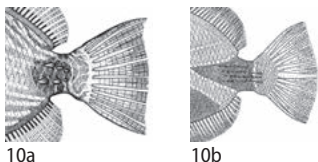


9b

Continued...

KEY TO GENERA

- 10a Third spine of 1st dorsal fin developed, extending above dorsal edge of body; peduncle with 2 longitudinal rows of large forward-projecting spines *Balistapus*
- 10b Third spine of 1st dorsal fin minute, barely extending above body; peduncle with 3–5 longitudinal rows of small forward-projecting spines *Rhinecanthus*



Abalistes stellatus, 26 cm SL (Mozambique). PC Heemstra © NRF-SAIAB

GENUS *Abalistes* Jordan & Seale 1906

Clearly distinguishable from all other genera by depressed peduncle. Mouth terminal; teeth uneven, notched. Two species, 1 in WIO.

Abalistes stellatus (Anonymous 1798)

Starry triggerfish

PLATES 106 & 107

Balistes stellatus Anonymous (ex Commerson) in Lacepède 1798: 682 (Mauritius, Mascarenes).

Balistes stellaris Bloch & Schneider 1801: 476 (Indian Ocean).

Balistes vachellii Richardson 1845: 129 (Canton [Guangdong], 'China seas').

Balistes phaleratus Richardson 1846: 484, Pl. 1,

Figs. 4–5 (west coast of Australia).

Abalistes stellatus: SSF No. 263.1*; Winterbottom *et al.* 1989;

Goren & Dor 1994; Kuitert 1998*; Fricke 1999; Fricke *et al.* 2009;

Matsuura 2014.

Dorsal fins 3 spines, 25–27 rays; anal fin 24 or 25 rays; pectoral fins 15 or 16 rays (usually 15, excluding uppermost rudimentary element). LSS 33–41; scales enlarged above pectoral-fin base and just behind gill opening, forming flexible tympanum; scales on rear part of body with prominent keels, forming longitudinal ridges. Prominent groove extending forward from eye for a distance equal to eye diameter.

Body grey-brown to olive-brown on back, pale below; small pale blue or yellow spots dorsally, and larger yellow spots ventrally (frequently faint); 3 large white blotches on back (fading in large specimens); soft rays of 2nd dorsal fin and anal fin with yellow, slightly oblique stripes; pectoral fins yellow. Attains 60 cm TL (commonly 40 cm TL).

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Red Sea to South Africa (Mossel Bay), Seychelles, Réunion, Mauritius, Chagos and St Brandon Shoals; elsewhere to southern Japan, Palau, Australia, Great Barrier Reef, Fiji and Tonga.

REMARKS Matsuura & Yoshino (2004) showed that *Balistes stellaris* Bloch & Schneider 1801 is a junior synonym of *Balistes stellatus* Anonymous 1798. Lives over sand, sponges or seagrasses, to ~100 m deep. Feeds on benthic invertebrates. Caught by bottom trawls and vertical longlines; marketed fresh and sometimes dried and salted.

GENUS *Balistapus* Tilesius 1820

Mouth terminal; teeth uneven, notched; enlarged bony scales behind gill opening; no groove before eye below nostrils; peduncle with 6 strong forward-projecting spines in 2 longitudinal rows. One species.

Balistapus undulatus (Park 1797)

Orange-lined triggerfish

PLATE 107

Balistes undulatus Park 1797: 37 (Bengkulu Province, Sumatra, Indonesia).

Balistes lineatus Bloch & Schneider 1801: 466 (Coromandel coast, India).

Balistes minor Forsskål in Niebuhr 1775: xvii [Red Sea].

Balistes aculeatus var. *viridis* Bennett 1828: Pl. 10 (south coast of Sri Lanka).

Balistapus undulatus: SSF No. 263.2*; Kuitert 1998*; Heemstra *et al.* 2004;

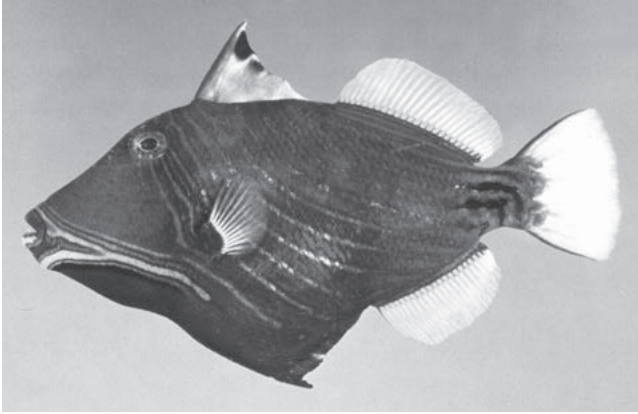
Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013;

Matsuura 2014.

Diagnosis as for genus. Dorsal fins 2 spines, 24–27 rays; anal fin 20–24 rays; pectoral fins 13–15 rays. LSS 36–40.

Body dark green to dark brown, with oblique curved orange lines on posterior head and body; oblique band of narrow blue

and orange stripes from around mouth to below pectoral fins; spines on peduncle with black bases; rays of 2nd dorsal fin, anal fin and pectoral fins orange; caudal fin orange. Attains 30 cm TL.



Balistapus undulatus, 13 cm SL (Comoros). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (KwaZulu-Natal; juveniles to Eastern Cape), Mozambique Channel, Madagascar, Comoros, Aldabra, Seychelles, Mascarenes, Maldives, Sri Lanka and India; elsewhere to Indonesia, southern Japan, Australia, New Caledonia, Society Is., Tuamotu Is. and Marquesas Is.

REMARKS Found on coral reefs, to ~50 m deep. Found in coral-rich areas; appears to be territorial. Feeds on a wide variety of benthic organisms.

GENUS *Balistoides* Fraser-Brunner 1935

Mouth terminal; teeth uneven, notched; deep groove before eye and below nostrils; enlarged bony scales behind gill opening; 3–6 longitudinal rows of tubercles on peduncle and slightly anteriorly onto body; caudal fin rounded. Two species, both in WIO.

KEY TO SPECIES

- | | | |
|----|--|------------------------|
| 1a | Cheek entirely covered with scales; ventral part of body with large rounded white blotches | <i>B. conspicillum</i> |
| 1b | Naked longitudinal fold behind corners of mouth; ventral part of body without white blotches | <i>B. viridescens</i> |

Balistoides conspicillum (Bloch & Schneider 1801)

Clown triggerfish

PLATE 107

Balistes niger Bonnaterre (ex Sonnerat) 1788: 10, Pl. 85, Fig. [352]

(Mauritius, Mascarenes) [preoccupied by *Balistes niger* Bloch 1786].

Balistes conspicillum Bloch & Schneider 1801: 474 (Mauritius, Mascarenes).

Balistoides conspicillum: SSF No. 263.4*; Winterbottom *et al.* 1989;

Kuiter 1998*; Fricke 1999; Manilo & Bogorodsky 2003;

Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009;

Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins 3 spines, 25–27 rays; anal fin 21–23 rays; pectoral fins 14 or 15 rays. LSS 39–50; cheek scales create a complete even covering. Peduncle with 3 or 4 rows of small forward-projecting spines.

Body black, with large round white blotches on ventral half; yellow network on back before soft dorsal fin; white or yellowish band across snout in front of eyes; lips and area around mouth orange-yellow; broad vertical white or slightly yellowish band on caudal fin. Attains 60 cm TL.



Balistoides conspicillum, 50 cm SL (Mauritius). O Alvheim © IMR

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (KwaZulu-Natal), Mozambique Channel, Comoros, Seychelles and Mascarenes; not known from Red Sea; elsewhere to Indonesia, Japan (Hokkaido), Australia, New Caledonia, Lord Howe I. and Samoa.

REMARKS Usually found on outer reef areas adjacent to steep drop-offs, to ~75 m deep. Feeds on sea urchins, crabs and other crustaceans, molluscs and tunicates. A popular marine aquarium fish.

Balistoides viridescens (Bloch & Schneider 1801)

Titan triggerfish

PLATES 106 & 107

Balistes viridescens Bloch & Schneider 1801: 477 [Mauritius, Mascarenes].

Balistes brasiliensis Bloch & Schneider 1801: 470 ('Brazilian seas'
[locality in error]).

Balistooides viridescens: SSF No. 263.5*; Winterbottom *et al.* 1989;
Kuitert 1998*; Fricke 1999; Manilo & Bogorodsky 2003;
Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013;
Matsuura 2014.

Dorsal fins 3 spines, 25 or 26 rays; anal fin 22–24 rays; pectoral fins 14 or 15 rays. LSS 29–32; cheek entirely scaled, except for scaleless area around lips, and scaled area continuing and narrowing beyond corners of mouth. Peduncle with 5 or 6 rows of small forward-projecting spines, rows extending to below end of soft dorsal fin.

Body mostly greyish green, with pale scale margins forming cross-hatched pattern; front third of body (tip of jaws to cheeks) and rear third of body (middle of median fins to base of caudal fin) pale yellowish green; dark band on upper jaw; wide blackish band with yellow spots extending from beneath eyes to pectoral-fin bases; soft dorsal fin, anal fin and caudal fin pale yellow with dark margins; juveniles with spots. Attains 80 cm TL.



Balistooides viridescens, juvenile (South Africa). © RE Stobbs



Balistooides viridescens, 39 cm SL (Mauritius). © Alvheim © IMR

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (Sodwana Bay, strays to Eastern Cape), Mozambique Channel, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, Ryukyu Is., Wake I., Australia, New Caledonia, Tonga, Tuamotu Is. and Pitcairn Is.

REMARKS Found on coral reefs, to ~50 m deep, and on deep seaward reefs, usually at 50–200 m. Nest-guarding females are very aggressive. Feeds on urchins, crabs and other crustaceans, molluscs and tubeworms.

GENUS *Canthidermis* Swainson 1839

Mouth terminal; teeth uneven, notched; deep groove before eye and below nostrils; no grooves on cheek; no enlarged bony scales behind gill opening. Five species, 2 in WIO.

KEY TO SPECIES

- 1a Body grey, paler grey ventrally; body scale rows 35–40 from gill opening to caudal-fin base; scale rows 25–29 from corner of mouth to lower end of gill opening *C. macrolepis*
- 1b Body dark grey with many elongate white spots; body scale rows 37–46 from gill opening to caudal-fin base; scale rows 28–32 from corner of mouth to lower end of gill opening *C. maculata*

Canthidermis macrolepis (Boulenger 1888)

Largescale triggerfish

PLATE 107

Balistes macrolepis Boulenger 1888: 666 (Muscat, Gulf of Oman);
Randall 1995*.

Canthidermis longirostris Tortonese 1956: 77, Fig. 1 (Dahlak I., Red Sea).

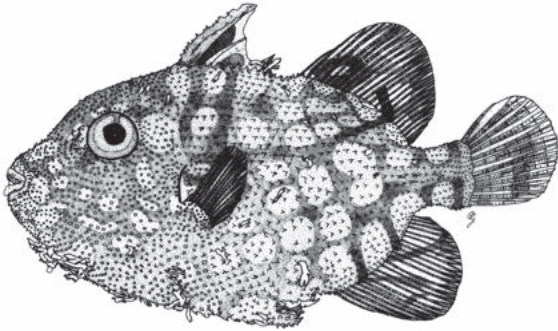
Canthidermis villosus Fedoryako 1979: 985, Fig. 1b–c (Indian Ocean,
12°29' N, 44°23' E).

Canthidermis maculatus (*non Balistes maculatus* Bloch 1786):
Berry & Baldwin 1966.

Canthidermis macrolepis: Randall 1995*; Gill & Randall 1997*;
Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins 3 spines, 25 or 26 rays; anal fin 22 or 23 rays; pectoral fins 14 or 15 rays; caudal fin double emarginate in adults, rounded in juveniles. LSS 35–40; scale rows 25–29 from corner of mouth to lower end of gill opening. Juveniles differ from congeners by relatively long branched fleshy outgrowths on body and head scales (versus short unbranched fleshy outgrowths, or outgrowths absent).

Head and body grey, shading to paler grey ventrally; median fins grey, with dark grey margins; pectoral fins dark grey. Attains 60 cm TL.



Canthidermis macrolepis, 3 cm SL, juvenile (Yemen).

Source: Gill & Randall 1997

DISTRIBUTION WIO: Red Sea to Gulf of Oman.

REMARKS Pelagic, often forming aggregations. Gill & Randall (1997) showed that *C. macrolepis* is a valid species.

Canthidermis maculata (Bloch 1786)

Spotted oceanic triggerfish

PLATE 107

Balistes maculatus Bloch 1786: 25, Pl. 151 (Tharangambadi, India);
Berry & Baldwin 1966*.

Balistes oculatus Gray 1831: Pl. 90, Fig. 1 (India).

Canthidermis maculata: SSF No. 263.6*; Kuitert 1998*; Fricke 1999;
Manilo & Bogorodsky 2003 [as *maculatus*]; Fricke *et al.* 2009;
Matsuura 2014.

Dorsal fins 3 spines, 23–25 rays; anal fin 20–22 rays; pectoral fins 14 or 15 rays. LSS 37–46; scale rows 28–32 from corner of mouth to lower end of gill opening.

Head and body dark grey, somewhat paler ventrally, with many elongate white spots concentrated on lower half of body in adults (spots may fade or disappear with growth), or small spots overall in juveniles; all fins dark grey. Attains 60 cm TL.



Canthidermis maculata, 38 cm TL, dorsal-fin spine broken. Source: SFSA

DISTRIBUTION Circumglobal in tropical to warm-temperate seas, including Red Sea, but not known from Mediterranean Sea; reaches south to South Africa and Réunion in WIO.

REMARKS Epipelagic in shallow and offshore coastal waters, to ~110 m deep. Distinct pairing observed. Feeds on zooplankton.

GENUS *Melichthys* Swainson 1839

Mouth terminal; teeth chisel-like and tapering, with notched ends, except for median pair which are truncate; enlarged bony scales behind gill opening; groove before eye and below nostrils; cheeks entirely scaly. Body dark brown to black. Transformation from prejuveniles occurs at 9–14 cm SL. Three species, all in WIO.

KEY TO SPECIES

- | | |
|----|--|
| 1a | Soft dorsal fin and anal fin pale with prominent black margins; caudal fin also pale (white at base and otherwise pink in live fish) with narrow black upper and lower edges <i>M. vidua</i> |
| 1b | Soft dorsal fin and anal fin black, with longitudinal pale blue or white line at base; caudal fin also mostly black 2 |
| 2a | Caudal fin deeply emarginate to lunate, upper and lower lobes produced (except in juveniles); scale rows 20–25 from corner of mouth to lower end of gill opening <i>M. niger</i> |
| 2b | Caudal fin slightly rounded to slightly emarginate; scale rows 27–31 from corner of mouth to lower end of gill opening <i>M. indicus</i> |

Melichthys indicus Randall & Klauswitz 1973

Indian triggerfish

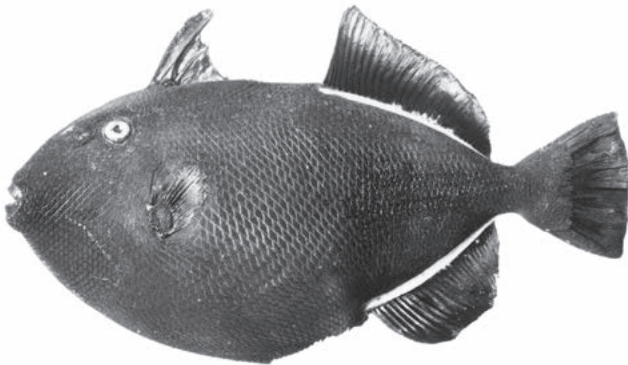
PLATES 106 & 107

Melichthys ringens (non Osbeck 1765): SFSA No. 1159*.

Melichthys indicus Randall & Klauswitz 1973: 60, 64, Figs. 4–6 (Similan Is., Thailand, Andaman Sea); SSF No. 263.7*; Winterbottom *et al.* 1989; Randall 1995*; Kuitert 1998*; Fricke 1999; Manilo & Bogorodsky 2003; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins 3 spines, 30–35 rays; anal fin 27–30 rays; pectoral fins 14–16 rays; caudal fin truncate to slightly rounded. LSS 60–70; scale rows 27–31 from corner of mouth to lower end of gill opening. Longitudinal ridges on peduncle not prominent.

Body black, with 6 thin greenish lines radiating dorsally and anteriorly from eyes; narrow bluish white band at bases of soft dorsal fin and anal fin; caudal fin with narrow white margin. Attains 27 cm TL.



Melichthys indicus, 21 cm SL (Kenya). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Oman, Red Sea to South Africa (Aliwal Shoal), Madagascar, Aldabra, Seychelles, Réunion, Mauritius, Chagos, Maldives and Sri Lanka; elsewhere to Thailand and Indonesia (Sumatra, Java and Bali).

REMARKS Found in coral-rich areas of seaward slopes; digs holes for shelter below coral bases. Feeds on algae, sponges and small invertebrates.

Melichthys niger (Bloch 1786)

Black triggerfish

PLATE 107

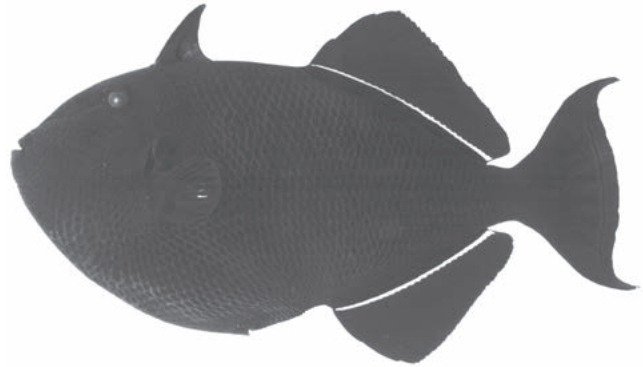
Balistes niger Bloch 1786: 27, Pl. 152, Fig. 2 [no locality given: possibly China].

Melichthys bispinosus Gilbert 1890: 125 (Clarión I. and Socorro I., Revillagigedo Archipelago, eastern Pacific).

Melichthys niger: SSF No. 263.8*; Winterbottom *et al.* 1989; Kuitert 1998*; Fricke 1999; Manilo & Bogorodsky 2003; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins 3 spines, 30–35 rays; anal fin 28–31 rays; pectoral fins 15–17 rays. LSS 57–66; scale rows 20–25 from corner of mouth to lower end of gill opening. Longitudinal ridges on peduncle prominent.

Body dark blue-green, with longitudinal black lines; pale blue narrow band at bases of soft dorsal fin and anal fin; blue lines radiating dorsally and anteriorly from eyes. Attains 35 cm TL.



Melichthys niger, 27 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Circumglobal in tropical to subtropical seas. WIO: East Africa to South Africa (KwaZulu-Natal), Comoros, Aldabra, Seychelles, Mascarenes, Chagos and Maldives.

REMARKS Found on seaward coral reefs, to ~75 m deep; most abundant around oceanic islands. Benthopelagic, typically in small, loose aggregations. Feeds primarily on calcareous algae and zooplankton.

Melichthys vidua (Richardson 1845)

Pinktail triggerfish

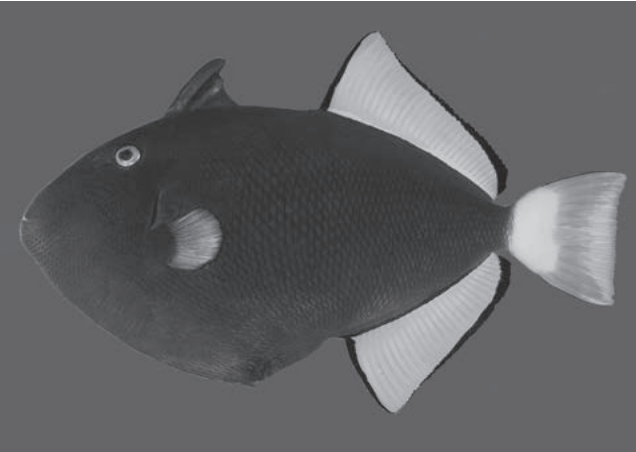
PLATES 106 & 107

Balistes vidua Richardson (ex Solander) 1845: 128, Pl. 59, Figs. 9–12 (Tahiti, Society Is.).

Melichthys vidua: SSF No. 263.9*; Fricke 1999; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins 3 spines, 31–35 rays; anal fin 28–31 rays; pectoral fins 14–16 rays. LSS 62–74; scale rows 26–32 from corner of mouth to lower end of gill opening. Longitudinal ridges on peduncle prominent.

Body of adults uniformly dark brown, soft dorsal fin and anal fin with black margins; juveniles paler, with dark lines radiating from eyes, and 3 or 4 longitudinal dark lines on soft dorsal fin and anal fin (no black margins). Attains 40 cm TL.



Melichthys vidua, 18 cm SL (Palau). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO (rare): Mozambique, South Africa (KwaZulu-Natal) and Réunion; elsewhere to Indonesia, southern Japan, southern Great Barrier Reef, New Caledonia, Tonga, Society Is., Tuamotu Is., Line Is., Marquesas Is. and Hawaii.

REMARKS Found on coral-rich seaward reefs, to at least 60 m deep. Benthopelagic, in small, loose aggregations. Feeds on algae, detritus, sponges, crustaceans, octopus and fishes.

GENUS *Odonus* Gistel 1848

Mouth slightly supraterminal, lower jaw jutting; distinctive red teeth, 2 canine-like lateral teeth in upper jaw; enlarged bony scales behind gill opening; deep groove before eye and below nostrils. One species.

Odonus niger (Rüppell 1836)

Redfang triggerfish

PLATE 108

Xenodon (Balistes) niger Rüppell 1836: 53, Pl. 14, Fig. 3 (Jeddah, Saudi Arabia, Red Sea).

Erythrodon niger: Rüppell 1852.

Balistes erythrodon Günther 1870: 228 (Jeddah, Saudi Arabia, Red Sea)
[replacement name for *Xenodon niger* Rüppell, secondarily preoccupied by *Balistes niger* Park 1797].

Odonus niger: SSF No. 263.10*; Winterbottom *et al.* 1989; Kuitert 1998*; Fricke 1999; Manilo & Bogorodsky 2003; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Diagnosis as for genus. Dorsal fins with 3 spines, 33–36 rays; anal fin 28–31 rays; pectoral fins 14 or 15 rays; caudal fin extremely lunate, with upper and lower lobes greatly produced into filaments. LSS 29–34.

Head and body bluish black; teeth red. Attains 50 cm TL (including long caudal-fin lobes).



Odonus niger, 10 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (Port Alfred, Eastern Cape), Mozambique Channel, Madagascar, Réunion, Mauritius and Maldives; elsewhere to Indonesia, southern Japan, Marianas Is., southern Great Barrier Reef, Tonga, Society Is. and Marquesas Is.

REMARKS Found on current-swept, seaward coral reefs, to ~40 m deep; frequently forms aggregations while feeding on zooplankton.

GENUS *Pseudobalistes* Bleeker 1866

Mouth terminal; teeth uneven, notched; cheek naked anteriorly, posteriorly covered with scales smaller than those on body; enlarged bony scales behind gill opening; groove before eye and below nostrils; soft dorsal fin and anal fin rounded or elevated anteriorly. Three species, 2 in WIO.

KEY TO SPECIES

- | | | |
|----|--|---------------------------|
| 1a | Five or 6 longitudinal scale ridges on peduncle; soft dorsal fin and anal fin rounded, not elevated anteriorly | <i>P. flavimarginatus</i> |
| 1b | No scale ridges on peduncle; soft dorsal fin and anal fin elevated anteriorly | <i>P. fuscus</i> |

Pseudobalistes flavimarginatus (Rüppell 1829)

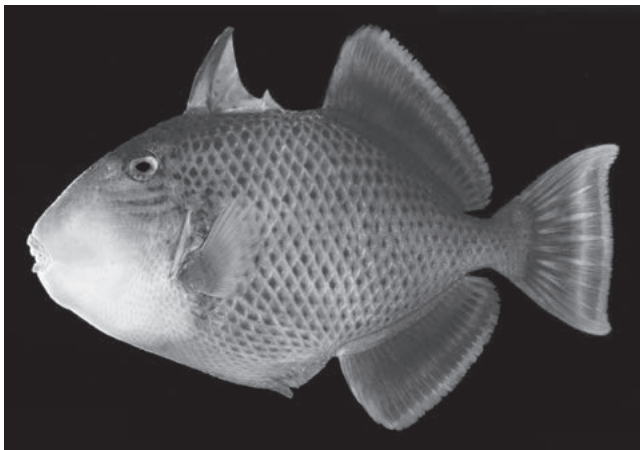
Yellowmargin triggerfish PLATES 107 & 108

Balistes flavimarginatus Rüppell 1829: 33 (Jeddah, Saudi Arabia, Red Sea).

Pseudobalistes flavimarginatus: SFSA No. 1167* [as *flavomarginatus*]; Matsuura 1980*; SSF No. 263.11*; Kuiter 1998*; Fricke 1999; Manilo & Bogorodsky 2003; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins with 3 spines, 24–27 rays; anal fin 23–25 rays; pectoral fins 15 or 16 rays; caudal fin rounded in young, lunate in adults. LSS 28–33; broad region around mouth naked. Three to 4 shallow horizontal grooves on cheek above level of mouth.

Body pale greyish yellow, scale centres darker yellowish grey; anterior and ventral part of head orange-yellow; margins of soft dorsal fin, anal fin and caudal fin orange-yellow. Attains 60 cm TL.



Pseudobalistes flavimarginatus, 21 cm SL (Red Sea).

© JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (KwaZulu-Natal), Mozambique Channel, Madagascar, Réunion, Mauritius and Maldives; elsewhere to Indonesia, southern Japan, Marshall Is., Australia, southern Great Barrier Reef, New Caledonia and Tuamotu Is.

REMARKS Solitary; found on coral reefs, to ~50 m deep; nest-guarding females are aggressive.

Pseudobalistes fuscus (Bloch & Schneider 1801)

Yellowspotted triggerfish PLATES 108 & 110

Balistes fuscus Bloch & Schneider 1801: 471 [no locality given: Indian Ocean].

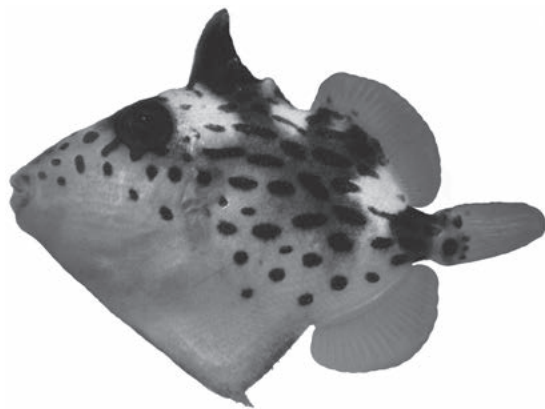
Balistes reticulatus Hollard 1854: 312 (Tongatapu [Tonga-Tabou], Tonga; Réunion, Mascarenes).

Xanthichthys fuscus: Fowler 1949.

Pseudobalistes fuscus: SSF No. 263.12*; Kuiter 1998*; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins with 3 spines, 25–27 rays; anal fin 19–24 rays; pectoral fins 14–16 rays. LSS 35–46; broad region around mouth without scales; lower cheek (between mouth and pectoral-fin base) with 4–6 shallow horizontal grooves. Soft dorsal fin and anal fin both elevated anteriorly; caudal fin rounded in young, double emarginate with produced upper and lower rays in adults.

Body deep blue to greyish blue, with small yellow spots, often forming irregular network; margins of soft dorsal fin, anal fin and caudal fin pale blue. Attains 55 cm TL.



Pseudobalistes fuscus, small juvenile (South Africa). © A Wright

DISTRIBUTION Indo-Pacific. WIO: Red Sea to South Africa (KwaZulu-Natal), Madagascar, Seychelles, Mascarenes, St Brandon Shoals and Maldives; elsewhere to Indonesia, southern Japan, Marshall Is., Australia, New Caledonia, Tonga and Society Is.

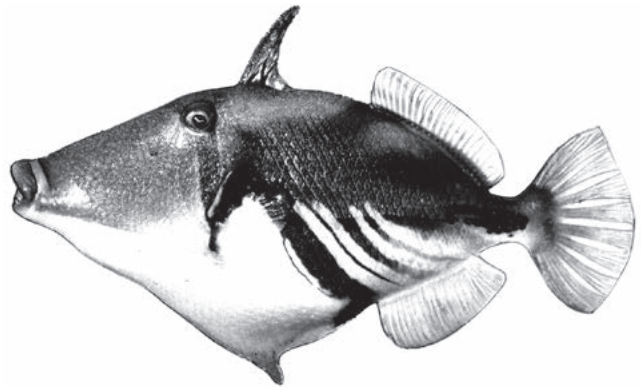
REMARKS Solitary; found on coral reefs, to ~50 m deep. Nest-guarding females are aggressive. Feeds on sea urchins, crabs and other crustaceans, molluscs and tunicates.

GENUS *Rhinecanthus* Swainson 1839

No groove before eyes and below nostrils; peduncle much constricted, and with 3–5 longitudinal rows of small forward-projecting spines. Seven species, 4 in WIO.

KEY TO SPECIES

- 1a Peduncle with 4 or 5 longitudinal rows of small forward-projecting spines *R. rectangulus*
- 1b Peduncle with 3 longitudinal rows of small forward-projecting spines 2
- 2a Semicircular white band on rear of body, and wide black bar on peduncle *R. cinereus*
- 2b No semicircular white band on rear of body, and no black bar on peduncle 3
- 3a Lowermost row of small forward-projecting spines on peduncle much shorter than upper 2 rows; large black area with radiating black bands on upper part of body from gill opening to end of soft dorsal-fin base *R. aculeatus*
- 3b Uppermost row of small forward-projecting spines on peduncle much shorter than lower 2 rows; no large black area on upper body *R. assasi*



Rhinecanthus aculeatus, 18 cm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Algoa Bay), Mozambique Channel, Madagascar, Seychelles, Mascarenes and Maldives; not known from Red Sea; elsewhere to Indonesia, southern Japan, Australia, Lord Howe I., Tuamotu Is., Pitcairn Is. and Hawaii.

REMARKS Common in subtidal reef flats and shallow protected lagoons, to ~10 m deep. A popular marine aquarium fish.

Rhinecanthus aculeatus (Linnaeus 1758)

White-banded triggerfish

PLATE 109

Balistes aculeatus Linnaeus 1758: 328 [Indo-Pacific].

Rhinecanthus aculeatus: SSF No. 263.13*; Kuitert 1998*;

Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009;

Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins with 3 spines, 23–26 rays; anal fin 21 or 22 rays; pectoral fins 12–14 rays. LSS 32–39. Peduncle with 3 longitudinal rows of small forward-projecting spines, upper 2 rows extending to below rear part of soft dorsal fin, and lowermost row short and restricted to peduncle.

Body mostly pale brown dorsally, and white ventrally, with intricate patterning; large black area on upper part of body, with several narrow black bands extending over white area to anal-fin base, and 2 broad diffuse black bands running upward to 2nd dorsal fin; dusky band edged by thin blue lines extending from eye to pectoral-fin base, preceded by another curved narrow blue line from eye to pectoral-fin base; blue band encircling upper lip; oblique narrow orange band from lips to lower pectoral-fin bases; spines on peduncle black, set within pale blue elliptical area. Attains 25 cm TL.

Rhinecanthus assasi (Fabricius 1775)

Picasso triggerfish

PLATE 109

Balistes assasi Fabricius in Niebuhr (ex Forsskål) 1775: 75 (Jeddah, Saudi Arabia, Red Sea).

Balistes aculeatus (*non* Linnaeus 1758): Rüppell 1829*.

Balistes (*Balistapus*) *assasi*: Tortonese 1937.

Rhinecanthus assasi: Randall 1995*; Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins with 3 spines, 25–27 rays; anal fin 22–24 rays; pectoral fins 15 rays. LSS 36–43. Peduncle with 3 longitudinal rows of small forward-projecting spines, rows extending to below rear part of soft dorsal fin, but uppermost row shorter than lower 2 rows.

Body pale brown dorsally, white ventrally; narrowing blue-edged, dark brown bar from eye to gill opening, preceded by yellow band and blue line; 4 narrow blue bands alternating with 3 black bands across interorbital space; blue line adjacent

to upper lip, and immediately behind this a dark brown line extends to lower pectoral-fin base; anus in large black spot surrounded by orange; spines on peduncle black, set within elliptical white area. Attains 30 cm TL.



Rhinecanthus assasi, 15 cm SL (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Red Sea, Gulf of Oman and Persian/Arabian Gulf.

Rhinecanthus cinereus (Bonnaterre 1788)

Ashen triggerfish

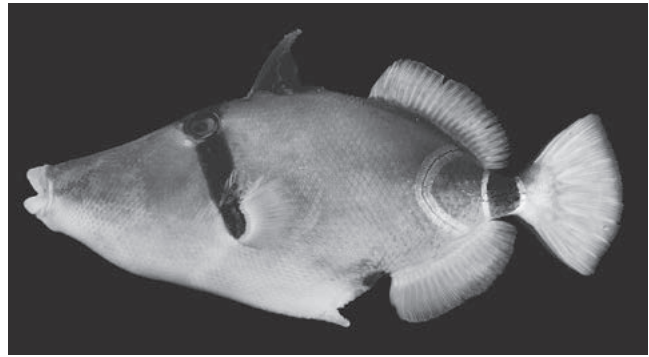
PLATE 109

Balistes cinereus Bonnaterre (ex Sonnerat) 1788: 20, Pl. 86, Fig. 353 (Mauritius, Mascarenes).

Rhinecanthus cinereus: Randall & Steene 1983*; Anderson *et al.* 1998; Kuitert 1998*; Fricke 1999; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins with 3 spines, 24 or 25 rays; anal fin 21 rays; pectoral fins 14 or 15 rays. LSS ~42. Peduncle with 3 longitudinal rows of small forward-projecting spines, upper 2 rows extending to below rear part of soft dorsal fin, and lowermost row short and restricted to peduncle.

Body pale brown dorsally, white ventrally; narrowing blue-edged, black-brown bar extends from eye to gill opening, appears edged by short orange line at pectoral-fin base; semicircular bluish white double band on body between rear parts of soft dorsal fin and anal fin; broad black bar on peduncle, edged with bluish white anteriorly and posteriorly; caudal fin yellow anteriorly, pale posteriorly. Attains 24 cm TL.



Rhinecanthus cinereus, 17 cm SL (Mauritius). © JE Randall, Bishop Museum

DISTRIBUTION Indian Ocean. WIO: South Africa (Sodwana Bay), Madagascar, Comoros, Seychelles, Réunion, Mauritius and Maldives; elsewhere, Andaman Sea.

Rhinecanthus rectangulus (Bloch & Schneider 1801)

Wedge-tail triggerfish

PLATES 109 & 110

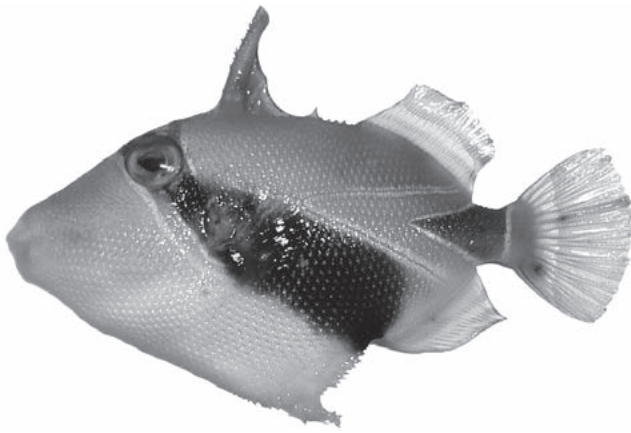
Balistes rectangulus Bloch & Schneider 1801: 465 (Mauritius, Mascarenes).

Balistes echarpe Anonymous [Lacepède] 1798: 682 (Mauritius, Mascarenes); Whitley 1959.

Rhinecanthus rectangulus: SSF No. 263.14*; Kuitert 1998*; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins with 3 spines, 22–24 rays; anal fin 20 or 21 rays; pectoral fins 13–15 rays. LSS 33–39. Peduncle with 4 or (rarely) 5 longitudinal rows of small forward-projecting spines, rows extending to below rear part of soft dorsal fin.

Body pale brown dorsally, white ventrally; black band from eye to gill opening and pectoral-fin base, continuing as broad black swathe to anal-fin base, this band edged posterodorsally with narrow golden line, which bifurcates below rear edge of 1st dorsal fin, lower line extending to rear part of anal-fin base, and upper line running to rear part of 2nd dorsal-fin base; broad blue band across interorbital space, containing 3 black lines; 3 blue lines extending downward from eye to pectoral region, posterior 2 or 3 lines forming edges of broad black band; narrow blue line on upper lip; peduncle with triangular black area, edged with narrow golden lines; narrow red line at pectoral-fin base. Attains 25 cm TL.



Rhinecanthus rectangulus, ~5 cm SL (Aldabra). A Northrop © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (Eastern Cape), Mozambique Channel, Madagascar, Seychelles, Aldabra, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, southern Japan, Australia, Lord Howe I., Kermadec Is., Marquesas Is. and Hawaii.

REMARKS Found in shallow outer reefs exposed to current surges, to ~20 m deep.

GENUS *Sufflamen* Jordan 1916

Mouth terminal; teeth uneven, notched; enlarged bony scales behind gill opening; deep groove before eye and below nostrils; many longitudinal rows of tubercles on peduncle and rear part of body. Five species, 4 in WIO.

KEY TO SPECIES

- | | | |
|----|---|------------------------------|
| 1a | Two vertical curved black to yellow bands around gill opening; anterior band from above and through eye to lower part of pectoral-fin base, and posterior band from upper part of pectoral-fin base to below middle of 1st dorsal fin | <i>S. bursa</i> |
| 1b | No vertical curved black bands around gill opening | 2 |
| 2a | Caudal fin uniformly dark | <i>S. fraenatum</i> |
| 2b | Caudal fin yellowish, with broad white rear margin, and narrower white upper and lower margins | 3 |
| 3a | Rear half of peduncle with broad white band | <i>S. albicaudatum</i> |
| 3b | Peduncle dark and without white band | <i>S. chrysopteron</i> |

Sufflamen albicaudatum (Rüppell 1829)

Bluethroat triggerfish

PLATES 109 & 110

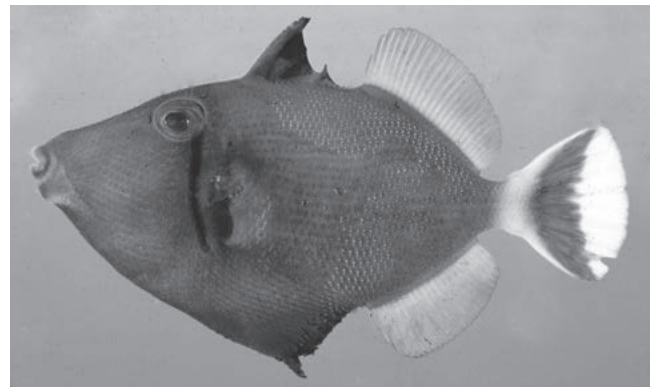
Balistes albicaudatus Rüppell 1829: 33 (Massawa, Eritrea, Red Sea).

Balistes niger (non Park 1797): Günther 1870 [in part].

Sufflamen albicaudatum: Goren & Dor 1994; Wright 2000*.

Dorsal fins with 3 spines, 26–29 rays; anal fin 23–26 rays; pectoral fin 13 or 14 rays. LSS 46–51; scales on rear part of body with small spines, forming longitudinal rows extending forward to below middle of 2nd dorsal fin.

Body brown; lower part of head and region around mouth purplish blue; vertical stripe extending from rear edge of eye to lower pectoral-fin base, varying in colour from pale yellow to dark brown; 2nd dorsal fin and anal fin yellowish near base; caudal fin dark brown or yellowish, prominently edged with white on all sides, and peduncle encircled with white band, which continues to edges of caudal fin. Attains 18 cm TL.



Sufflamen albicaudatum, 5 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Red Sea (common) and possibly to Gulf of Oman; possibly also South Africa (one specimen from Aliwal Shoal).

REMARKS Might be best regarded as a subspecies of *S. chrysopteron* (Randall 1995). Solitary, on coral reefs; known at 2–29 m.

Sufflamen bursa (Bloch & Schneider 1801)

Boomerang triggerfish

PLATE 109

Balistes bursa Bloch & Schneider (ex Sonnerat & Bonnaterre) 1801: 476 (Mauritius, Mascarenes).

Sufflamen bursa: Masuda *et al.* 1975*; SSF No. 263.15*; Winterbottom *et al.* 1989; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013; Matsuura 2014.

Dorsal fins with 3 spines, 27–30 rays; anal fin 25–27 rays; pectoral fins 13 or 14 rays. LSS 43–50. Median part of each scale on rear part of body with small spine, sharp posteriorly and weak anteriorly, forming elevated, longitudinal ridges on body extending forward to below middle of spinous dorsal fin.

Body pale brown; 2 vertical, curved, yellowish brown to greenish bands on body, anterior band from above and through eye to in front of pectoral-fin base, and posterior band from below middle of 1st dorsal fin to pectoral-fin base; distinct narrow blue-white line from near corner of mouth to anal-fin origin, and throat and belly below this line paler than rest of body; ventral midline brown from pelvic-fin rudiment to some point along anal-fin base. Attains 25 cm TL.



Sufflamen bursa, 17 cm TL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay), Mozambique Channel, Madagascar, Comoros, Aldabra, Seychelles, Mascarenes and Maldives; elsewhere to Indonesia, southern Japan, Micronesia, Great Barrier Reef, New Caledonia, Marquesas Is., Rapa Iti, Pitcairn Is. and Hawaii.

REMARKS Often inhabits the seaward side of reefs, below surge zone, to along drop-offs; known at 3–90 m.

Sufflamen chrysopterus (Bloch & Schneider 1801)

Flagtail triggerfish

PLATES 109, 110 & 111

Balistes niger Park 1797: 37 [preoccupied by *Balistes niger* Bloch 1786].

Balistes chrysopterus Bloch & Schneider 1801: 466 (Coromandel coast, India).

Balistes armatus Bloch & Schneider 1801: 469 (Tranquebar, India).

Balistes subarmatus Gray 1831: Pl. 90, Fig. 3 [Indian Ocean].

Sufflamen chrysopterus: SSF No. 263.16*; Winterbottom *et al.* 1989

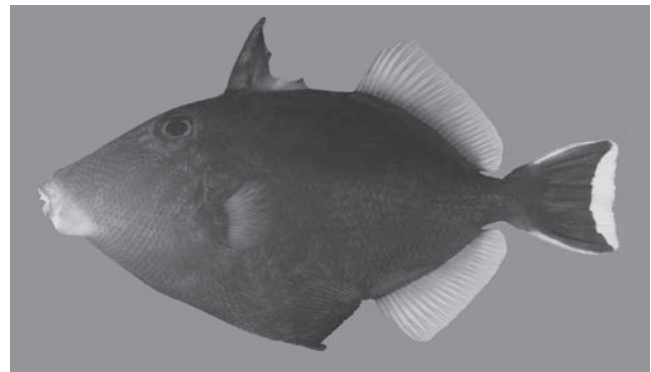
[as *chrysopterus*]; Randall 1995*; Manilo & Bogorodsky 2003; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fins with 3 spines, 26–28 rays; anal fin 23–26 rays; pectoral fins 12–14 rays. LSS 41–47; scales of rear part of body with small spines, forming longitudinal rows extending forward of caudal-fin base to below middle of 2nd dorsal fin.

Body dark brown; throat and belly bluish purple; short transverse white band on chin; vertical band varying in colour, from yellow to pale brown, extending from back edge of eye to lower pectoral-fin base; caudal fin dark brown with broad white rear margin and narrow upper and lower white margins. Attains 30 cm TL.



Sufflamen chrysopterus, juvenile (South Africa). AD Connell © NRF-SAIAB



Sufflamen chrysopterus, 13 cm SL (Maldives). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (Aliwal Shoal, juveniles to eastern Cape), Mozambique Channel, Madagascar, Aldabra, Seychelles, Mascarenes, St Brandon Shoals, Chagos, Maldives and India; elsewhere to Micronesia, southern Japan, Australia, New Caledonia, Lord Howe I., Tonga and Samoa.

REMARKS Usually solitary, in shallow lagoons and sheltered back reefs, to ~20 m deep.

Sufflamen fraenatum (Latreille 1804)

Bridled triggerfish

PLATES 109 & 111

Balistes fraenatus Latreille 1804: 74 [no locality given].*Balistes capistratus* Shaw 1804: 417 ('Indian Seas').*Balistes mitis* Bennett 1832: 169 (Mauritius, Mascarenes).*Balistes frenatus*: Richardson 1844*.*Balistes (Balistapus) frenatus*: Bleeker 1865*.*Pachynathus capistratum*: Jordan & Fowler 1902.*Sufflamen fraenatus*: SSF No. 263.17*; Kuiter 1998*; Fricke 1999.*Sufflamen fraenatum*: Winterbottom *et al.* 1989; Heemstra *et al.* 2004; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins with 3 spines, 27–31 rays; anal fin 24–28 rays; pectoral fins 14 or 15 rays. LSS 43–54; scales on rear part of body with spines, forming longitudinal rows extending forward to below 2nd dorsal-fin origin.

Body dark brown; males with rosy white band from corner of mouth to below rear edge of eyes, meeting with the opposite band through transverse band on chin (no bands in females). Attains 38 cm TL.

*Sufflamen fraenatum*, 21 cm TL (Tanzania). M Mwale © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: southern Red Sea to South Africa (KwaZulu-Natal), Madagascar, Seychelles, Mascarenes, St Brandon Shoals and Maldives; elsewhere to southern Japan, Australia, Lord Howe I., Tuamotu Is., Marquesas Is. and Hawaii.

REMARKS Benthopelagic, on seaward rocky reefs, over sand and rubble patches; known from 8–186 m. Feeds on fishes, molluscs, polychaetes, tunicates, crustaceans, algae and detritus.

GENUS *Xanthichthys* Kaup 1856

Cheek with 3–6 longitudinal, somewhat diagonal grooves; no enlarged bony scales behind gill opening; third spine of 1st dorsal fin minute, barely visible. Four species, 3 in WIO.

KEY TO SPECIES

- 1a Cheek with 3 prominent, slightly oblique, dark brown grooves, extending from just behind and below corners of mouth nearly to gill opening; upper half of body with longitudinal dark brown lines *X. lineopunctatus*
- 1b Cheek with 5 or 6 slightly oblique grooves; no dark longitudinal lines on body 2
- 2a Body scales with prominent median elevation, forming longitudinal ridges; body brownish grey with bluish or lavender cast *X. auromarginatus*
- 2b Body scales each with median tubercle, forming slight longitudinal ridges; irregular longitudinal blue line on body from pectoral-fin axil to upper side of peduncle; lateral bony extension below pectoral fins (specimens <16 cm SL) *X. caeruleolineatus*

Xanthichthys auromarginatus (Bennett 1832)

Gilded triggerfish

PLATES 109 & 111

Balistes auromarginatus Bennett 1832: 168 (Mauritius, Mascarenes).*Balistes calolepis* Hollard in Guichenot 1853: 183 (Mauritius, Mascarenes).*Xanthichthys auromarginatus*: Winterbottom *et al.* 1989; SSF No. 263 [1995]; Kuiter 1998*; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins with 3 spines, 27–29 rays; anal fin 25–27 rays; pectoral fins 12–14 rays. LSS 42–47.

Body brownish grey with bluish tinge; each scale with pale spot; margins of 2nd dorsal fin, anal fin and caudal fin dark brown in females, and bright yellow in males; males with large bright blue patch on head below level of mouth. Attains 21 cm TL.

*Xanthichthys auromarginatus*, 18 cm SL (South Africa).

PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: South Africa (KwaZulu-Natal), Réunion, Mauritius, Chagos and Maldives; elsewhere to Cocos (Keeling) Is., Christmas I., Micronesia, Ryukyu Is., Great Barrier Reef, Australia, New Caledonia, French Polynesia and Hawaii.

REMARKS Often found in upper margins of current-swept seaward drop-offs and on ledges, at 8–150 m.

Xanthichthys caeruleolineatus

Randall, Matsuura & Zama 1978

Blueline triggerfish

PLATE 111

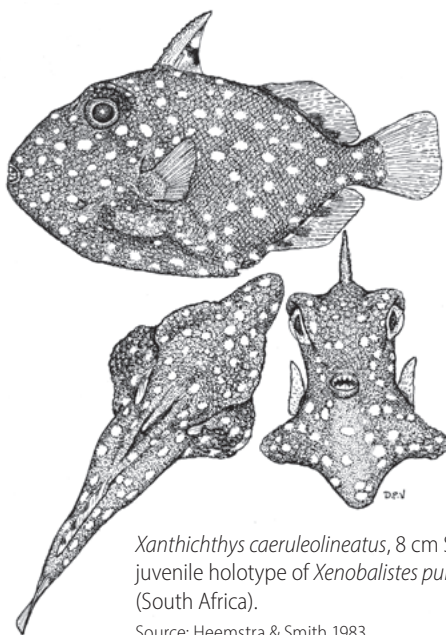
Xanthichthys lineopunctatus (non Hollard 1854): Gushiken 1973*.

Xanthichthys caeruleolineatus Randall, Matsuura & Zama 1978: 701, Figs. 2d, 7 (Manihi Atoll, Tuamotu Archipelago).

Xenobalistes punctatus Heemstra & Smith 1983: 1, Figs. 1–3 (Van Stadens River mouth, Eastern Cape, South Africa); SSF No. 263.19*; Matsuura 2014.

Dorsal fins 3 spines, 26–28 rays; anal fin 23–25 rays; pectoral fins 12–14 rays. LSS 40–48. Cheek with 6 diagonal grooves separating the scale rows.

Body olive-brown dorsally, each scale with vertically elongate pale blue spot, and lower half of body pale grey: these two areas separated by irregular thin longitudinal line from pectoral-fin axil to upper peduncle in adults; body dark brown with silvery white or pale yellow spots in juveniles and young. Attains 35 cm TL.



Xanthichthys caeruleolineatus, 8 cm SL, juvenile holotype of *Xenobalistes punctatus* (South Africa).

Source: Heemstra & Smith 1983



Xanthichthys caeruleolineatus, 21 cm SL (South Africa).

PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: South Africa (Algoa Bay), Agaléga Is., St Brandon Shoals, Chagos and Maldives; elsewhere to Cocos (Keeling) Is., Indonesia, southern Japan, Micronesia, Coral Sea, Australia, Samoa, Tuamotu Is., Hawaii and Galápagos Is.

REMARKS Occurs on deep seaward reefs, usually at 50–200 m.

Xanthichthys lineopunctatus (Hollard 1854)

Striped triggerfish

PLATE 111

Balistes lineopunctatus Hollard 1854: 65 (Réunion, Mascarenes).

Xanthichthys lineopunctatus: SSF No. 263.18*; Fricke *et al.* 2009; Matsuura 2014.

Dorsal fins 3 spines, 27–30 rays; anal fin 25–27 rays; pectoral fins 13 or 14 rays. LSS 44–50.

Body brownish grey, paler ventrally: upper half of body with longitudinal dark brown lines, lower half with dark brown spots; dark brown grooves on cheek, edged with pale blue. Attains 20 cm TL.



Xanthichthys lineopunctatus, 17 cm SL (South Africa).

PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific (anti-equatorial). WIO: Kenya to South Africa (Eastern Cape), Comoros, Aldabra, Réunion, Mauritius and southwestern India; elsewhere to Philippines, Ryukyu Is., New Guinea and northern Australia.

REMARKS Found on offshore reefs, often well above the bottom.

GLOSSARY

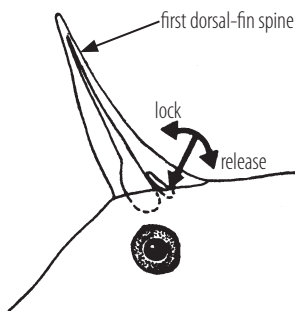
tympanum – an area of enlarged scales behind the gill opening of some Balistidae that can be vibrated to produce sound.

FAMILY MONACANTHIDAE

Filefishes

J Barry Hutchins

Tiny to medium-sized (~3 cm to 1 m TL) with usually oblong to moderately deep and highly compressed body, with smooth to rough shagreen-like skin. Mouth small, terminal; teeth pointed and not fused together. Two separate dorsal fins: 1st dorsal fin over eyes, comprising prominent long spine which can be locked in upright position by much smaller second spine, but locking spine absent in *Anacanthus*); 2nd dorsal fin long-based, with 24–51 unbranched rays; anal fin similar to soft-rayed dorsal fin; pelvic fins absent or represented by bony rudiment of 1–3 pairs of scales encasing rear of pelvis and projecting through skin, and pelvis often capable of vertical movement to spread a ventral abdominal flap.



First dorsal-fin spine erectile and can be locked in position by the tiny second spine.

Peduncle entirely naked or with 2 pairs of spines on each side and/or a dense patch of bristles, and a few species also with stout elongate spines or bristles on midsides of body. Gill opening a short vertical to oblique slit in front of or directly above pectoral-fin base. Colouration often drab brown or greenish brown, but frequently with patterning, although

some species rather brightly coloured and uniquely patterned, especially the males. Body depth is measured between the origins of the soft-rayed dorsal fin and anal fin.

Adults occur in shallow seaweed beds and on coral and rocky reefs, to >250 m deep. Feed on a wide variety of benthic invertebrates, but also on corals or zooplankton. Many of the larger species are good to eat, although mature males of some may develop a rank flavour.

About 30 genera and at least 100 species worldwide; 14 genera and 31 species in WIO.

KEY TO GENERA

- 1a Body extremely elongate, strongly compressed and blade-like; fleshy barbel on lower jaw *Anacanthus*
- 1b Body not extremely elongate; no fleshy barbel on lower jaw 2
- 2a First dorsal-fin spine not fully erectile but enveloped in loose flap of skin attached to body; mimics colour pattern of *Canthigaster* pufferfishes *Paraluteres*
- 2b First dorsal-fin spine fully erectile and not enveloped in loose flap of skin; colour pattern never mimics *Canthigaster* pufferfishes 3
- 3a Snout tube-like and turning upwards at mouth; colour in life green to bluish green, with numerous yellow-orange spots on head and body *Oxymonacanthus*
- 3b Snout not tube-like; colour not as above 4
- 4a Soft-rayed dorsal fin and anal fin each with ≥ 43 rays 5
- 4b Soft-rayed dorsal fin and anal fin each with 22–39 rays 6
- 5a Origin of first dorsal-fin spine well in front of eyes *Pseudalutarius*
- 5b Origin of first dorsal-fin spine over eyes *Aluteres*
- 6a No pelvic-fin rudiment; body of adults relatively circular in lateral profile and abdomen inflatable; gill opening directly above pectoral-fin base *Brachaluteres*
- 6b Pelvic-fin rudiment obvious, near rear end of pelvis (may be difficult to see in old specimens); body of adults not circular in lateral profile, and abdomen not inflatable; gill opening in front of pectoral-fin base 7



Continued...

KEY TO GENERA

- 7a Pelvic-fin rudiment fused to rear end of pelvis; branchiostegal rays 6 8
- 7b Pelvic-fin rudiment movably articulated with rear end of pelvis; branchiostegal rays 5 10

- 8a Dorsal fin 26–29 rays; anal fin 22–25 rays *Amanses*
- 8b Dorsal fin 31–39 rays; anal fin 28–36 rays 9

- 9a Soft-rayed dorsal fin and anal fin evenly rounded; 1st dorsal-fin spine with row of minute retrorse barbs along each posterolateral edge, and spine fits into deep groove on back when depressed; paired spines or patch of bristles on peduncle present or absent *Cantherhines*
- 9b Soft-rayed dorsal fin and anal fin elevated anteriorly in adults, most prominently in males; 1st dorsal-fin spine with row of laterally directed barbs along each lateral edge, and groove for spine shallow or absent; no paired spines or patch of bristles on peduncle *Thamnaconus*

- 10a Pelvic-fin rudiment and 1st dorsal-fin spine robust, with relatively large prominent barbs; peduncle deep, its length 1.8–3.8 into its depth; caudal fin rounded, without filamentous rays *Pervagor*
- 10b Pelvic-fin rudiment and 1st dorsal-fin spine slender, with small to moderate barbs; peduncle slender, its length usually ≤ 1.6 into its depth; caudal-fin margin rounded, concave, truncate or diamond-shaped, and some with filamentous rays 11

- 11a Rear margin of ventral abdominal flap usually concave, and pelvic-fin rudiment generally extending past rear edge of flap; scales on midsides of body and peduncle of males without bristles *Paramonacanthus*
- 11b Rear margin of ventral abdominal flap usually convex, and pelvic-fin rudiment not extending past flap; scales on midsides of body and/or peduncle of males usually with short bristles 12

- 12a Anal fin 30–35 rays; pectoral fins 13 or 14 rays; skin rough, scales on midsides of adults with mushroom-shaped clump of many small spinules fused together at bases *Stephanolepis*
- 12b Anal fin 26–28 rays; pectoral fins 10 or 11 rays; skin velvety to slightly rough, and scales on midbody without fused spinules 13

- 13a Body small and slender, its depth 2.1–3 in SL; maximum size ~5 cm TL *Enigmacanthus*
- 13b Body larger and deep, its depth 1.4–1.6 in SL; maximum size ~11 cm TL *Lalmohania*

GENUS *Aluterus* Cloquet 1816

First dorsal-fin spine over eyes, slender and feeble (usually broken in capture); dorsal fin and anal fin each with ≥ 43 rays; pelvic-fin rudiment inconspicuous (often lost in large specimens). Four species, 2 in WIO.

KEY TO SPECIES

- 1a Caudal fin usually shorter than snout length; peduncle longer than deep; no blue markings on body *A. monoceros*
- 1b Caudal fin usually longer than snout length (some large individuals may have lost part of caudal fin); peduncle deeper than long; body with blue dots and dashes *A. scriptus*

Aluterus monoceros (Linnaeus 1758)

Unicorn filefish

PLATE 113

Balistes monoceros Linnaeus 1758: 327 (Asia; America).

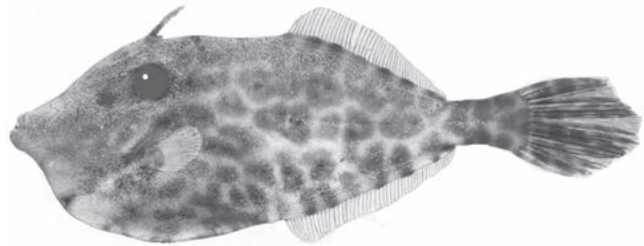
Alutera monoceros: Smith 1949*; Smith & Smith 1966*; Penrith 1969.

Aluterus monoceros: SSF No. 264.1*; Randall 1995*; Manilo &

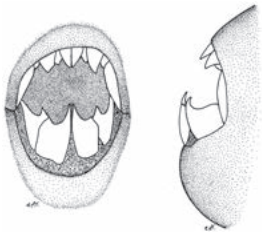
Bogorodsky 2003; Matsuura 2014.

Dorsal fins 2 spines, 45–51 rays; anal fin 47–54 rays; pectoral fins 13 or 14 rays. Snout profile slightly concave in small juveniles, convex in adults; peduncle longer than deep.

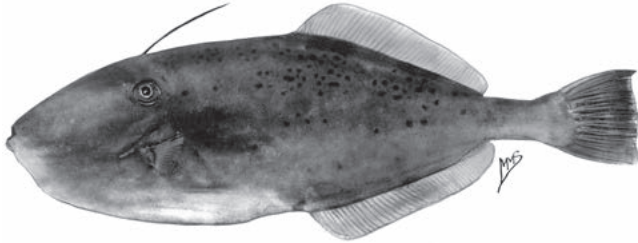
Body sandy brown to grey, often with numerous small brown spots dorsally; soft-rayed dorsal fin and anal fin pale brownish yellow; caudal-fin membrane blackish brown; juveniles usually with reticulate pattern of pale lines enclosing grey blotches and brown spots (pattern may persist in small adults), several round or oval black spots extending onto caudal fin, and black ring sometimes around peduncle. Attains 76 cm TL.



Aluterus monoceros, 12 cm SL, juvenile (South Africa).



Aluterus monoceros, 44 cm TL, specimen and teeth (South Africa). Source: SSF



DISTRIBUTION Circumglobal in tropical to subtropical seas, including South Africa (Saldanha Bay) in southeastern Atlantic, to Mozambique (Beira) in WIO.

REMARKS Generally benthopelagic, but occasionally found in shallow water near drop-offs, to ~50 m deep. Adults solitary or in pairs; juveniles found in floating *Sargassum* seaweed.

Aluterus scriptus (Osbeck 1765)

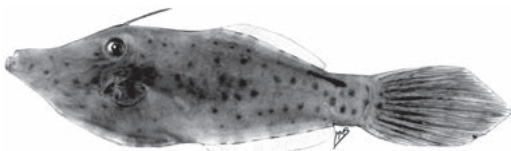
Scrawled filefish

PLATE 113

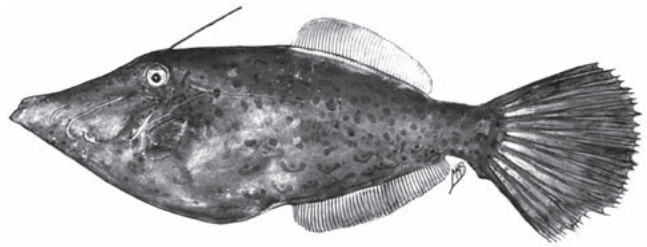
Balistes scriptus Osbeck 1765: 145 (South China Sea, off Vietnam).
Osbeckia scripta: Smith 1949*; Smith & Smith 1963*, 1966*;
 Jones & Kumaran 1980*.
Aluterus scriptus: SSF No. 264.2*; Winterbottom *et al.* 1989*;
 Debelius 1993*, 1998*; Randall & Anderson 1993; Eichler & Lieske
 1994*; Randall 1995*; Field & Field 1998*; Manilo & Bogorodsky 2003;
 Heemstra *et al.* 2004; Field 2005*; Matsuura 2014.

Dorsal fins 2 spines, 43–49 rays; anal fin 46–52 rays; pectoral fins 13–15 rays. Snout profile prominently concave; peduncle deeper than long.

Body pale olive-brown to grey background; sides of head and body with widely spaced bright blue spots and dashes, often intermingled with finer brown to black spotting. Able to change colour quickly. Attains 110 cm TL.



Aluterus scriptus, 19 cm TL, juvenile (Mozambique). Source: SSF



Aluterus scriptus, 51 cm TL (Seychelles). Source: SSF

DISTRIBUTION Circumglobal in tropical to subtropical seas. WIO: Red Sea and Oman to South Africa (juveniles to Knysna), Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives, Lakshadweep, India and Sri Lanka.

REMARKS Usually solitary on reefs, at 3–120 m; juveniles often associate with floating *Sargassum* seaweed. Omnivorous, feeding on algae, seagrasses and a variety of invertebrates, including some jellyfishes.

GENUS *Amanses* Gray 1835

Pelvic-fin rudiment immovable; skin smooth, velvety. One species.

Amanses scopas (Cuvier 1829)

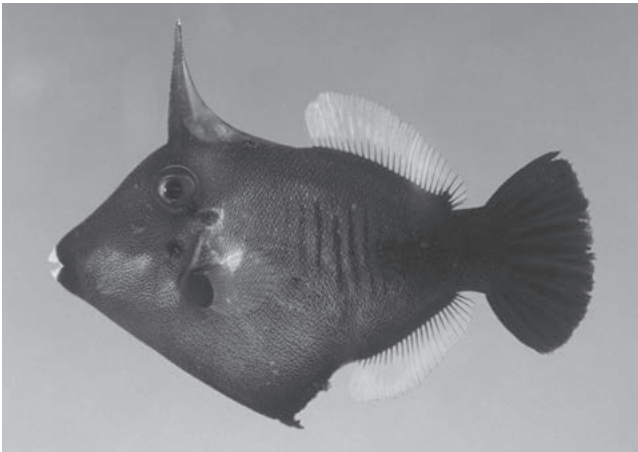
Broom filefish

PLATE 113

Balistes scopas Cuvier in Cuv. & Val. 1829: 373 [Mauritius, Mascarenes].
Amanses scopas: Smith 1955*, 1961*; Smith & Smith 1963*; Randall 1964*;
 SSF No. 264.3*; Allen & Steene 1987*; Debelius 1993*, 1998*; Randall &
 Anderson 1993; Eichler & Lieske 1994*; Manilo & Bogorodsky 2003;
 Matsuura 2014.

Diagnosis as for genus. Dorsal fins 2 spines, 26–29 rays; anal fin 22–25 rays; pectoral fins 13 rays. First dorsal-fin spine over front half of eyes, with minute posteriorly directed barbs along each posterolateral edge, and spine folds into deep groove on back; patch of spiny bristles on midsides: larger and more posteriorly directed in males, more toothbrush-like in females; skin otherwise smooth. Lips not covering teeth when mouth closed.

Body brown or pale brown, but head, lips and caudal fin very dark brown; up to ~12 narrow brown vertical bars on midsides; pectoral fins, soft-rayed dorsal fin and anal fin with yellowish rays and transparent membrane. Attains 20 cm TL.



Amanses scopas, 7 cm SL (Comoros). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Somalia to Mozambique (Maputo), Tanzania (Zanzibar), Madagascar, Comoros, Aldabra, Maldives, Seychelles, Réunion, Mauritius, India and Sri Lanka; elsewhere to Indonesia, Australia and Tuamotu Is.

REMARKS Inhabits clear coastal waters and outer reefs, usually in rich coral areas with rubble patches, at 3–18 m.

GENUS *Anacanthus* Gray 1830

Body and head extremely elongate, compressed and blade-like. Mouth tiny, opening dorsally, lower jaw protruding, and chin with prominent long fleshy barbel. First dorsal-fin spine over rear third of eyes, very short and feeble, without obvious barbs on edges; 2nd spine absent. Some workers have considered this name to be preoccupied by the vernacular 'Les Anacanthes' Cuvier 1829, referring to a dasyatid, but the latter name is unavailable as the type species was never described. One species.

Anacanthus barbatus Gray 1830

Bearded filefish

PLATE 113

Anacanthus barbatus Gray 1830: Pl. 84, Fig. 2 (Singapore); Day 1878*;

Munro 1955*; Hutchins 1977; Matsuura 2014.

Psilocephalus barbatus: Jones & Kumaran 1980*.

Diagnosis as for genus. Dorsal fins 1 spine, 47–52 rays; anal fin 56–62 rays; pectoral fins 8–10 rays; caudal fin elongate (often damaged in capture). Body depth ~9 in SL; HL ~4.3 in SL; eye diameter ~6 in snout length; soft-rayed dorsal fin and anal fin very long-based; caudal fin long, margin rounded.

Colouration cryptic: body brown, greenish brown or pale brown, often with several series of pale spots along body and continuing onto caudal fin; sometimes 1 or 2 paler stripes along body (one from dorsal surface of snout to upper part of caudal-fin base, and another along midsides), and sometimes up to ~14 diffuse vertical bars on sides. Attains 35 cm TL.



Anacanthus barbatus (India). Source: Day 1878

DISTRIBUTION Indo-Pacific. WIO: Lakshadweep, India and Sri Lanka; elsewhere to Andaman Is., Gulf of Thailand, Indonesia, Aru Is., Singapore, Philippines, New Guinea and northwestern Australia.

REMARKS Found in a range of habitats, often in sandy and weedy areas of coastal reefs, but also mangroves, estuaries and bays, at 3–8 m. Often found lining up with seawhips or large stringy sponges. Has minor commercial importance as a food source.

GENUS *Brachaluteres* Bleeker 1865

Very small-sized (<7 cm SL) with mostly circular body in lateral profile, and abdomen greatly inflatable; 1st dorsal fin with 2 spines (except 2nd locking spine absent in one species from Australia); no pelvic-fin rudiment; gill slit directly above pectoral-fin base. Four species, 1 in WIO.

Brachaluteres fahaqa Clark & Gohar 1953

Red Sea pygmy filefish

Brachaluteres baueri fahaqa Clark & Gohar 1953: 45, Figs. 11–12

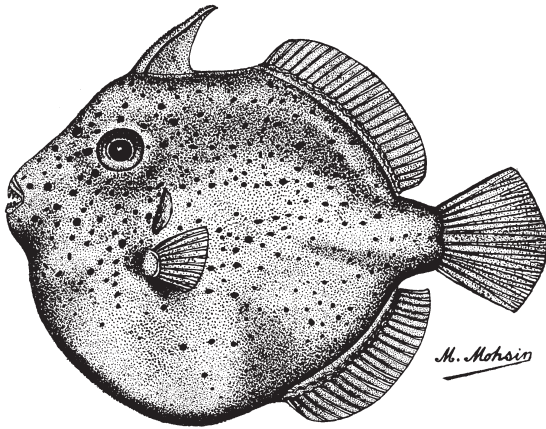
(Al-Ghardaqa [Hurghada], Egypt, Red Sea).

Brachaluteres fahaqa: Dor 1984; Hutchins & Swainston 1985*;

Golani & Bogorodsky 2010.

Dorsal fins 2 spines, 23 or 24 rays; anal fin 20–22 rays; pectoral fins 10 rays; caudal fin ~1.4 in HL.

Colour in life unknown. Clark & Gohar (1953) described the preserved type specimens as “pale with numerous small dark dots and dashes in the form of about 7–10 horizontal lines on body, and 8–10 lines radiating from eye.” Attains at least 4 cm TL.



Brachaluteres fahaqa, 3 cm SL, female holotype (Red Sea).
Source: Clark & Gohar 1953

DISTRIBUTION WIO: possibly endemic to Red Sea.

REMARKS Known from few specimens. Depth unknown, probably shallow waters. A juvenile of the genus *Brachaluteres* has been found in the Maldives, but (at just 9 mm SL) is too small to distinguish to species.

GENUS *Cantherhines* Swainson 1839

First dorsal-fin spine over front half of eyes, with minute posteriorly directed barbs along each posterolateral edge, and spine folds into deep groove on back; soft-rayed dorsal fin and anal fin evenly rounded, anterior rays not obviously elevated; pelvic-fin rudiment immovable, with 3 pairs of encasing scales; peduncle with or without patch of fine bristles and paired spines on each side. Lips wide, covering teeth when mouth closed. Eight species, 3 in WIO.

KEY TO SPECIES

- 1a Pectoral fins usually 15 (rarely 14) rays; pair of spines on each side of peduncle (small and difficult to detect in juveniles and adult females, enlarged and recurved in adult males) *C. dumerilii*
- 1b Pectoral fins 12 or 13 (rarely 14) rays; no spines on sides of peduncle 2
- 2a Caudal fin 1.6–2 times longer than peduncle depth; no prominent bars across interorbital region *C. pardalis*
- 2b Caudal fin 2.2–2.4 times longer than peduncle depth; 2 dark bars across interorbital region and joining eyes *C. fronticinctus*

Cantherhines dumerilii (Hollard 1854)

Yellow-eye filefish

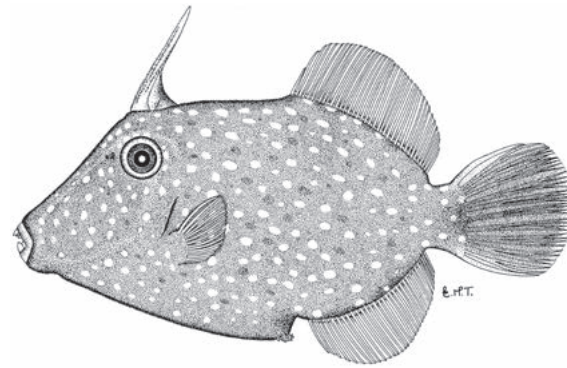
PLATES 112 & 113

Monacanthus dumerilii Hollard 1854: 361 (Mauritius, Mascarenes);
Smith & Smith 1963*; Jones & Kumaran 1980*.

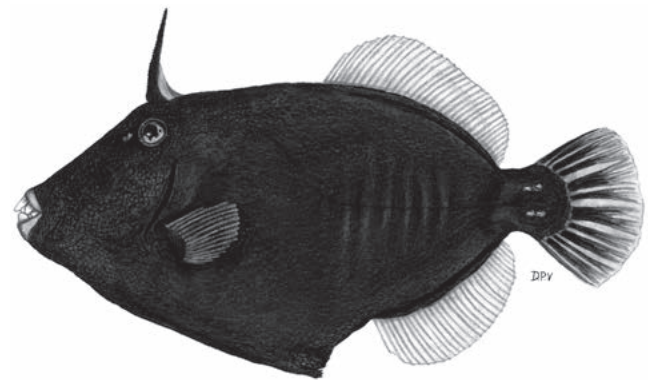
Cantherhines dumerilii: Randall 1964*; Smith 1975; SSF No. 264.4*;
Winterbottom *et al.* 1989*; Debelius 1993*, 1999*; Randall & Anderson
1993*; Eichler & Lieske 1994*; Randall 1995; Manilo & Bogorodsky 2003;
Heemstra *et al.* 2004; Matsuura 2014.

Dorsal fins 2 spines, 34–39 rays; anal fin 28–35 rays; pectoral fins 14 or 15 rays. Body depth 1.9–2.4 in SL; pair of spines on each side of peduncle (most easily detected in adult males), preceded by patch of short, fine bristles.

Body greyish or yellowish brown to dark brown, with ~12 faint vertical bars on rear half; eyes bright yellow; lips whitish; soft-rayed dorsal fin, anal fin and pectoral fins pale yellowish; caudal fin orange to yellow, with dusky rays; peduncle spines of adult males orange; juveniles and subadults with prominent white spots on head and body. Attains 38 cm TL.



Cantherhines dumerilii, 20 cm SL, subadult (South Africa). Source: SSF



Cantherhines dumerilii, 30 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific to eastern Pacific. WIO: Arabian Sea and Oman to South Africa (Algoa Bay), Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives, Lakshadweep and India; elsewhere to Indonesia, Philippines, Taiwan, southern Japan, Hawaii, New Caledonia, Tonga, Rapa Iti, Pitcairn Is. and Central America.

REMARKS Solitary or in pairs; inhabits offshore coral reefs, at 10–70 m, and also found in surface waters around oceanic islands.

Cantherhines fronticinctus (Günther 1867)

Spectacled filefish PLATE 113

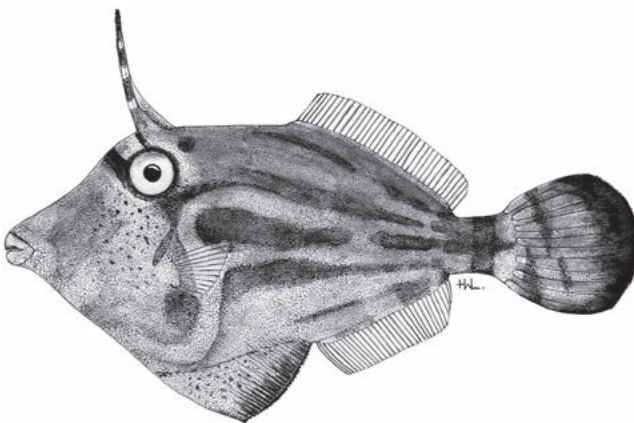
Monacanthus fronticinctus Günther in Playfair & Günther 1867: 136, Pl. 19, Fig. 2 (Zanzibar, Tanzania).

Amanses fronticinctus: Smith 1949*; Smith & Smith 1963*.

Cantherhines fronticinctus: Randall 1964*; Hutchins & Randall 1982*; SSF No. 264.5*; Randall & Anderson 1993*; Eichler & Lieske 1994*; Debelius 1999*; Heemstra *et al.* 2004; Matsuura 2014.

Dorsal fins 2 spines, 33–35 rays; anal fin 31 or 32 rays; pectoral fins 12–14 rays; caudal fin 2.2–2.4 times longer peduncle depth. Adult males with patch of fine bristles on side of peduncle.

Body yellowish brown, with ~5 darker irregular longitudinal blotches on sides, each enclosing 1 or 2 obscure rows of tiny brown spots; dark blotch usually behind upper end of gill opening and 2 irregular dark bands across interorbital region joining eyes, upper band narrower; thin blue line usually surrounding eyes; dorsal-, anal- and pectoral-fin rays pale brown, membranes transparent; broad white to yellowish band encircles anterior portion of peduncle, and caudal fin similarly pale yellowish brown, with broad, dark brown margin. Attains 23 cm TL.



Cantherhines fronticinctus, 10 cm TL. Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Tanzania to South Africa (KwaZulu-Natal; juveniles to Eastern Cape), Madagascar, Seychelles, Mascarenes and Maldives; elsewhere to Indonesia, southern Japan, Marshall Is., New Guinea, Australia and Tonga.

REMARKS Uncommon; found on coral-rich seaward reefs and in harbours, at 1–43 m.

Cantherhines pardalis (Rüppell 1837)

Honeycomb filefish PLATES 112 & 113

Monacanthus pardalis Rüppell 1837: 57, Pl. 15, Fig. 3 (El Tur, Gulf of Suez, Red Sea).

Monacanthus natalensis Gilchrist & Thompson 1911: 48 (KwaZulu-Natal, South Africa).

Hanomancus bovinus Smith 1949: 403, Fig. 1143 (East London, Eastern Cape, South Africa).

Amanses sandwichiensis (*non* Quoy & Gaimard 1824): Smith 1949*; Smith & Smith 1963*; Jones & Kumaran 1980*.

Cantherhines pardalis: Randall 1964*, 1995*; SSF No. 264.6*;

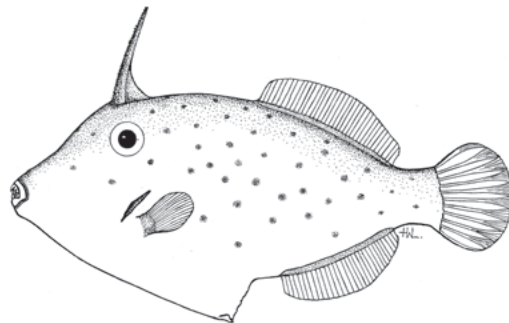
Winterbottom *et al.* 1989*; Debelius 1993*, 1998*;

Randall & Anderson 1993; Eichler & Lieske 1994*;

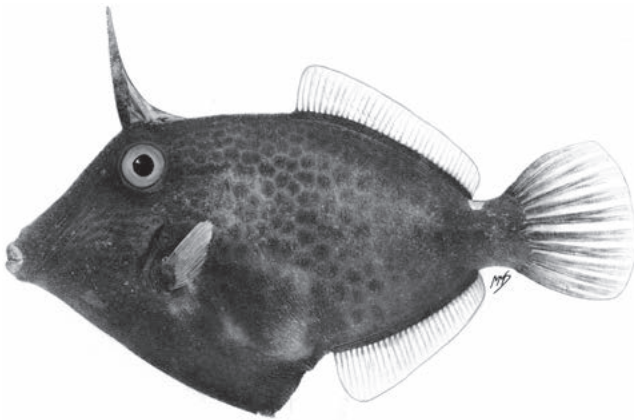
Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Matsuura 2014.

Dorsal fins 2 spines, 32–36 rays; anal fin 29–32 rays; pectoral fins 12–14 rays; caudal fin 1.6–2 times longer than peduncle depth. Adult males with patch of fine bristles on peduncle.

Body blackish, greyish, yellowish and greenish brown, often with reticulate pattern of pale green to bright blue intersecting lines on sides (producing netting or honeycomb appearance), but occasionally with 5 darker longitudinal stripes on rear half of body; alternating blue (or green) and brown lines running from eye and gill slit to mouth (may be difficult to distinguish in dark-brown form); white to silver area (sometimes faint) usually present along bases of soft-rayed dorsal fin and anal fin. Attains 20 cm TL.



Cantherhines pardalis, 5 cm TL, juvenile (South Africa). Source: SSF



Cantherhines pardalis, 18 cm TL. Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman to South Africa (Mossel Bay), Madagascar, Comoros, Mascarenes, Chagos, Maldives and Sri Lanka; elsewhere to Indonesia, southern Japan, Australia, New Caledonia, Tuamotu Is. and Marquesas Is.

REMARKS Occurs on outer reef slopes, at 2–20 m or deeper.

GENUS *Enigmacanthus* Hutchins 2002

First dorsal-fin spine over rear third of eyes, its rear edge with moderate-sized barbs projecting mostly posterolaterally; pelvic-fin rudiment small and moveable; scales on midsides each with up to 6 minute spinules on transverse ridge. One species.

Enigmacanthus filamentosus Hutchins 2002

Enigma filefish

PLATE 112

Monacanthus setifer (non Bennett 1831): Regan 1908.

Stephanolepis freycineti (non Quoy & Gaimard 1824): Fraser-Brunner 1940*; Smith 1949*; Smith & Smith 1963*.

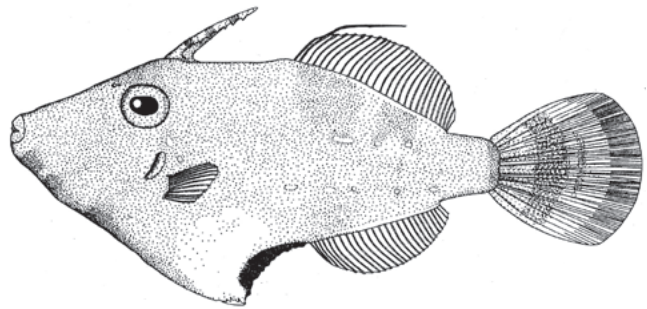
Genus b: Hutchins 1988*, 1994.

Enigmacanthus filamentosus Hutchins 2002: 214, Figs. 1–3 (lagoon at Rongelap Atoll, Marshall Is.).

Diagnosis as for genus. Dorsal fins 2 spines, 27 or 28 rays; anal fin 26 rays; pectoral fins 11 rays. Tiny, slender to moderately deep-bodied, body depth 2.1–3 in SL; caudal-fin length subequal to HL. Adult males with second ray of dorsal fin elongate and filamentous, and also with small patch of elongate bristles on peduncle.

Colour in life [based on photograph by R Winterbottom]: Body pale brown, with bright orange expanded ventral flap

(posterior border dusky); head and body with many small pale to whitish spots, tending to form 5 longitudinal series of larger, elongate markings on sides of body; bases of soft-rayed dorsal fin and anal fin each with 3 whitish blotches, fins otherwise hyaline; pectoral fins yellowish; caudal-fin rays pale greenish, membranes yellowish orange with longitudinal series of bright red to purplish spots between each ray, tending to form rather irregular convex stripes down posterior border of fin, and dusky convex band on anterior third of fin. Black and white photograph of preserved holotype shows the following distinctive features: ventral abdominal flap with darkish rear margin; ventral surface between throat and pelvic-fin rudiment darkish, with 3 inverted saddle blotches; white spots along sides of body; caudal fin with curved darkish band near middle, and margin dusky. Fraser-Brunner (1940) described red spots on the caudal fin of a recently preserved paratype. Attains at least 5 cm TL.



Enigmacanthus filamentosus, 4 cm SL (Seychelles).

Source: Hutchins 2002, WAM

DISTRIBUTION Indo-Pacific. WIO: Seychelles; elsewhere, Palau and Marshall Is.

REMARKS Known from few specimens, collected from sandy bottom, at 36–67 m. Mature by 3 cm SL.

GENUS *Lalmohania* Hutchins 1994

Body deep, 1.4–1.6 in SL. One species.

Lalmohania velutina Hutchins 1994

Velvet filefish

PLATES 112 & 113

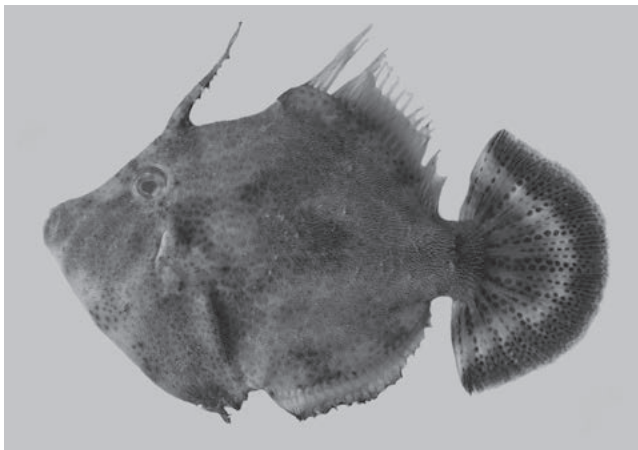
?*Stephanolepis diaspros* (non Fraser-Brunner 1940): Munro 1955.

Genus a: Hutchins 1988*.

Lalmohania velutina Hutchins 1994: 570, Figs. 1–3 (market at Kilakkarai, India, Gulf of Mannar); Matsuura 2014.

Dorsal fins 2 spines, 25–27 rays; anal fin 25–28 rays; pectoral fins 10 or 11 rays. First dorsal-fin spine over middle of eyes, with 2 rows of moderately large barbs on posterior edge projecting mostly posterolaterally. Interdorsal space distinctly concave. Ventral abdominal flap small. Scales on rear of body each with single spinule (more elongate centrally in males), and some scales bristle-like but not forming distinct patch. Caudal fin wedge-shaped in males.

Head and body pale greenish grey to pale brown, with many close-set dark brown spots, and also darker blotches forming at least 2 or 3 irregular oblique crossbands; caudal fin with 2 dark curved crossbands, and membrane densely spotted as on body. Attains at least 11 cm TL.



Lalmohania velutina, 7 cm SL (SW India). KK Bineesh © CMFRI

DISTRIBUTION Indian Ocean: Gulf of Mannar (India and possibly Sri Lanka).

REMARKS Found in shallow water with weedy bottom, to ~5 m, but probably occur deeper.

GENUS *Oxymonacanthus* Bleeker 1865

Snout tube-like and turning upwards slightly at mouth. First dorsal-fin spine over front half of eyes, robust, and with 2 rows of small downwardly directed barbs on rear edge, and spine folds into deep groove on back. Body scales each with 1–3 bristles (more elongate and curving anteriorly on rear third of body in males); paired scales of pelvic-fin rudiment not distinguishable from adjacent pelvic-region scales; no scales on sides of ventral abdominal flap. Colour blue to bluish green, with round orange spots (spots often more elongate on head). Feed on *Acropora* polyps. Two species, both in WIO.

KEY TO SPECIES

- 1a Second dorsal fin 29–33 rays; anal fin 27–31 rays; pectoral fins 10–12 rays; snout long and tubular; orange spots on body usually well-separated from each other, forming ~7 longitudinal series in adults; no spots on dorsal surface of snout; ventral abdominal flap of males with prominent black blotch with white spots *O. longirostris*
- 1b Second dorsal fin 26–31 rays; anal fin 23–28; pectoral fins 9–11 rays; snout shorter and less tubular; orange spots on body usually small and crowded together, forming ~10 longitudinal series in adults, and dorsal surface of snout also spotted; ventral abdominal flap of males lacking black blotch with white spots *O. halli*

Oxymonacanthus halli Marshall 1952

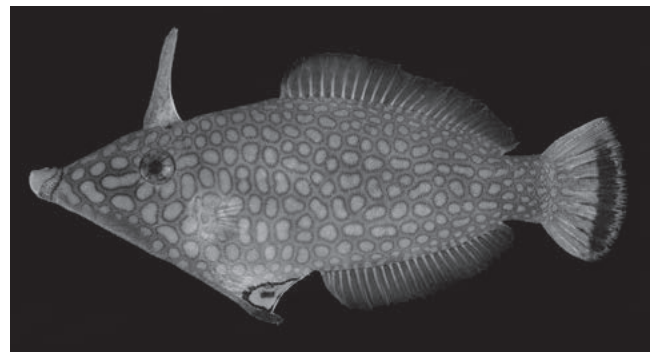
Red Sea harlequin filefish

PLATE 113

Oxymonacanthus halli Marshall 1952: 244, Fig. 3 (Sanafir Is., Straits of Tiran, Saudi Arabia, Red Sea); Dor 1984; Debelius 1993*, 1998*; Eichler & Lieske 1994*; Field & Field 1998*; Matsuura 2014.

Diagnosis as in key.

Body blue to bluish green, with >10 longitudinal series of circular orange, sometimes dark-rimmed, spots on entire body (reduced to series of ~5 on head), including spots on dorsal surface of snout; mouth surrounded by orange area; ventral abdominal flap of males with large orange blotch outlined with black; subterminal black bar on caudal fin relatively long, generally extending over three-quarters of fin. Attains 7 cm TL.



Oxymonacanthus halli, 7 cm TL (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Inhabits coral-rich fringing reefs. Depth unknown, probably shallow waters.

Oxymonacanthus longirostris

(Bloch & Schneider 1801)

Harlequin filefish

PLATE 113

Balistes hispidus var. *longirostris* Bloch & Schneider (ex Seba)
1801: 464 [Indonesia].*Oxymonacanthus longirostris*: Smith 1957, 1961; Smith & Smith 1963*;
SSF No. 264.7*; Winterbottom 1989*; Debelius 1993*, 1999*;
Randall & Anderson 1993; Eichler & Lieske 1994*; Matsuura 2014.

Diagnosis as in key.

Body blue to bluish green, with ~7 longitudinal series of circular orange spots on entire body (reduced to series of 3 or fewer elongate spots on head), but no spots on dorsal surface of snout; subterminal black bar on caudal fin relatively short, extending over less than half of fin; ventral abdominal flap of males with orange blotch below large black blotch spotted with white. Attains 9 cm TL.



Oxymonacanthus longirostris, 6 cm SL, female (top); 6 cm SL, male (bottom) (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Kenya to Mozambique, Madagascar, Comoros, Seychelles, Mascarenes, Chagos, Maldives and Lakshadweep; elsewhere to Indonesia, Ryukyu Is., Australia, Great Barrier Reef, Tonga and Samoa.

REMARKS Solitary, in pairs, or in small groups; inhabits clear lagoons and seaward reefs, to at least 30 m deep; found in branching *Acropora* corals. Feeds exclusively on coral polyps and nests near bases of dead corals.

GENUS *Paraluteres* Bleeker 1865

First dorsal-fin spine not fully erectile but attached to interdorsal space by flap of skin. No pelvic-fin rudiment or ventral abdominal flap. Scales on front part of body difficult to detect, usually embedded in skin; scales on rear part of body more obvious, each with single posteriorly directed spinule. Paired spines on each side of peduncle, spines enlarged and curving anteriorly in adult males and preceded by large patch of fine bristles with anteriorly curving extremities. Known to mimic species of the poisonous pufferfish genus *Canthigaster*. Four species, 2 in WIO (1 undescribed).

KEY TO SPECIES

- 1a Dorsal fin 24 or 25 rays; anal fin 22 rays; body of adults relatively slender, depth ~2.5 in SL *P. arqat*
1b Dorsal fin 25–28 rays; anal fin 23–25 rays; body of adults relatively deep, depth 1.9–2.2 in SL *Paraluteres* sp.

Paraluteres arqat Clark & Gohar 1953

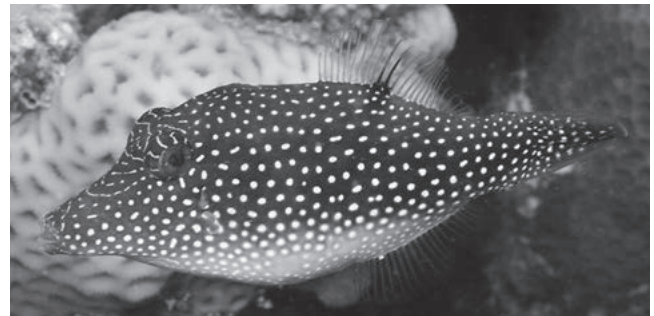
Red Sea mimic filefish

PLATE 112

Paraluteres arqat Clark & Gohar 1953: 43, Fig. 10 (Al-Ghardaqa [Hurghada], Red Sea); Dor 1984; Field & Field 1998*; Matsuura 2014.

Diagnosis as in key.

Body dark brown dorsally, with many small bluish to whitish spots and similarly coloured lines radiating anterodorsally from eyes; faint black circular blotch on body below front of soft-rayed dorsal fin; throat and breast dusky, lower sides and belly pale brown to white; fins transparent, except caudal fin dusky and covered with bluish to whitish spots (middle portion of fin palest). Attains 9 cm TL.



Paraluteres arqat (Red Sea). © SV Bogorodsky

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Mimics the pearl toby *Canthigaster margaritata*.

Paraluteres sp.

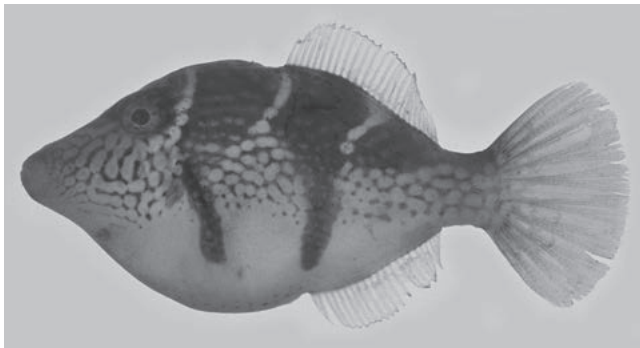
African blacksaddle mimic filefish

PLATE 115

Paraluteres prionurus (non Bleeker 1851): Smith 1958*; Smith & Smith 1963*; Jones & Kumaran 1980*; Hutchins 1986*; Winterbottom *et al.* 1989*; Debelius 1993*; Randall & Anderson 1993*; Eichler & Lieske 1994*; Randall 1995*; Manilo & Bogorodsky 2003.

Diagnosis as in key.

Background colour white, with 4 prominent blackish brown saddles, middle 2 narrowing and extending down sides; midlateral area with fine dark reticular pattern enclosing whitish spots, extending onto head and dorsal surface of snout; caudal fin yellowish. Juveniles with less-defined saddles, or upper half of body wholly brownish, and upper two-thirds of head and body covered with white spots, those on back forming 3 curved lines of spots. Andaman Sea form covered with white spots similar to the white-spotted form in WIO, but without prominent bars on body or lines of spots on back, plus the spotting on body persists in adults. Attains 11 cm TL.



Paraluteres sp., 6 cm SL (South Africa). © RE Stobbs

DISTRIBUTION WIO: Oman to South Africa (Aliwal Shoal), Madagascar, Comoros, Seychelles, Mauritius, Réunion, Chagos, Maldives and Lakshadweep.

REMARKS Solitary or in small groups, on shallow reefs at 5–10 m. Mimics the poisonous model toby *Canthigaster valentini*, which is avoided by predators; the white-spotted forms apparently mimic either the spotted toby *C. amboinensis* or the false-eye toby *C. solandri*. The taxonomic status of these colour forms needs investigation.

GENUS *Paramonacanthus* Bleeker 1865

Soft-rayed dorsal fin and anal fin elevated anteriorly in males; most species with elongate filamentous ray in soft-rayed dorsal

fin or caudal fin (except not in *P. frenatus*); rear edge of ventral abdominal flap usually concave; pelvic-fin rudiment moveable, generally extending past edge of flap; no patch of bristles or paired spines on peduncle. Inhabits seagrass beds and trawling grounds, often forming schools. Eleven species, 5 in WIO.

KEY TO SPECIES

- 1a First dorsal-fin spine flattened in cross-section, with 4 rows of barbs, those on lateral edges projecting laterally; snout profile straight or distinctly convex; adult males with uppermost and lowermost caudal-fin rays elongated *P. pusillus*
- 1b First dorsal-fin spine somewhat circular in cross-section, with 2 rows of barbs along front of spine (lost in large fish), and row of larger barbs projecting posterolaterally 2
- 2a Dorsal fin 24–27 rays; pectoral fins 10–12 (rarely 12) rays; soft-rayed dorsal fin and anal fin of males elevated anteriorly; anal fin with narrow black margin 3
- 2b Dorsal fin 26–31 rays; pectoral fins 11–13 (mostly 12) rays; soft-rayed dorsal fin and anal fin of males only moderately elevated anteriorly; no black band along anal-fin margin 4
- 3a Body slender, its depth 2–3 in SL; second ray of dorsal fin elongate and filamentous in males *P. nematophorus*
- 3b Body depth 1.9–2.2 in SL; dorsal fin of males without filamentous ray *P. frenatus*
- 4a Distinctive dark brown blotch on body below front of soft-rayed dorsal fin bisected longitudinally by narrow pale line; scales on midbody rough, usually with single, large, multibranching spinule per scale *P. arabicus*
- 4b Dark brown blotch on body below front of soft-rayed dorsal fin bisected by pale wedge-shaped bar; scales on midbody mostly smooth, with numerous small spinules arranged in 1 or 2 transverse series per scale *P. tricuspis*

Paramonacanthus arabicus Hutchins 1997

Arabian filefish

PLATE 114

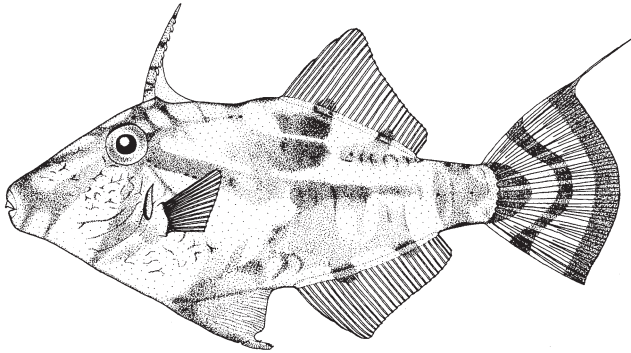
Paramonacanthus tricuspis (non Hollard 1854): Hutchins 1986.

Paramonacanthus sp.: Randall 1995*.

Paramonacanthus arabicus Hutchins 1997: 9, Figs. 5b, 6e, 8–9 (near Manifa–Tanajib Bay, Saudi Arabia); Matsuura 2014.

Dorsal fins 2 spines, 26–30 rays; anal fin 27–30 rays; pectoral fins 11–13 rays. Shape of head and body variable, ranging from slender, fusiform, and with convex snout and elevated soft-rayed dorsal fin and anal fin (males), to deep-bodied with slightly concave snout and rounded fins (females); scales on midbody usually rough, with single, large, multi-branched spinule per scale.

Body pale brown to whitish, with mottled pattern of brownish dusky blotches; dusky blotch on body below front of soft-rayed dorsal fin bisected longitudinally by narrow whitish line. Attains 9 cm TL.



Paramonacanthus arabicus, 7 cm SL, male (Persian/Arabian Gulf).
Source: Hutchins 1997, WAM

DISTRIBUTION WIO: Persian/Arabian Gulf.

REMARKS Inhabits shallow weed beds; caught in trawls at ~35 m.

Paramonacanthus frenatus (Peters 1855)

Wedge-tail filefish

PLATE 114

Monacanthus frenatus Peters 1855: 464 (Querimba I., Inhambane, Mozambique).

Monacanthus bertolonii Bianconi 1855: 148 (Mozambique).

Paramonacanthus barnardi Fraser-Brunner 1941: 193,

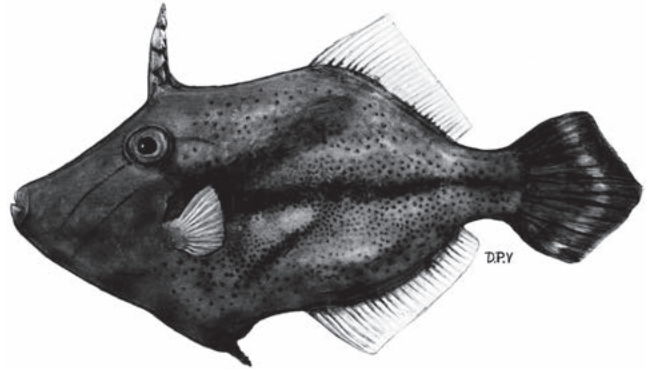
Fig. 6 (Zanzibar, Tanzania) [in part]; Smith 1949*; Smith & Smith 1963*; SSF No. 264.9*.

Paramonacanthus frenatus: Hutchins 1997, 2002; Matsuura 2014.

Dorsal fins 2 spines, 24–26 rays; anal fin 25–28 rays; pectoral fins 10–12 rays; soft-rayed dorsal fin and anal fin prominently elevated anteriorly in males, fins rounded in females; caudal fin wedge-shaped in males, more rounded in females. Body often scattered with many pale filaments, usually longer in females than in males.

Body greenish grey, covered with many close-set small brown spots, but no spots on head; males with 2 or 3 alternating blue and yellow oblique lines from mouth to pelvic-fin rudiment, and blue spots dorsally along snout to origin of 1st dorsal-fin spine; soft-rayed dorsal fin, anal fin and pectoral fins pale yellow to hyaline; anal fin with narrow brown or black margin, and males with first 2 rays dusky and edged with yellow, and narrow black blotch along outer edge, from apex

to about middle of fin; caudal fin pale yellowish to hyaline, with numerous blackish spots forming 2 faint concentric dark bands. Attains 12 cm TL.



Paramonacanthus frenatus, 11 cm SL (S Mozambique). Source: SSF

DISTRIBUTION WIO: Kenya to South Africa (KwaZulu-Natal), including Tanzania (Zanzibar), and Seychelles.

REMARKS Found in weedy areas of sheltered bays, to ~12 m deep.

Paramonacanthus nematophorus

(Günther 1870)

Seagrass filefish

PLATES 114 & 115

Monacanthus nematophorus Günther 1870: 241 (China or Borneo [erroneous: probably East Africa: see Hutchins 1997, p. 39]).

Monacanthus cirrosus Kossman & Räuber 1877: 413 (Massawa, Eritrea, Red Sea).

Paramonacanthus barnardi Fraser-Brunner 1941: 193, Fig. 6 (Zanzibar, Tanzania) [in part].

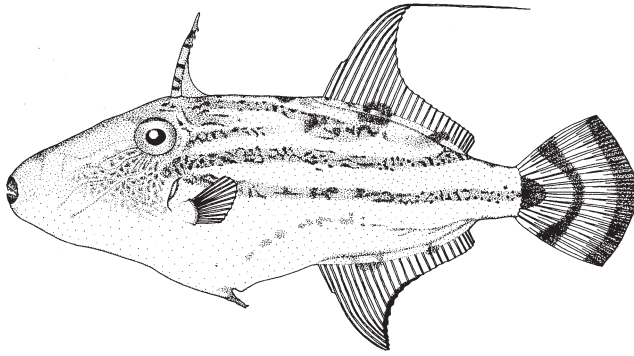
Thamnaconus modestoides (non Barnard 1927): Debelius 1993*.

Paramonacanthus nematophorus: Hutchins 1997*; Debelius 1998*; Matsuura 2014.

Dorsal fins 2 spines, 24–27 rays; anal fin 24–28 rays; pectoral fins 10–12 rays (usually 11 rays in Red Sea fish, 12 rays in African fish); 2nd dorsal fin and anal fin elevated anteriorly in males, and dorsal fin with elongate filamentous ray at apex; 2nd dorsal fin and anal fin rounded in females; caudal fin rounded in both sexes. Body often scattered with many pale filaments, usually longer in females than in males.

Body whitish or pale yellowish to brownish, usually more olive to brownish dorsally, with darker close-set spots, dashes and blotches, tending to form 4–6 stripes along body; soft-rayed dorsal fin and anal fin hyaline to brownish orange; anal

fin with narrow black margin, and males with first 2 or 3 rays of anal fin yellowish; caudal fin hyaline to pale brown, with dark basal blotch followed by 2 curved dark crossbands. Attains 12 cm TL.



Paramonacanthus nematophorus, 6 cm SL, male (Gulf of Aqaba).
Source: Hutchins 1997, WAM

DISTRIBUTION WIO: Red Sea to Tanzania (Zanzibar), Seychelles and St Brandon Shoals.

REMARKS Inhabits coastal seagrass beds and among soft corals. Depth unknown.

Paramonacanthus pusillus (Rüppell 1829)

Black-striped filefish

PLATE 114

Monacanthus pusillus Rüppell 1829: 34 (Massawa, Eritrea, Red Sea).

Laputa cingalensis Fraser-Brunner 1941: 191, Fig. 5 (Sri Lanka).

Laputa umgazi Smith 1949: 402, Fig. 1138 (Umgazi River mouth, Eastern Cape, South Africa).

Rudarius virgulatus Nalbant & Mayer 1975: 240, Pl. 13, Figs. 10–13 (Kunduchi, near Mbuya I., Tanzania).

Paramonacanthus falcatus Kotthaus 1979: 31, Fig. 481 (off Perim, Yemen, Red Sea).

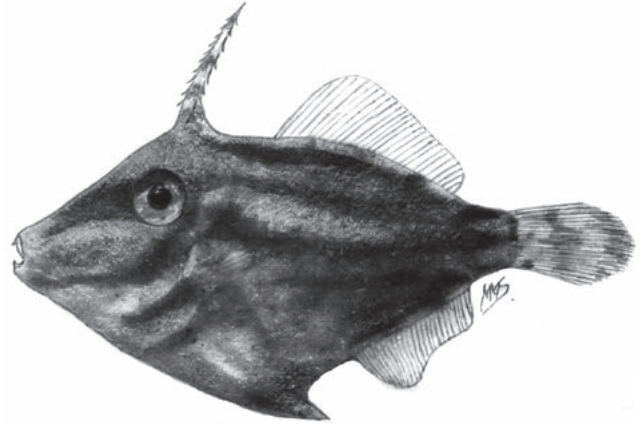
Paramonacanthus cingalensis: SSF No. 264.10*.

Paramonacanthus pusillus: Hutchins 1997*; Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins 2 spines, 25–30 rays; anal fin 24–29 rays; pectoral fins 11–13 rays; caudal fin of males with uppermost and lowermost rays elongate and filamentous. Snout profile with prominent bony hump, more pronounced in males than in females.

Body greyish brown to whitish, with numerous darker markings tending to form 4 or 5 longitudinal stripes on body, curving upwards behind head, but occasionally appearing more blotchy than linear; 2nd dorsal fin and anal fin hyaline,

but anal fin with narrow blackish margin; caudal fin hyaline with 2 curved dark crossbands. Attains 19 cm TL (~12 cm TL in WIO).



Paramonacanthus pusillus, 4 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea and Gulf of Aden to South Africa (Eastern Cape), Réunion and Sri Lanka; elsewhere to Myanmar, Indonesia, Japan and Australia.

REMARKS Found at 28–79 m.

Paramonacanthus tricuspis (Hollard 1854)

Indian filefish

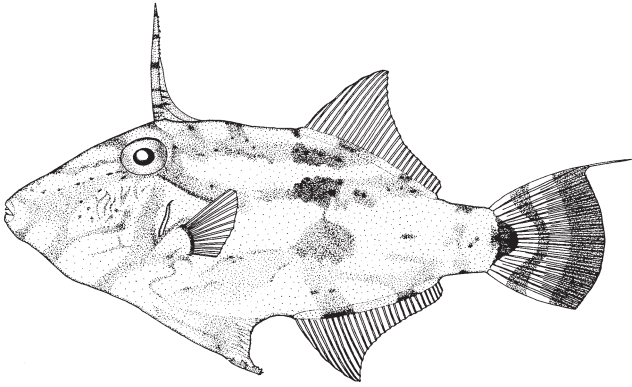
Monacanthus tricuspis Hollard 1854: 351, Pl. 13, Fig. 3 ('Indian sea').

Paramonacanthus horae Fraser-Brunner 1941: 196, Fig. 8 (Madras, India).

Paramonacanthus tricuspis: Hutchins 1997*; Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins 2 spines, 26–29 rays; anal fin 27–30 rays; pectoral fins 11 or 12 rays. Scales on midbody smooth, usually with numerous small spinules arranged in 1 or 2 transverse series per scale (females may rarely possess a single large, branched spinule per scale); numerous filaments scattered on head and body, usually more prominent in females than in males.

Colour in life unknown. B/W photograph of freshly caught specimen shows the following features: head and body pale, with darker blotches tending to form 3 indistinct stripes on body; 2 blotches on body below front of soft-rayed dorsal-fin base separated by pale wedge-shaped bar; caudal fin with dusky basal blotch followed by 2 dark curved crossbands. Attains 10 cm TL.



Paramonacanthus tricuspis, 8 cm SL, male (Persian/Arabian Gulf).
Source: Hutchins 1997, WAM

DISTRIBUTION Indian Ocean. WIO: Persian/Arabian Gulf, Maldives and India; elsewhere to east coast of India and Thailand.

REMARKS Found on muddy bottom in estuaries, and near algal rubble, at ~6–50 m.

GENUS *Pervagor* Whitley 1930

Snout profile prominently concave. First dorsal-fin spine over front half of eyes, and with row of prominent, laterally directed barbs along each edge; 2nd dorsal fin and anal fin not elevated anteriorly; peduncle deep (except in very small juveniles); pelvic-fin rudiment large, movably articulated with pelvis, and with relatively large barbs. Scales on midbody rough, each with 1–7 spinules along single transverse ridge; all scales on rear half of body of adults with elongate spinules, those of males prominently curved with forward-directed extremities. Eight species, 3 in WIO.

KEY TO SPECIES

- 1a Body short and deep, its depth 1.9–2.1 in SL; relatively wide dark stripes along sides of body..... *P. randalli*
- 1b Body oblong, its depth usually 2.2–2.5 in SL; body with or without narrow dark lines along sides 2
- 2a Black blotch over gill slit faint or absent; rear half of body usually yellowish brown; individual scale outlines on midsides usually obvious *P. aspricaudus*
- 2b Distinct black blotch over gill slit; rear half of body dark brown, greenish brown or purplish brown; individual scale outlines on midsides usually difficult to distinguish *P. janthinosoma*

Pervagor aspricaudus (Hollard 1854)

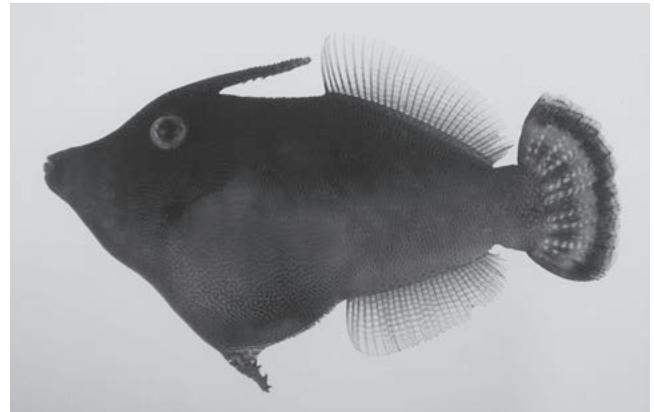
Orangetail filefish

PLATE 114

Monacanthus aspricaudus Hollard 1854: 330 [no locality given].
Monacanthus rubricauda Bliss 1883: 62 (Mauritius, Mascarenes).
Pervagor aspricaudus: Hutchins 1986*; Debelius 1993*, 1999*;
Heemstra *et al.* 2004; Matsuura 2014.

Dorsal fins 2 spines, 31–35 rays; anal fin 28–32 rays; pectoral fins 12 or 13 rays. Individual scale outlines on midsides usually visible. Pelvic-fin rudiment not attached to rear margin of ventral abdominal flap.

Body and head colour variable: body brownish or greyish green, or head and front half of body dark brown, fading to orange or yellow posteriorly; usually with closely packed tiny dark dots and dashes forming thin longitudinal series along body; sometimes with dark blotch on gill slit; soft-rayed dorsal fin and anal fin hyaline to yellowish, with longitudinal series of blue spots tending to form lines; caudal fin yellow or orange, usually with transverse series of yellowish spots forming crossbars, and prominent thin subterminal brownish orange to blackish band. Attains 13 cm TL.



Pervagor aspricaudus, 9 cm SL (Rodrigues). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific (antitropical). WIO: Mascarenes; elsewhere to Indonesia, Christmas Is., Taiwan, southern Japan, Marshall Is., Australia, New Caledonia and Hawaii.

REMARKS Inhabits clear lagoons and seaward reefs, at 1–25 m.

Pervagor janthinosoma (Bleeker 1854)

Redtail filefish

PLATE 114

Monacanthus janthinosoma Bleeker 1854: 504 (Ambon Is., Moluccas, Indonesia).

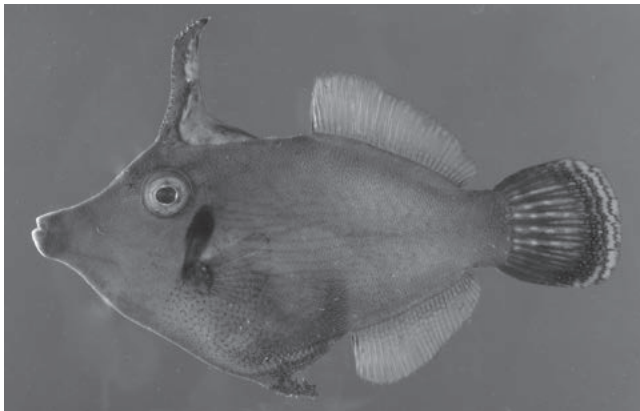
Pervagor scanleni Smith 1957: 221, Fig. 3 (Port Alfred, Eastern Cape, South Africa).

Pervagor melanocephalus (non Bleeker 1853): Smith & Smith 1963*; SSF No. 264.11*; Winterbottom 1989*;

Pervagor janthinosoma: Hutchins 1986*; Randall & Anderson 1993; Eichler & Lieske 1994*; Debelius 1999*; Heemstra *et al.* 2004; Matsuura 2014.

Dorsal fins 2 spines, 29–34 rays; anal fin 26–30 rays; pectoral fins 10–13 rays. Individual scale outlines on midsides of body difficult to distinguish. Pelvic-fin rudiment not attached to ventral abdominal flap.

Colour variable: either dark brown, blackish brown, purplish brown, brownish green or brownish orange; head and front of body sometimes darker than remainder of body; many closely packed tiny dark spots forming dark longitudinal lines along body; blackish to dark blue bar over gill slit (except in small juveniles); soft-rayed dorsal fin and anal fin hyaline yellow or orange, with longitudinal series of blue spots forming lines; caudal fin orange to red with numerous yellow spots, and margin with blue spots and lines, and dusky subterminal band sometimes present. Attains 14 cm TL.



Pervagor janthinosoma, 5 cm SL (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Algoa Bay), Mozambique Channel, Madagascar, Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, southern Japan, Caroline Is., Australia, Fiji, Tonga and Samoa.

REMARKS Usually solitary; found in shallow lagoons, on seaward reefs, and common in coral-rich areas, at 8–20 m.

Pervagor randalli Hutchins 1986

Randall's filefish

PLATES 114 & 115

Monacanthus melanocephalus (non Bleeker 1853): Kossmann & Räuber 1877; Tortonese 1936*.

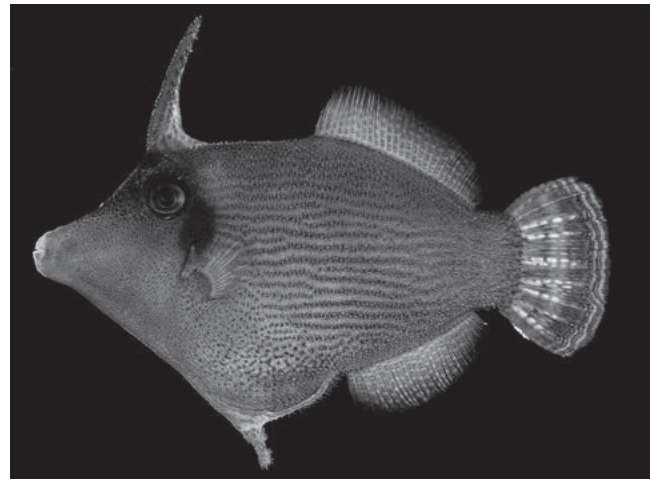
Pervagor melanocephalus (non Bleeker 1853): Clark & Gohar 1953.

Pervagor randalli Hutchins 1986: 30, Pl. 2d–e (off Djibouti, Masakali Is., Gulf of Aden).

Pervagor randalli: Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins 2 spines, 29–31 rays; anal fin 27 or 28 rays; pectoral fins 12 rays. Body depth 1.9–2.1 in SL. Individual scale outlines usually visible on midsides. Pelvic-fin rudiment not attached to ventral abdominal flap.

Body dark brown, with numerous dark irregular lines on sides, breaking into spots ventrally; large blackish blotch on gill slit; soft-rayed dorsal fin and anal fin orange with irregular blue lines; caudal fin reddish orange with yellow spots, and margin with irregular series of transverse blue lines and curved submarginal dusky band. Attains 9 cm TL.



Pervagor randalli, 6 cm SL, holotype (Gulf of Aden).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Red Sea and Gulf of Aden.

REMARKS Inhabits shallow coral reefs, to ~10 m or deeper.

GENUS *Pseudalutarius* Bleeker 1865

First dorsal-fin spine long and slender, without barbs, and located well in front of eyes. Head and body of females long and slender, males deeper-bodied; body depth 4–6 in SL. One species.

Pseudalutarius nasicornis

(Temminck & Schlegel 1850)

Rhino filefish

PLATE 115

Alutera nasicornis Temminck & Schlegel 1850: 293, Pl. 131,

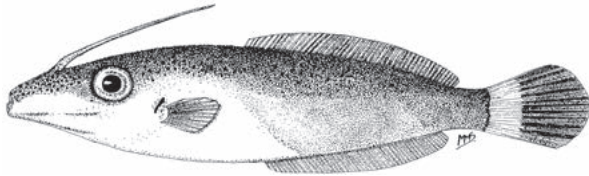
Fig. 2 [Nagasaki, Japan].

Pseudalutarius nasicornis: Smith 1947*; Smith & Smith 1963*;

SSF No. 264.12*; Randall & Anderson 1993; Manilo & Bogorodsky 2003; Matsuura 2014.

Diagnosis as for genus. Dorsal fins 2 spines, 43–50 rays; anal fin 41–46 rays; pectoral fins 10–12 rays. No obvious pelvic-fin rudiment.

Body silvery grey to pale brown or white, with 2 longitudinal yellow-brown stripes along upper sides (juveniles and small adults), occasionally replaced by broader brownish stripes in some individuals; adults may also develop many tiny yellow spots on head and body (most prominent in males); soft-rayed dorsal fin and anal fin hyaline to pale brown; caudal fin more whitish, with large brown to black blotch covering centre of fin. Attains 19 cm TL.

*Pseudalutarius nasicornis*, 5 cm TL, juvenile (South Africa). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Tanzania (Zanzibar) to South Africa (Eastern Cape), Madagascar, Seychelles, Mauritius, Réunion and Maldives; elsewhere to Thailand, Indonesia, Philippines, southern Japan, New Guinea, northern Australia and New Caledonia.

REMARKS Rare, found at 1–55 m; inhabits coastal reefs, often in silty habitats, especially those with rich invertebrate cover, and sometimes enters estuaries.

GENUS *Stephanolepis* Gill 1861

First dorsal-fin spine slender, over rear half of eyes, with row of downward-directed barbs along each posterolateral edge, and no groove on back for depressed spine; soft-rayed dorsal fin and anal fin rounded; 2nd (and sometimes 3rd) ray of 2nd dorsal fin elongate and filamentous in males. Pelvic-fin rudiment moveable, consisting of 5 encasing scales with moderately sized barbs. Skin rough: scales on midbody of adults with elliptically shaped patch of spinules supported

mushroom-like by single pedicle. Inhabit coastal waters, from shore to ~50 m deep, usually in areas with rich invertebrate growth. Seven species, 2 in WIO.

KEY TO SPECIES

- 1a Second dorsal fin 28–34 rays; no patch of bristles on peduncle; body with irregular brown blotching (without linear arrangement of close-set blotches within network of white lines); males with irregular pale blue markings adjacent to bases of soft-rayed dorsal fin and anal fin, blue marks often continuing onto head, peduncle and ventral abdominal flap *S. aurata*
- 1b Second dorsal fin 31–35 rays; adult males with prominent patch of bristles on peduncle and extending forward along midsides; adults whitish or greenish brown, with linear arrangement of close-set brown blotches usually surrounded by network of pale lines, and juveniles greenish yellow; no blue markings at bases of soft-rayed dorsal fin and anal fin *S. diaspros*

Stephanolepis aurata (Castelnau 1861)

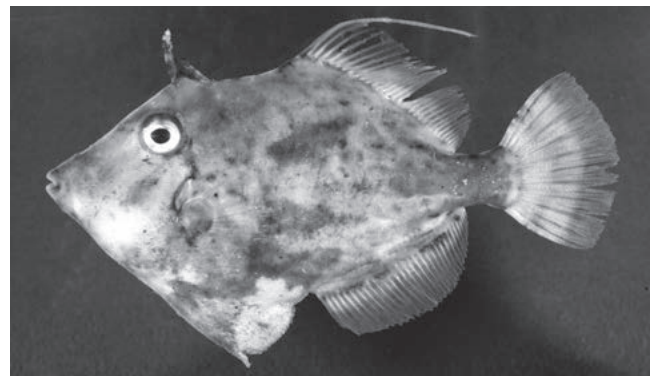
Porky

PLATES 115 & 116

Monacanthus auratus Castelnau 1861: 77 (Algoa Bay, Eastern Cape, South Africa).*Stephanolepis rectifrons* Fraser-Brunner 1940: 531, Fig. 6 (Maputo Bay, Mozambique); Barnard 1948; Smith 1949*.*Stephanolepis auratus*: Fraser-Brunner 1940; Smith 1949*; SSF No. 264.13*; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004*.

Dorsal fins 2 spines, 28–34 rays; anal fin 30–34 rays; pectoral fins 13 or 14 rays. Body depth 1.6–1.8 in SL.

Body pale greenish grey to pale brown, with scattered dark blotches on sides; males also with irregular pale blue spots and dashes adjacent to bases of soft-rayed dorsal fin and anal fin, continuing onto head and peduncle; fin rays pale brown, membranes hyaline; caudal fin with 2 concentric dark bands, rear margin yellow. Attains 28 cm TL.

*Stephanolepis aurata*, 8 cm SL (N Mozambique). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Somalia to South Africa (False Bay) and Madagascar.

REMARKS Found in seagrass beds and over shallow sandy or rocky bottom, to ~18 m deep; tiny juveniles often congregate under floating *Sargassum* seaweed and jellyfish in the open ocean.

Stephanolepis diaspros Fraser-Brunner 1940

Reticulated filefish

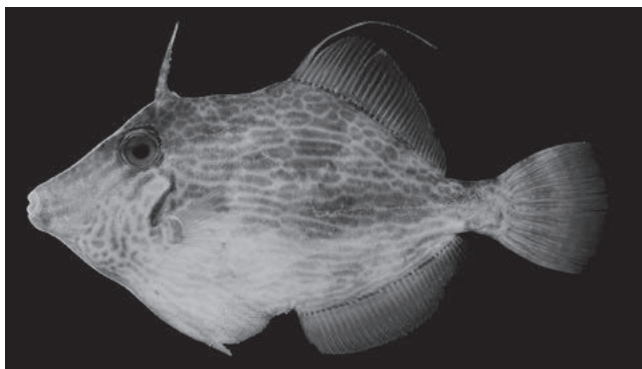
PLATE 116

Stephanolepis diaspros Fraser-Brunner 1940: 528, Fig. 4 (Muscat, Oman, Gulf of Oman); Randall 1995*; Manilo & Bogorodsky, 2003; Matsuura 2014.

?*Stephanolepis ocheticus* Fraser-Brunner 1940: 529, Fig. 5 (Ismailia, Egypt, Gulf of Suez).

Dorsal fins 2 spines, 31–35 rays; anal fin 30–35 rays; pectoral fins 13 or 14 rays. Body depth 1.8–2 in SL.

Body pale greenish grey, pale yellowish or pale brownish grey, with close-set rather elongate darker blotches on sides, usually enclosed in network of pale lines (in some pale individuals, only a few darker blotches may be evident, and the pale lines less pronounced); front edge of gill opening blackish in adults; fin rays brownish to greyish, and fin membranes hyaline, except caudal fin with 2 curved dark crossbands. Attains 22 cm TL.



Stephanolepis diaspros, 11 cm SL (Persian/Arabian Gulf).

© JE Randall, Bishop Museum

DISTRIBUTION WIO: Persian/Arabian Gulf, Gulf of Oman, Gulf of Aden and Red Sea (to Gulf of Aqaba and Gulf of Suez), and apparently a Lessepsian migrant to Mediterranean Sea.

REMARKS Two forms are recognised: a deeper-bodied form from Oman and Persian/Arabian Gulf, and a more elongate form from the Red Sea. However, deep-bodied examples have been found at the eastern limits of the Red Sea form, and as they otherwise appear identical in morphology, the two forms are treated as a single species. Inhabits rocky coastal areas, usually with vegetation, at 20–50 m.

GENUS *Thamnaconus* Smith 1949

First dorsal-fin spine over centre of eyes, with row of laterally directed barbs along each edge, and shallow groove on back behind spine; soft-rayed dorsal fin and anal fin elevated anteriorly, more prominently in males, and distal fin margins concave. Pelvic-fin rudiment immovable, with 2 pairs of scales; no spines or bristles on peduncle. Usually inhabit relatively deep water, to ~170 m. Thirteen species, 5 or 6 in WIO.

KEY TO SPECIES

- 1a Dorsal fin 33–38 rays; anal fin 32–36 rays; no dark spotting on body, and dark ring around anus present or absent 2
- 1b Dorsal fin 31–34 rays; anal fin 30–34 rays; body with spotting and dark ring around anus 3
- 2a Soft-rayed dorsal fin and anal fin prominently elevated anteriorly in adults; no dark ring around anus; maximum size ~38 cm TL *T. modestoides*
- 2b Soft-rayed dorsal fin and anal fin slightly elevated anteriorly in adults; thin dark ring around anus; maximum size ~18 cm TL *T. erythraensis*
- 3a Dorsal fin 31 or 32 rays; anal fin 30 or 31 rays; body of preserved specimens grey, with many small close-set dark spots, forming 3 or 4 longitudinal stripes or slightly darker band between origins of soft-rayed dorsal fin and anal fin; no dark crossbands on caudal fin *T. arenaceus*
- 3b Dorsal fin 32–34 rays; anal fin 31–34 rays; colour in preservative not as above; caudal fin usually with dark crossbands (may be indistinct in *T. melanoproctes*) 4
- 4a Head and body covered with irregular, distinct, dark brown spots and blotches, those on body tending to form longitudinal series *T. fajardo*
- 4b Body with longitudinal series of dark lines and stripes, and oblique dark lines on cheeks 5
- 5a Body with ≥12 thin dark lines on lower two-thirds, and 2 broad dark stripes enclosing fine spotting from eyes to rear of soft-rayed dorsal-fin base; faint dark crossbands on caudal fin *T. melanoproctes*
- 5b Body with 7 or 8 dark lines along lower sides, and several lines along upper sides, usually breaking into irregular spots; 2 prominent concentric dark bands on caudal fin *T. striatus*

Thamnaconus arenaceus (Barnard 1927)

Sandy filefish

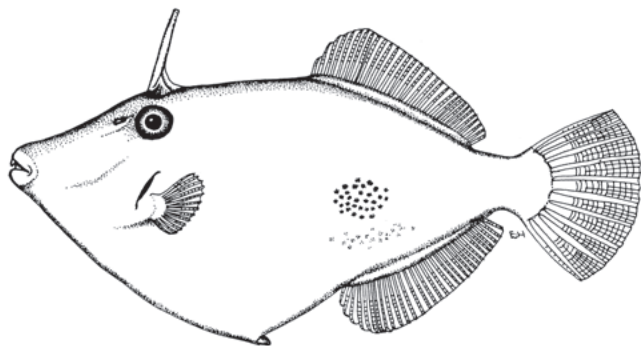
PLATES 114 & 116

Cantherhines arenaceus Barnard 1927: 78 (South Africa [probably KwaZulu-Natal]), also Barnard 1927: 958.

Thamnaconus arenaceus: Smith 1949*; Hutchins 1986*, 1988*; Matsuura 2014.

Dorsal fins 2 spines, 31 or 32 rays; anal fin 30 or 31 rays; pectoral fins 13 rays.

Preserved specimens pale brown, grey or yellowish brown, with many fine darker spots on head and body (most obvious on midsides, or spots enclosed in 3 or 4 brown stripes along sides); dorsal- and anal-fin rays greenish yellow, membranes hyaline; dorsal-fin spine of adult male with yellow membrane, and female with black membrane; caudal fin dusky; thin black ring and darker blotch around anus. Attains at least 25 cm TL.



Thamnaconus arenaceus, 25 cm TL (South Africa).

DISTRIBUTION Known only from three specimens from South Africa (probably KwaZulu-Natal) and Madagascar.

REMARKS Probably taken from 80–115 m.

Thamnaconus erythraeensis

Bauchot & Maugé 1978

Aqaba filefish

PLATE 114

Thamnaconus modestoides erythraeensis Bauchot & Maugé 1978: 541,

Fig. 1 (Gulf of Aqaba, Red Sea); Baranes & Golani 1993*.

Thamnaconus erythraeensis: Hutchins 1988*.

Dorsal fins 2 spines, 33–36 rays; anal fin 32–34 rays; pectoral fins 13 rays. Lateral line obvious, especially on sides of head.

Body brown, with indications of 2 pale lines along upper side from eye to below rear part of soft-rayed dorsal fin; soft-rayed dorsal fin and anal fin hyaline; caudal fin yellowish, with darker blotches and spots forming 2 crossbands; dark ring around anus. Attains 23 cm TL.

DISTRIBUTION WIO: endemic to Red Sea.

REMARKS Known from ~150–170 m.

Thamnaconus fajardoi Smith 1953

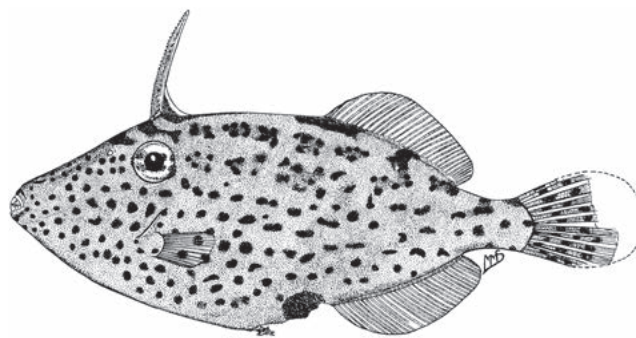
Spotted filefish

PLATES 114 & 116

Thamnaconus fajardoi Smith 1953: 19, Fig. 2 (Mozambique Channel); Hutchins & Matsuura 1984*; SSF No. 264.15*; Matsuura 2014.

Dorsal fins 2 spines, 32–34 rays; anal fin 31–33 rays; pectoral fins 12 or 13 rays.

Head and body pale brown, covered with irregular, distinct, dark brown spots and blotches, those on body tending to form longitudinal series; 2 dark bands between eyes: one V-shaped, its apex pointing down midline of snout, the other U-shaped; soft-rayed dorsal fin and anal fin hyaline; caudal fin pale brown, with dark spots and blotches forming 2 crossbands; prominent dark brown blotch around anus. Attains 22 cm TL.



Thamnaconus fajardoi, 15 cm TL, holotype (Mozambique Channel). Source: SSF

DISTRIBUTION WIO: South Africa, Mozambique Channel, Madagascar, Réunion, Mauritius and St Brandon Shoals.

REMARKS Found at 20–236 m.

Thamnaconus melanoproctes (Boulenger 1889)

Oman filefish

PLATE 114

Monacanthus melanoproctes Boulenger 1889: 242, Pl. 28 (Muscat, Oman, Gulf of Oman).

Navodon melanoproctes: Fraser-Brunner 1941.

Thamnaconus melanoproctes: Hutchins 1988*; Randall 1995*; Manilo & Bogorodsky 2003; Matsuura 2014.

Dorsal fins 2 spines, 32–34 rays; anal fin 31–34 rays; pectoral fins 12 or 13 rays. First dorsal-fin spine reaches first ray of dorsal fin.

Body pale brown, with series of tiny spots forming several longitudinal brown lines on head and lower two-thirds of body, plus 2 or 3 much wider brown stripes on upper body (upper stripes enclosing rather irregular spotting) from origin of 1st

dorsal fin to rear of soft-rayed dorsal fin; membrane behind 1st dorsal-fin spines yellow in males, brownish in females; all fin rays pale brownish; membranes of soft-rayed dorsal fin and anal fin hyaline; caudal fin blotchy, with indications of crossbands. Attains 22 cm TL.



Thamnaconus melanoproctes, 20 cm TL, holotype (Oman).
Source: Boulenger 1889

DISTRIBUTION Indo-Pacific. WIO: Gulf of Aden to Gulf of Oman and Persian/Arabian Gulf; elsewhere, Indonesia (Bali), Japan and northwestern Australia.

REMARKS May be a synonym of *Cantherhines multilineatus* (Tanaka 1918). Taken as bycatch in bottom trawls at 73–200 m in Gulf of Aden; photographed at ~30 m deep off Muscat, Oman.

Thamnaconus modestoides (Barnard 1927)

Drab filefish

PLATE 116

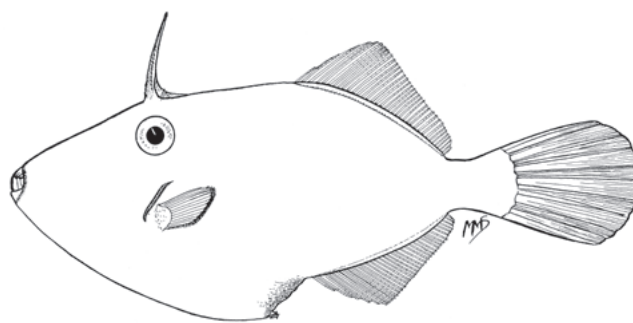
Cantherhines modestoides Barnard 1927: 78 (Algoa Bay, Eastern Cape, South Africa).

Navodon modestus (non Günther 1877): Fowler 1934.

Thamnaconus modestoides: Smith 1949*; Hutchins 1986*;
Winterbottom *et al.* 1989*; Matsuura 2014.

Dorsal fins 2 spines, 33–38 rays; anal fin 33–36 rays; pectoral fins 12–14 rays.

Body uniformly pale grey, pale brown or purplish brown; spinous dorsal-fin membrane dusky in females and juveniles, pale yellow to bright yellow in adult males; all fin rays yellowish in juveniles, dusky brown in adults; fin membranes hyaline, but caudal fin often more whitish. Attains 38 cm TL.



Thamnaconus modestoides, 22 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Mozambique to South Africa (south coast), Madagascar, Réunion and Chagos; elsewhere to Andaman Is., Indonesia, Taiwan, southern Japan, northern Australia, New Caledonia and Fiji.

REMARKS Taken in trawls at 73–250 m.

Thamnaconus striatus (Kotthaus 1979)

Lined filefish

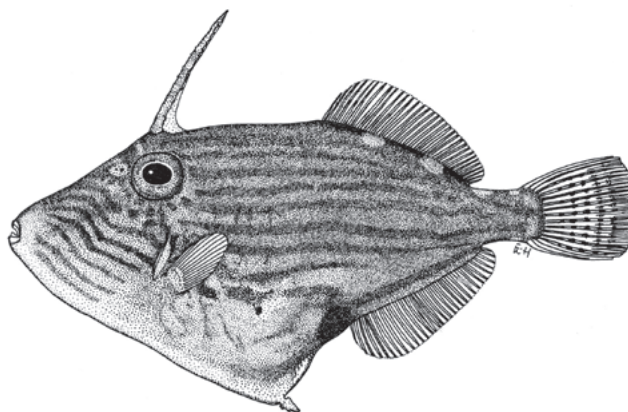
Amanses striatus Kotthaus 1979: 33, Fig. 483 (southwest of Socotra, Arabian Sea).

Thamnaconus melanoproctes [in part]: Hutchins 1988.

Thamnaconus striatus: Manilo & Bogorodsky 2003.

Dorsal fins 2 spines, 32 or 33 rays; anal fin 31–33 rays; pectoral fins 13 rays.

Head and body greenish purple dorsally, paler green ventrally; ~8 rusty brown longitudinal lines along sides (but specimens from same locality showing considerable variation: ~7–20 lines), with lines on cheeks oblique and broken up to form spots dorsally; 1st dorsal fin slightly yellowish; other fin membranes hyaline, and fin rays pale brown; caudal fin with darker markings forming 2 concentric bands (posterior band narrower); anus surrounded by brown blotch. Attains 22 cm TL.



Thamnaconus striatus, 14 cm SL, holotype (Somalia). Drawn from photograph

DISTRIBUTION Indo-Pacific (disjunct; taxonomically uncertain). WIO: Socotra; elsewhere, Indonesia (Bali) and northern Australia.

REMARKS Found at 175–337 m. A slightly different form presently recognised as *Cantherhines multilineatus* (Tanaka 1918), from the Andaman Is. and Japan, seems to form a species-complex with *T. striatus* and *T. melanoproctes*, which differ only slightly from each other in colour pattern. Additional specimens are needed to study the relationships between these three forms.

GLOSSARY

pedicle – a small, stalk-like structure connecting two structures.
retorse – pointing or curved backwards.
shagreen-like – rough, like shark skin.

FAMILY OSTRACIIDAE

Boxfishes and cowfishes

Phillip C Heemstra

Head and body enclosed in armour-like carapace, but with openings for the mouth, eyes, nostrils, gill opening, fins, anus and flexible peduncle. The hard carapace comprises hexagonal or polygonal scale plates firmly joined to each other. Scale plates often granulated and may form carapace spines over eyes or body in some species. Mouth small and terminal; lips fleshy; premaxilla and maxilla fused, not protrusile; teeth moderate, conical, generally 6–16 in each jaw. No fin spines; most fin rays branched; no pelvic fins. Lateral line inconspicuous. Branchiostegal rays usually 2 + 4. Total vertebrae 9 + 9 or 10 + 8 = 18.

Typically slow, solitary and demersal in tropical and subtropical waters. Some species attain ~60 cm TL, but most reach only 15–20 cm TL. Habitats include coral and rocky reefs, estuaries, seagrass beds, and open sandy or silty bottom, to ~100 m deep. The absence of small males coupled with transitional female-to-male colour patterns of some species raises the possibility of protogynous sexual transition in some boxfishes. Eggs and larvae are planktonic. Juveniles and adults feed on crustaceans, small molluscs, worms, echinoderms, sponges, tunicates, bryozoans and algae. Caught in traps and considered a delicacy in the Caribbean, but not eaten in the WIO region because of their close relationship with the poisonous pufferfishes (Tetraodontidae). If a boxfish is stressed or confined with other fishes, the lips and skin of the oral cavity produce a foamy toxic secretion called ostracitoxin,

which can kill fishes in confined quarters but is less toxic to the boxfish itself. The dried-out carapaces of boxfish are often washed up on beaches and kept as curios.

The anomalous record of the Atlantic species *Acanthostracion quadricornis* (Linnaeus 1758) from Algoa Bay, South Africa (SSF No. 266.1), is unsubstantiated. According to JLB Smith (SFSA, p. 411) the species was reported once from Algoa Bay, although MM Smith's painting (SSF: Pl. 141) is labelled 'Knysna.' Five genera and 22 species (Matsuura 2015); 3 genera and 11 species in WIO.

KEY TO GENERA

- 1a Carapace with 3 longitudinal ridges; cross-section triangular; mid-dorsal ridge with a spine *Tetrosomus*



- 1b Carapace with 4 or 5 longitudinal ridges; cross-section rectangular or pentagonal 2

- 2a Carapace with 5 ridges; cross-section pentagonal in adults *Lactoria*

- 2b Carapace with 4 ridges; cross-section rectangular, dorsal surface flat, and no spines or mid-dorsal ridge on carapace *Ostracion*



GENUS *Lactoria* Jordan & Fowler 1903

Carapace with 5 ridges, cross-section pentagonal (adults); pair of spines ('horns') in front of eyes, and a spine on each side of body at anal-fin base. Three species, all in WIO.

KEY TO SPECIES

- 1a No mid-dorsal spine; long spines in front of eyes and on rear of carapace become more elongate with growth, as does caudal fin *L. cornuta*

- 1b Mid-dorsal ridge with spine; short spines ('horns') in front of eyes, and caudal-fin length subequal to HL 2

Continued...

KEY TO SPECIES

- 2a Mid-dorsal ridge and spine feeble; underside of carapace convex *L. diaphana*
- 2b Mid-dorsal ridge and spine distinct; underside of carapace flat *L. fornasini*

Lactoria cornuta (Linnaeus 1758)

Longhorn cowfish

PLATE 117

Ostracion cornutus Linnaeus 1758: 331 (India).

Ostracion chwakaensis Von Bonde 1934: 457, Pl. 23,

Fig. 9 (Chwaka, Zanzibar, Tanzania).

Lactoria cornuta: SSF No. 266.3*; Anderson *et al.* 1998; Fricke *et al.* 2009; Golani & Bogorodsky 2010.

Dorsal fin and anal fin each with 8 or 9 rays; pectoral fins 10 or 11 rays; caudal fin 9 or 10 rays, 8 branched. Prominent spines ('horns') on head and rear of carapace become more elongate with growth, as does the caudal fin, which may exceed half SL.

Cryptic colouring: background pale brown with irregular brown patches and purple, pink or violet spots (1 spot per plate; spots can change colour within seconds), or background olive-green to orange-yellow with blue spots; caudal fin with pale spots or faint dusky spots. Attains 46 cm TL.



Lactoria cornuta, 5 cm SL (S Mozambique). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Gulf of Oman, Red Sea, Kenya to South Africa (Knysna), Madagascar, Aldabra, Seychelles, Mauritius and Maldives; elsewhere to southern Japan, Lord Howe I., Marquesas and Tuamotu Is.

REMARKS Common on seagrass beds, open sandy areas or silty bottom in bays or estuaries, to ~100 m deep. Juveniles may form small groups; adults shy and solitary. Frequently thrown ashore in stormy weather along south coast of South Africa.

Lactoria diaphana (Bloch & Schneider 1801)

Roundbelly cowfish

PLATE 117

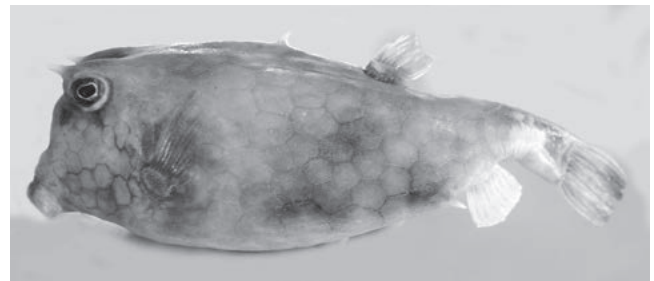
Ostracion diaphanus Bloch & Schneider 1801: 501 [Indonesia].

Lactoria diaphana: Leis & Moyer 1985*; SSF No. 266.4*;

Heemstra & Heemstra 2004*.

Dorsal fin and anal fin each with 9 rays; pectoral fins 10 or 11 rays; caudal fin 10 rays, 8 branched. Small spine (rarely 2 contiguous spines) on mid-dorsal ridge, and pair of short spines ('horns') in front of eyes. Underside of carapace distinctly convex.

Sexually dichromatic. Females: carapace pale grey to white, with irregular black blotches and small black spots; dorsal fin yellowish; pectoral fins hyaline reddish. Males (>20 cm SL) uniformly pale grey. Attains 27 cm SL.



Lactoria diaphana, 27 cm SL (Mauritius). O Alnheim © IMR

DISTRIBUTION Southeastern Atlantic (Swakopmund, Namibia, to Cape Point, South Africa) and Indo-Pacific. WIO: Mozambique (Ibo I.) to South Africa (False Bay), Seychelles, Soudan Bank and Mauritius; elsewhere to Indonesia, southern Japan, Australia, New Caledonia, Kermadec Is., Easter I., Hawaii, southern California and Peru.

REMARKS Small translucent juveniles often found in estuaries. Adults forage over rocks and boulders, to ~61 m deep, feeding mainly on sponges, sea hare eggs and gastropod eggs.

Lactoria fornasini (Bianconi 1846)

Backspine cowfish

PLATE 117

Ostracion fornasini Bianconi 1846: 115, Pl. 1 (Mozambique).

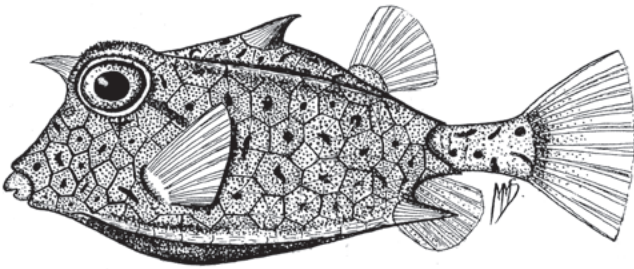
Lactoria fuscocomaculata Von Bonde 1923: 38, Pl. 9 [labelled '*fuscolineata*'], Fig. 1 (KwaZulu-Natal, South Africa).

Ostracion adersi Von Bonde 1934: 456, Pl. 23, Fig. 8 (north of Zanzibar, Tanzania).

Lactoria fornasini: SFSA No. 1180*; Sanches 1963*; SSF No. 266.5*; Fricke 1999; Manilo & Bogorodsky 2003.

Dorsal fin and anal fin each with 9 rays; pectoral fins 10 or 11 rays; caudal fin 10 rays, 8 branched. Mid-dorsal ridge with stout retrorse spine. Ventrolateral ridges expanded to create wide-bottomed shape.

Cryptic colouring: plates pale brown or yellowish, with central blue or magenta spot that can change colour within seconds. Attains 23+ cm TL.



Lactoria fornasini, 12 cm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: East Africa (common) to South Africa (False Bay, sometimes to southeastern Atlantic), Aldabra, Seychelles, Soudan Bank, Mauritius and Maldives; elsewhere to Indonesia, southern Japan, Australia, Lord Howe I. and Hawaii.

REMARKS Inhabits coral reefs and weedy areas, at 5–80 m (usually <30 m deep). Forages over sand and feeds mainly on polychaete worms, ascidians, amphipods and algae.

GENUS *Ostracion* Linnaeus 1758

Characterised by smooth, quadrangular carapace, broader ventrally; dorsal surface and ridges slightly rounded; no spines on carapace. About 7 species, 6 in WIO.

KEY TO SPECIES

- 1a Colour of juveniles (<10 cm SL): yellow-orange or pale grey, covered with small black spots. Colour of females (<25 cm SL): mustard-yellow carapace covered with black-edged round white spots, and often with 1–4 small pale-edged black spots on each plate; median fins also with black spots. Colour of males (>30 cm SL): greenish blue carapace; peduncle and median fins dark blue and covered with small black spots *O. cubicum*
- 1b Colour not as above 2

Continued...

KEY TO SPECIES

- 2a Colour of females (<10 cm SL): dull yellow, covered with small black spots on sides and underside, some spots joining to form short stripes; dorsalmost surface greyish brown with faint irregular darker marks. Colour of males (>9 cm SL): dull greenish yellow carapace dorsally; sides, underside, peduncle and caudal fin dark blue, with numerous black spots; caudal-fin margin may be pale grey; irregular brownish pink blotch on sides below and behind eyes; lips white and fleshy; dorsal fin and anal fin transparent with grey rays *O. cyanurus*
- 2b Colour not as above 3
- 3a Colour of females and juveniles: green, brown or black carapace, peduncle and caudal-fin base, covered with small white spots. Colour of adult males: dark blue carapace on sides, with numerous small golden orange spots or bands, sometimes with irregular gold stripe from over eye along upper lateral ridge to upper part of peduncle; dorsal surface black, with numerous small white or yellowish spots. Head profile slightly convex; caudal-fin margin slightly convex, with rounded corners and broad (unspotted) pale edge *O. meleagris*
- 3b Colours not as above 4
- 4a Head profile slightly concave; body depth ~2.8 in SL. Plates mostly hexagonal; most plates of rear half of abdomen with long pointed central tubercle, and tubercles also on plates of pre-dorsal-fin area. Colour of juveniles (<10 cm SL): dark brown to black, with small round white spots on sides; underside whitish with small faint dark spots; dorsal surface uniformly dark brown. Colour of adult females: dark brown to black, sides of carapace with distinct round and irregular white spots; underside whitish, with brown bands and yellow-edged brown spots on central region. Colour of adult males: blackish dorsally, with small white spots, extending forward to interorbital area, which is crossed by black-edged white band; snout and sides of carapace blue-grey, with prominent black-edged white stripe adjacent to upper ridges; peduncle and caudal fin dark brown, with a few white dots near fin base; underside pale bluish grey, with large, median, black-edged white spot at level of gill opening; upper lip blackish with white edges, and lower lip white *O. trachys*
- 4b Head with median protuberance; body pale grey or tan to silvery white, with black spots 5
- 5a Body oblong, its depth 3.4–3.6 in SL. Males with large, bluntly conical, median protuberance on snout in front of eyes and not in contact with lips *O. rhinorhynchus*
- 5b Snout profile distinctly concave, and snout with short protuberance overhanging fleshy upper lip. Colour of juveniles and females (<20 cm SL): pale grey to silvery white carapace, peduncle and caudal-fin base, with scattered black spots smaller than iris. Colour of adult males (>25 cm SL): white carapace and peduncle, overlain with irregular pale yellow-green blotches, and covered with small round black spots, crowded on dorsal surface to form dark network *O. nasus*

Ostracion cubicum Linnaeus 1758

Yellow boxfish

PLATE 117

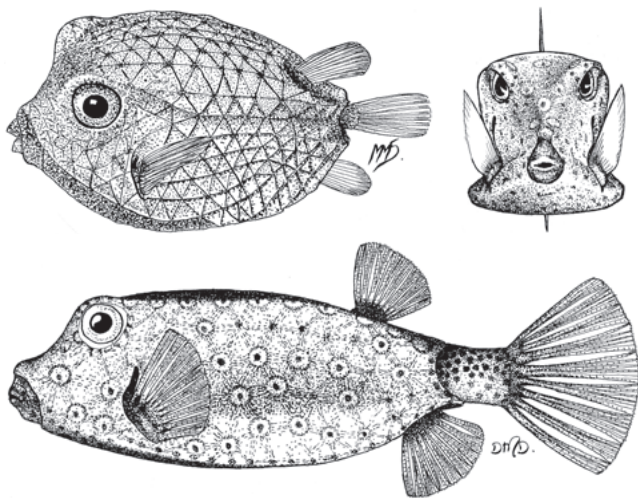
Ostracion cubicum Linnaeus 1758: 332 (India); SFSA No. 1177*; Smith & Smith 1966*; Smith 1980; SSF No. 266.6*; Heemstra & Heemstra 2004*.

Ostracion tuberculatus Linnaeus 1758: 331 (India).

Rhynchostracion nasus (non Bloch 1785): Smith & Smith 1963*.

Dorsal fin 9 rays; anal fin 8–10 rays; pectoral fins 10 or 11 rays; caudal fin 10–12 rays, 8 branched.

Colour pattern as in key. Attains 45 cm TL.



Ostracion cubicum, 3 cm TL, juvenile (top left); and 23 cm TL, anterior and lateral views (all South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa (Knysna), Madagascar, Seychelles, Mauritius, St Brandon Shoals, Chagos, Maldives and Sri Lanka; elsewhere to Indonesia, southern Japan and Tuamotu Is.

REMARKS Solitary; found in lagoons and semi-sheltered seaward reefs, usually to ~75 m deep. Juveniles often live among *Acropora* corals; small juveniles secretive, inhabiting narrow crevices. Feeds primarily on algae with complement of micro-organisms, invertebrates, molluscs, sponges, sand-dwelling polychaetes, crustaceans, foraminifera and fishes. Juveniles popular as aquarium fish.

Ostracion cyanurus Rüppell 1828

Bluetail boxfish

PLATES 117 & 118

Ostracion cyanurus Rüppell 1828: 4, Pl. 1, Fig. 2 (Al-Muwaylih, Tabuk, Saudi Arabia, Red Sea); Randall 1995*; Field 2005*.

Dorsal fin and anal fin each with 9 rays; pectoral fins 11 rays; caudal fin 10 rays, 8 branched. Head profile slightly concave in females, convex in males; lips and chin fleshy and protuberant.

Colour pattern as in key: adult males typically dark blue on sides and underside, and spotted, and greenish yellow on dorsal surface, without spots; probably with transitional female-to-male colour patterns. Attains 15 cm TL.

DISTRIBUTION WIO: Red Sea and Gulf of Aden to Gulf of Oman and Persian/Arabian Gulf.

REMARKS The absence of small male specimens of this species implies a protogynous type of reproduction, with males produced by transformation of adult females, with transitional colour patterns. Solitary; inhabits areas of moderate coral growth.

Ostracion meleagris Shaw 1796

Whitespotted boxfish

PLATE 118

Ostracion meleagris Shaw in Shaw & Nodder 1796; Pl. 253 [South Pacific]; Smith 1980; Randall & Anderson 1993.

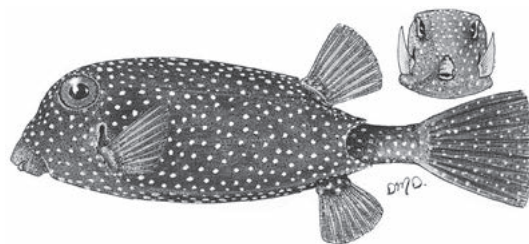
Ostracion lentiginosus: SFSA No. 1176*.

Ostracion sebae: SFSA No. 1177a; Smith & Smith 1963*.

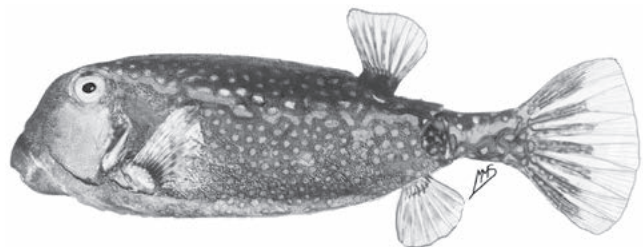
Ostracion meleagris: SSF No. 266.7*.

Dorsal fin and anal fin each with 9 rays; pectoral fins 10 or 11 rays; caudal fin 10 rays, 8 branched.

Sexually dichromatic (colour pattern as in key): juveniles and females brown or green with white spots; large males with orange bands and spots on sides of body. Attains 25 cm TL.



Ostracion meleagris, 18 cm TL, female (S Mozambique). Source: SSF



Ostracion meleagris, 23 cm TL, male (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (juveniles to Struis Bay, Western Cape), Madagascar, Comoros, Seychelles, Mauritius, Chagos and Maldives; elsewhere to Indonesia, Japan, Great Barrier Reef, Hawaii and Mexico.

REMARKS Two subspecies are sometimes recognised: *Ostracion meleagris clippertonense* (in eastern Pacific) and *Ostracion meleagris camurum* (from Hawaiian Is.). Bleeker (1851) was confused by the sexual dichromatism of this species, hence his description of the junior synonym *Ostracium* [sic] *sebae*. Solitary; inhabits clear lagoons and seaward reefs from lower surge zone, to at least 30 m deep. Juveniles found among rocky boulders, often with longspined urchins, and adults on reef crests and slopes. Males swim about more openly than females, which are often seen in the vicinity of males. Feeds on tunicates, polychaetes, sponges, molluscs, copepods and algae.

Ostracion nasus Bloch 1785

Shortnose boxfish

PLATE 118

Ostracion nasus Bloch 1785: 118, Pl. 138 (Nile River mouth).
Rhynchostracion nasus: Gloerfelt-Tarp & Kailola 1984*.

Dorsal fin and anal fin each with 9 rays; caudal fin 10 rays, 8 branched. Snout profile distinctly concave, and snout with short protuberance overhanging fleshy lips. Carapace of females somewhat oblong, body depth ~3.3 in SL; carapace of males deeper and broader, and snout protuberance thicker and wider.

Colour pattern as in key. Attains 30 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Sri Lanka; elsewhere to Indonesia, Philippines, Micronesia (Chuuk Is.) and Fiji.

REMARKS Found over rocky and sandy bottom, at 2–80 m. Bloch's type locality is dubious for this Indo-Pacific species.

Ostracion rhinorhynchus Bleeker 1851

Torpedo boxfish

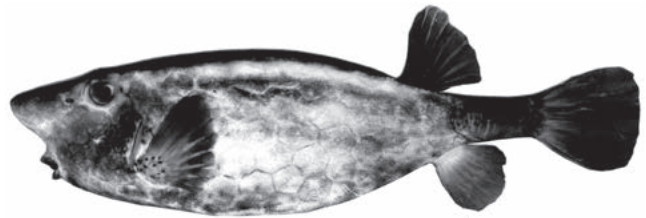
PLATE 118

Ostracion rhinorhynchus Bleeker 1851: 34, Pl. 6, Fig. 12 (Jakarta, Java, Indonesia).

Rhynchostracion rhinorhynchus: Randall & Anderson 1993*;
Gloerfelt-Tarp & Kailola 1984*.

Dorsal fin and anal fin each with 9 rays; caudal fin 10 rays, 8 branched. Males with large, bluntly conical, median protuberance in front of eyes and not in contact with lips. Carapace oblong, body depth 3.4–3.6 in SL; mid-dorsal ridge weakly developed; ventrolateral ridges sharp, but without spines.

Body pale grey dorsally, with or without small dark spots, but spots more distinct on peduncle and more diffuse on sides of body, forming dusky patch on each plate; underside white; pectoral-fin bases pale with a few black spots, and fins dusky; plates below eyes with dark edges. Attains 37 cm TL.



Ostracion rhinorhynchus, 29 cm SL (Maldives).

Source: Randall & Anderson 1993

DISTRIBUTION Indo-Pacific. WIO: Maldives and possibly Sri Lanka; elsewhere to Indonesia, Philippines, Palau, southern Japan and northern Australia.

REMARKS Uncommon; solitary or in pairs; inhabits rubble substrates in channels between sheltered inner reefs or deep sandy lagoons around coral patches, at 35–37 m. Feeds on benthic invertebrates.

Ostracion trachys Randall 1975

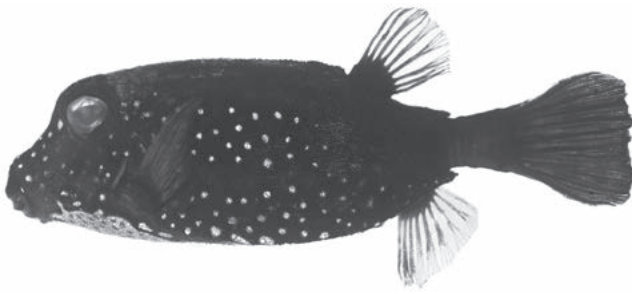
Rough boxfish

PLATE 118

Ostracion trachys Randall 1975: 59, Fig. 1a–b (Mauritius, Mascarenes).

Dorsal fin and anal fin each with 9 rays; caudal fin 10 rays, upper and lowermost unbranched, and fin margin convex. Carapace oblong, body depth ~3 in SL; dorsal and ventral surfaces convex, sides concave; end of carapace at sides (at peduncle) distinctly concave; HL (from tip of upper lip to upper edge of gill opening) ~3.4 in SL; peduncle depth ~3 in HL. Lips fleshy and plicate; teeth forward-projecting and slightly compressed, 10 in upper jaw, 8 in lower jaw. Plates mostly hexagonal, strongly tuberculate, with long pointed central tubercle on most plates of rear half of abdomen and upper surface anterior to dorsal fin.

Colour pattern as in key. Attains 12 cm TL.



Ostracion trachys, 10 cm SL (Mauritius). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Mauritius and Réunion.

REMARKS Secretive, often found hiding in holes and under ledges, at 15–30 m.

GENUS *Tetrosomus* Swainson 1839

Carapace triangular in cross-section, and closed behind dorsal fin and anal fin; mid-dorsal and ventrolateral ridges sharp. Dorsal fin set distinctly ahead of anal fin. Two species, both in WIO.

KEY TO SPECIES

- 1a Mid-dorsal ridge with sharp conical spine; dorsal profile of carapace slightly concave from above eyes to mid-dorsal spine; ventrolateral ridge with 4 or 5 acute spines *T. gibbosus*
- 1b No strong mid-dorsal ridge spine; dorsal profile of carapace distinctly convex from above eyes to dorsal fin, and with 1 or 2 small recumbent spines *T. reipublicae*

Tetrosomus gibbosus (Linnaeus 1758)

Humpback boxfish

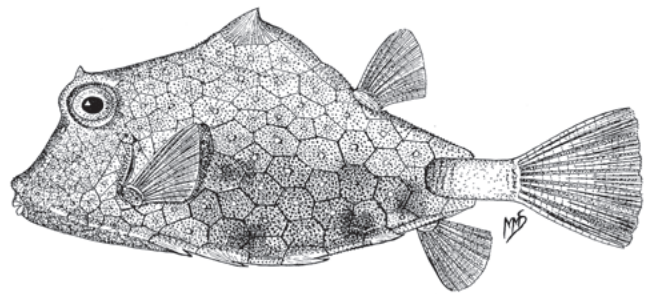
PLATE 119

Ostracion gibbosus Linnaeus 1758: 332 (India).

Tetrosomus gibbosus: Gloerfelt-Tarp & Kailola 1984*; SSF No. 266.10*; Randall & Anderson 1993; Golani & Bogorodsky 2010.

Dorsal fin 9 rays; anal fin 9 or 10 rays; caudal fin 10 rays, 8 branched. Body depth 1.8–2.1 in SL. Spine on mid-dorsal ridge and 4 or 5 spines along ventrolateral ridge diminish with growth; some specimens with tiny spine above each eye.

Carapace pale brownish, with irregular dark spots or blotches and reticulations, and sometimes with irregular pale blue streaks. Attains 30 cm TL.



Tetrosomus gibbosus, 23 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea to South Africa (KwaZulu-Natal), Mauritius and Maldives; elsewhere to Indonesia, southern Japan and northern Australia; Lessepsian migrant to Mediterranean Sea.

REMARKS Inhabits deep coastal slopes or sheltered muddy or sandy substrates, usually offshore, at 37–110 m, but occasionally in shallow water near seagrass beds with silty rubble substrates. Feeds on macroalgae and benthic invertebrates. Commercially harvested in some parts of its range for the aquarium trade.

Tetrosomus reipublicae (Whitley 1930)

Triangular boxfish

PLATE 119

Lactophrys reipublicae Ogilby 1913: 92 (Moreton Bay, Queensland, Australia) [*nomen nudum*].

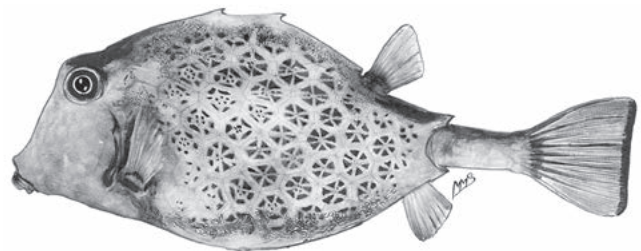
Triurus reipublicae Whitley 1930: 27, Pl. 1, Fig. 2 (Moreton Bay, Queensland, Australia) [based on *Lactophrys reipublicae* Ogilby 1913 plus additional material].

Tetrosomus concatenatus (non Bloch 1785): SSF No. 266.9*.

Tetrosomus reipublicae: Gloerfelt-Tarp & Kailola 1984*; Matsuura 2014.

Dorsal body profile smoothly convex; body depth ~2.3 in SL. Dorsal fin 9 rays; anal fin 9 or 10 rays; pectoral fins 10 or 11 rays; caudal fin 10 rays, 8 branched.

Carapace yellowish, with irregular blue lines or streaks; most plates blue with yellow radial lines. Attains 30 cm TL.



Tetrosomus reipublicae, 28 cm TL, male (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Mozambique to South Africa (False Bay), Madagascar and Réunion; elsewhere to Indonesia, southern Japan, northern Australia and New Caledonia.

REMARKS Found in muddy bays and estuaries, over flat bottom, from shore to ~107 m deep; usually associated with large, remote sponges.

GLOSSARY

protogynous (hermaphrodite) – an individual that functions first as a female and then changes to a male.

FAMILY ARACANIDAE

Trunkfishes

Phillip C Heemstra

Head and body enclosed in bony shell or carapace, but with openings for the mouth, eyes, gill opening, fins, anus and flexible peduncle. The hard carapace usually comprises hexagonal scale plates firmly joined to each other but with numerous tiny plates on peduncle separate from main carapace, the anteriormost plates joined and articulate with carapace; scale plates often granulated and may form carapace spines over eyes or on body in some species. Mouth small and terminal; lips fleshy; teeth moderate, conical, generally <16 in each jaw. No pelvic fins. No fin spines; most fin rays branched. Branchiostegal rays 1 + 4 or 2 + 3; gill opening a moderately short slit in front of pectoral-fin base. Lateral line inconspicuous. Total vertebrae 18.

Occur in temperate to tropical waters of Indo-Pacific, at 5–300 m (Matsuura 2015); typically slow and demersal. Little known of their WIO habitats; specimens usually collected from trawls. Some authors have placed trunkfishes as a subfamily of Ostraciidae but recent studies (Santini & Tyler 2003; Santini *et al.* 2013) show sufficient characters to elevate Aracaniinae to family level. Five genera and 13 species; 1 species in WIO.

GENUS *Kentrocapros* Kaup 1855

Dorsal surface of carapace flat; caudal fin 9 branched rays. Five species (Matsuura 2015), 1 in WIO.

Kentrocapros rosapinto (Smith 1949)

Basketfish

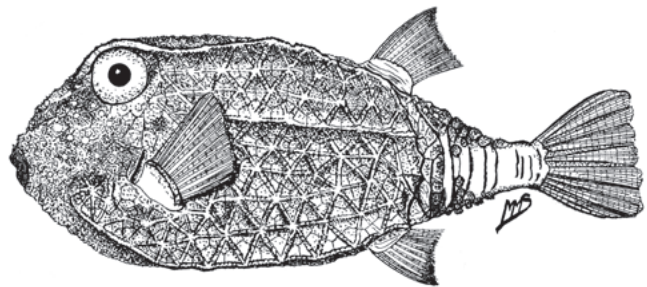
PLATE 119

Aracanostracion rosapinto Smith 1949: 355, Fig. 1 (Maputo Bay, Mozambique); Smith 1953; SFSA No. 1172a*.

Kentrocapros rosapinto: Matsuura & Yamakawa 1982*; SSF No. 266.2*; Collette & Parin 1991*; Matsuura 2015*.

Dorsal fin and anal fin each with 10 or 11 rays; pectoral fins 11–13 rays; caudal fin 11 rays, 9 branched. Dorsal snout profile convex in males, concave or straight in females. Carapace flat in area between upper ridges and also between lower ridges; ridges sharp, but without spines; low midlateral ridge; 2 full plates obliquely between upper ridge and midlateral ridge; 4 plates between midlateral ridge and lower ridge. Gill opening almost vertical, below rear edge of eye. Lips thickly papillose; each jaw with single row of 8 inconspicuous conical teeth.

Females presumably with pale yellowish grey carapace, with numerous round dark spots above level of pectoral-fin bases and on peduncle; median fins hyaline, but rays dusky yellow; lips dark brown; teeth reddish brown. Males presumably with yellowish brown carapace dorsally, and yellow midlateral stripe running from mouth and under eye to upper part of peduncle, with bright blue lateral plates above stripe; snout blue, lips red; median fins yellow, but large specimens with narrow dark caudal-fin margin; dorsal- and anal-fin bases white; pectoral-fin bases pale yellow. Attains 16 cm TL.



Kentrocapros rosapinto, 15 cm TL, holotype (S Mozambique).

Source: Smith 1949

DISTRIBUTION WIO: Mozambique (Bazaruto I.) to South Africa (KwaZulu-Natal), Madagascar, Seychelles, Mauritius, Saya de Malha Bank and Walters Shoals.

REMARKS Found in 21–210 m. Generally solitary, sometimes in pairs, but 8 specimens once trawled together off Bazaruto, southern Mozambique.

FAMILY TRIODONTIDAE

Threetooth puffer

Phillip C Heemstra

Body oblong and moderately compressed, with enlarged, extensible, compressed pouch extending from lower jaw to anus; pouch supported by 6 slender ribs and elongate pelvic bone; peduncle long and slender. Mouth beak-like, with teeth fused to form 2 tooth plates in upper jaw and single V-shaped plate in lower jaw. Dorsal fin and anal fin acute, with short bases, unbranched segmented rays, and no spines; pectoral fins short and rounded, with branched rays; no pelvic fins; caudal fin forked, 10 branched rays, and 8 or 9 procurrent rays. Gill opening restricted to vertical slit in front of pectoral-fin base. Scales small and plate-like, spinoid, with 1–5 spinules. Vertebrae 9 + 11.

Monotypic.

Triodon macropterus Lesson 1829

Threetooth puffer

PLATE 120

Triodon macropterus Lesson 1829: 103, Pl. 4 (Mauritius, Mascarenes); Tyler 1967*; SSF No. 267.1*; Johnson & Britz 2005*; Matsuura 2015*.
Triodon bursarius: Smith 1953*.

Diagnosis as for family. Dorsal fin 10–12 rays; anal fin 9 or 10 rays; pectoral fins 14–16 rays. Interorbital area slightly concave; eye diameter ~1.6 in interorbital width. Gill arches 4; gill rakers short, 6/8 on 1st arch, plus 4 rudiments at front of lower limb.

Body yellowish brown dorsally, paler below; belly flap yellow with concentric series of merging white spots and conspicuous black blotch midlaterally on upper part of flap. Attains 60 cm TL.

DISTRIBUTION Indo-Pacific. WIO: South Africa (Eastern Cape and KwaZulu-Natal), Mozambique, Mauritius, Chagos and India; elsewhere to Indonesia, Philippines, Korea, Japan, Australia, New Caledonia and Tonga.

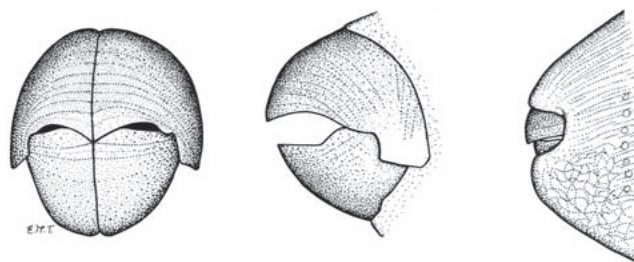
REMARKS Rare; demersal and associated with rocky and coral reefs, at 50–377 m (Matsuura 2015). Caught by trawl and benthic longlines at ~160–414 m.

FAMILY TETRAODONTIDAE

Puffers, tobies

Keiichi Matsuura

Small- to medium-sized (<90 cm TL), able to inflate their body by swallowing air or water as a predator defence, forming an almost spherical body, aided by tough elastic skin, with or without small spinules present on dorsum and/or belly and sometimes the sides. Head large and blunt; 4 heavy powerful teeth: 2 teeth fused into beak-like plate in each jaw. Dorsal fin and anal fin located far back, each with 7–15 soft rays, no fin spines; no pelvic fins; caudal fin truncate, rounded or emarginate to barely lunate. Gill opening a simple slit in front of pectoral fins. Usually 1 or 2 lateral lines, often indistinct (e.g., in *Canthigaster*) and forming interconnecting pattern on sides of head and body, but quite distinct in some genera (e.g., *Lagocephalus* and *Torquigener*), and absent in *Pelagocephalus marki*.



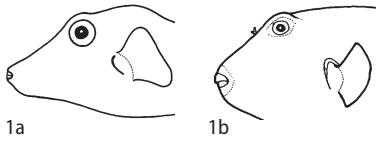
Teeth of *Canthigaster amboinensis*. Source: SSF

Many species excrete a poison (tetrodotoxin) from the skin. Consequently, the skin, flesh, viscera and blood of most species are toxic. It is strongly advised not to eat puffers outside of licensed restaurants. Commercially important in several countries (especially Japan and Korea); taken by trawls, longlines and traps.

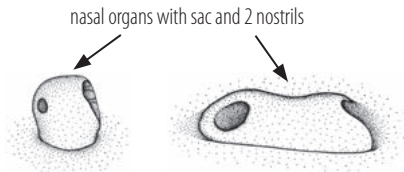
Occur in tropical to temperate seas, most frequently inhabiting shallow inshore waters and sometimes entering brackish or fresh water, but a few species are pelagic. Twenty-seven genera and ~184 species worldwide; 10 genera and 41 species in WIO.

KEY TO GENERA

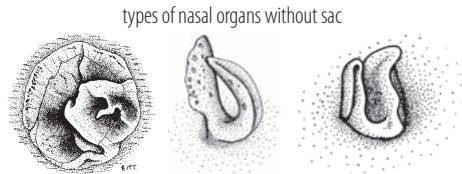
- 1a Snout long, 1.3–1.8 in HL; nostrils or nasal organ barely visible without magnification; dorsal surface of head and nape with fleshy ridge *Canthigaster*
- 1b Snout short, 1.8–3.1 in HL; nasal organ easily visible without magnification; dorsal surface posterior to eyes more or less smooth, without fleshy ridge 2



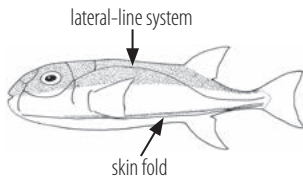
- 2a Nasal organ covered by small sac with 2 nostrils 3



- 2b Nasal organ not covered by small sac with 2 nostrils 8

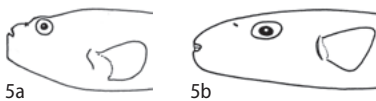


- 3a No raised skin fold along ventrolateral part of peduncle 4
- 3b Raised skin fold along ventrolateral part of peduncle 5

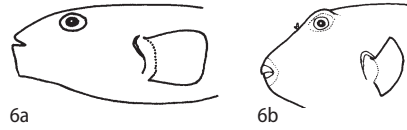


- 4a No spinules on head or body *Sphoeroides*
- 4b Spinules cover head and body except for peduncle *Tylerius*

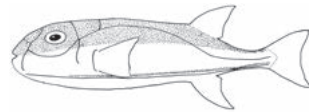
- 5a Mouth supraterminal (at or above level of upper pectoral-fin bases) *Amblyrhynchote*
- 5b Mouth terminal 6



- 6a Chin distinct *Torquigener*
- 6b Chin indistinct 7



- 7a Lower half of body silvery white, contrasting with dark dorsal half *Lagocephalus*



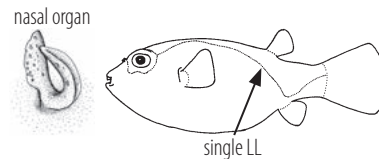
- 7b Body variously coloured, but lower half of body not silvery white *Takifugu*

- 8a Nasal organ plate-like, wrinkled, barely elevated above surface of snout *Pelagocephalus*

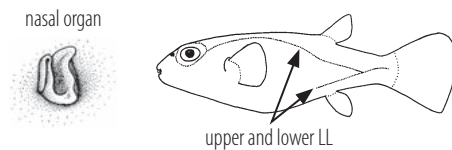


- 8b Nasal organ not plate-like, but distinctly elevated above surface of head 9

- 9a Single lateral line on sides of body; nasal organ with a single bifid tentacle *Arothron*



- 9b Two lateral lines: upper line joining lower line in region above or behind anal fin; nasal organ a depression with slightly raised anterior and posterior margins forming pair of elongate flaps *Chelonodontops*



GENUS *Amblyrhynchote* Duméril 1855

Mouth supraterminal, at or above level of upper pectoral-fin base, and chin usually prominent; nasal organ covered by small sac with 2 nostrils; ventrolateral skin fold prominent between anus and caudal-fin base; small spinules on back and belly. One species.

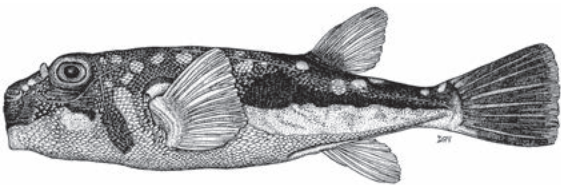
Amblyrhynchote honckenii (Bloch 1785)

Evil-eye puffer PLATE 120

Tetrodon honckenii Bloch 1785: 133, Pl. 143 (China; East Indies).
Sphoeroides marleyi Fowler 1929: 263, Fig. 6 (Thukela River mouth, KwaZulu-Natal, South Africa).
Amblyrhynchotes honckenii: SSF No. 268.1*; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004*.

Diagnosis as for genus. Dorsal fin 9 or 10 rays; anal fin 8 rays; pectoral fins 14–16 rays; peduncle short, 3.6–4.6 in SL; bony interorbital width 3.8–7.7 in HL. Body somewhat squarish in cross-section.

Dorsal surface blackish brown, with yellowish white spots; sides yellow; ventral surface whitish; dorsal fin, pectoral fins and caudal fin dusky with yellow tinge; anal fin yellow in breeding females, white in males. Attains 30 cm TL.



Amblyrhynchote honckenii, 8 cm SL (South Africa). Source: Whitfield 1998



Amblyrhynchote honckenii, 21 cm TL (WIO). Source: SFSA

DISTRIBUTION Southeastern Atlantic (Cape of Good Hope) and Indo-Pacific. WIO: Persian/Arabian Gulf Gulf, Kenya, Mozambique, South Africa (common: False Bay to KwaZulu-Natal), Madagascar, Réunion, Mauritius and India; elsewhere to China, Micronesia, southern Japan and Coral Sea (northeastern Australia).

REMARKS Found in tidepools, estuaries and in the sea, to ~400 m deep.

GENUS *Arothron* Müller 1841

Body ovoid, broad and heavy; single lateral line on sides of body; nasal organ with single bifid tentacle; spinules on body developed; no skin fold on ventrolateral part of body. Most species solitary, but young of *A. firmamentum* form schools. About 14 species, 11 in WIO.

KEY TO SPECIES

- 1a Back and sides brown with many longitudinal white lines, and belly yellowish white *A. multilineatus*
- 1b No longitudinal black lines on back 2
- 2a No colour markings on body; caudal fin dusky yellow with prominent black margin *A. immaculatus*
- 2b Body with various colour markings; no black margin on caudal fin 3
- 3a Dorsal fin and anal fin bluntly pointed; dorsal fin and anal fin each with 13–15 (usually 14) rays *A. firmamentum*
- 3b Dorsal fin and anal fin rounded; dorsal fin and anal fin each with 9–12 rays 4
- 4a Eyes encircled by alternating dark brown and pale blue lines *A. caeruleopunctatus*
- 4b Eyes not encircled by lines 5
- 5a Many dark brown lines radiating from eyes *A. mappa*
- 5b No radiating lines from eyes 6
- 6a Many prominent longitudinal dark brown lines on belly *A. inconditus*
- 6b No longitudinal dark brown lines on belly 7
- 7a Sides of head and ventrolateral part of body with wide dark vertical bars, and upper body dark with many white spots *A. hispidus*
- 7b No vertical dark bars on head or body 8
- 8a Mouth surrounded by dark brown area 9
- 8b No dark brown area surrounding mouth (black phase of *A. meleagris* entirely black with many white spots) 10

Continued...

KEY TO SPECIES

- 9a Wide transverse dark brown band across eyes *A. diadematus*
 9b No dark band between eyes *A. nigropunctatus*
- 10a Upper body of adults white with many black spots, creating network pattern, and mostly white ventrally (juveniles with many dark bands on belly) *A. stellatus*
 10b Body and fins entirely dark brown to black, covered with many white spots; yellow-phase individuals with yellow body with many black or dark brown speckles *A. meleagris*

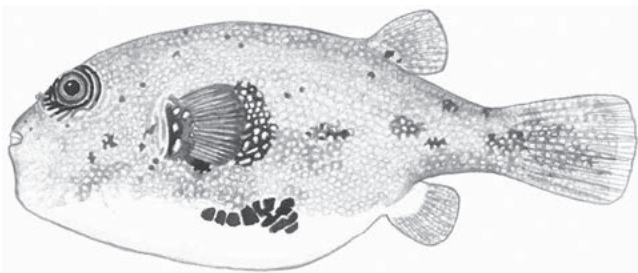
Arothron caeruleopunctatus Matsuura 1994

Blue-spotted puffer PLATE 120

Arothron sp. Gloerfelt-Tarp & Kailola 1984: 294 (Lesser Sunda Is., Indonesia).*Arothron stellatus* (*non* Bloch & Schneider 1801): Masuda 1984*: 194 (Maldive Is.).*Arothron caeruleopunctatus* Matsuura 1994: 29, Figs. 1–2 (Bikini Atoll, Marshall Is.); Fricke 1999; Fricke *et al.* 2009.

Dorsal fin 11 or 12 rays; anal fin 10–12 rays; pectoral fins 18 or 19 rays.

Head and body brown dorsally, covered with many pale blue spots; eyes circled by alternating dark brown and pale blue lines; pale ventrally, with or without black blotches just below pectoral fins. Attains 80 cm TL.

*Arothron caeruleopunctatus*, 4 cm SL (Réunion).

DISTRIBUTION Indo-Pacific. WIO: Réunion, Mauritius and Maldives; elsewhere to Indonesia, Japan, Marshall Is., New Guinea and Coral Sea (northeastern Australia).

REMARKS Solitary; found on coral reefs, at 2–50 m.

Arothron diadematus (Rüppell 1829)

Masked puffer

PLATE 121

Tetraodon diadematus Rüppell 1829: 65, Pl. 17, Fig. 3 (Red Sea).*Arothron diadematus*: Randall 1983*; Dor 1984.

Dorsal fin and anal fin each with 10 rays; pectoral fins 18 or 19 rays.

Body pale brown with orange tinge dorsally, and paler ventrally, frequently with brown spots; dark brown band across eyes, separated by white region from broad dark brown area around mouth. Attains 30 cm TL.

*Arothron diadematus*, 15 cm SL (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Endemic to Red Sea.

Arothron firmamentum (Temminck & Schlegel 1850)

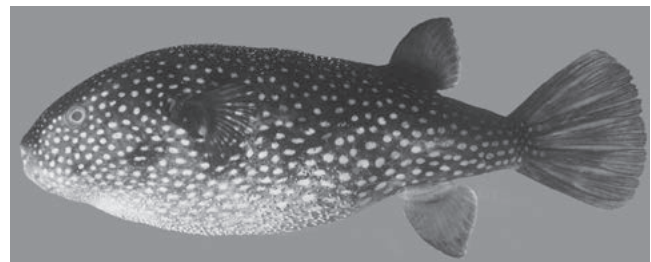
Starry puffer

PLATES 120 & 121

Tetraodon firmamentum Temminck & Schlegel 1850: 280, Pl. 126, Fig. 2 (Japan).*Arothron firmamentum*: Hardy 1980*; Masuda *et al.* 1984*; Díaz de Astarloa *et al.* 2003; Heemstra & Heemstra 2004.

Dorsal fin and anal fin each with 13–15 rays, and fins bluntly pointed; pectoral fins 15–17 rays. Body relatively oblong (streamlined) compared to congeners.

Head and body bluish black, covered with many white spots. Attains 43 cm TL.

*Arothron firmamentum*, 34 cm TL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Southwestern Atlantic (Argentina) and Indo-Pacific. WIO: South Africa (south coast); elsewhere antitropical in Pacific Ocean (Taiwan, Japan, southeastern Australia and northern New Zealand).

REMARKS Young observed forming schools.

Arothron hispidus (Linnaeus 1758)

Whitespotted puffer

PLATE 121

Tetraodon hispidus Linnaeus 1758: 333 (India).

Tetraodon perspicillaris Rüppell 1829: 63 (Red Sea).

Tetraodon semistriatus Rüppell 1837: 58, Pl. 16, Fig. 3 (Massawa, Eritrea, Red Sea).

Tetrodon pusillus Klunzinger 1871: 645 (Al-Qusayr, Egypt, Red Sea).

Arothron hispidus: SSF No. 268.2*; Goren & Dor 1994; Randall 1995*; Fricke 1999; Heemstra & Heemstra 2004*; Fricke *et al.* 2009.

Dorsal fin and anal fin each with 10 or 11 rays; pectoral fins 17–19 rays.

Head and body greenish brown dorsally, with many small white spots, becoming white ventrally, with curved dark stripes; wide dark vertical bars on sides of head and body; pectoral-fin bases and gill opening encircled with alternating white or yellow and black lines. Attains 45 cm TL.



Arothron hispidus, 33 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific to eastern Pacific. WIO: Oman, Red Sea, Kenya to South Africa (Knysna), Madagascar, Seychelles, Réunion, Mauritius, St Brandon Shoals and India; elsewhere to Indonesia, southern Japan (Ogasawara Is.), New Caledonia, Lord Howe I., Rapa Iti, Hawaii and Panama.

REMARKS Inhabits coral reefs, to ~59 m deep, but juveniles frequently occur in weedy areas of estuaries.

Arothron immaculatus (Bloch & Schneider 1801)

Blackedged puffer

PLATE 121

Tetrodon immaculatus Bloch & Schneider (ex Lacepède) 1801: 507 [no locality given].

Tetrodon sordidus Rüppell 1829: 64 (Massawa, Eritrea, Red Sea).

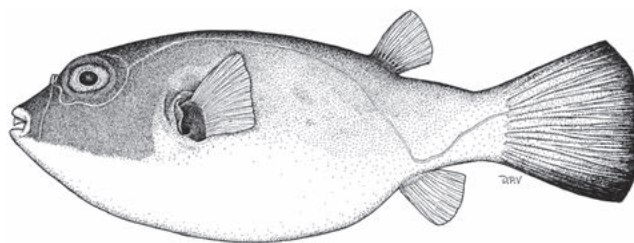
Tetraodon parvus Joannis 1835: Pl. 15 (Al-Qusayr, Egypt, Red Sea).

Arothron immaculatus: SSF No. 268.3*; Kuitert 1998*;

Heemstra & Heemstra 2004*.

Dorsal fin 9–11 rays; anal fin 9 or 10 rays; pectoral fins 16–19 rays.

Body pale brown with olive tinge, without markings; dorsal fin and anal fin yellowish, caudal fin bright yellow with broad black edge, and pectoral-fin rays yellow with hyaline membranes. Attains 30 cm TL.



Arothron immaculatus, 11 cm SL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea, East Africa to South Africa (Knysna), Madagascar, Seychelles, Mascarenes and Maldives; elsewhere to Indonesia, Philippines, Taiwan, Japan (Ryukyu Is.) and northern Australia.

REMARKS Occurs in estuaries; particularly common in areas with sea grasses and mangroves, to ~50 m deep.

Arothron inconditus Smith 1958

Bellystriped puffer

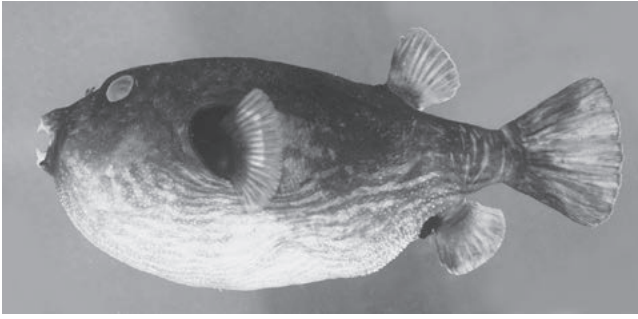
PLATES 120 & 121

Arothron inconditus Smith 1958: 159, Pl. 2, Figs. D–E (Algoa Bay, Eastern Cape, South Africa); SSF No. 268.4*;

Heemstra & Heemstra 2004.

Dorsal fin and anal fin each with 10–12 rays; pectoral fins 18 or 19 rays.

Head and body dark dorsally, paler ventrally; many longitudinal dark brown lines on belly from chin to anal fin; short black line on each side of lower lip; pectoral-fin bases and area around gill opening in large black blotches; fins dusky, except edge of caudal fin narrowly pale in juveniles. Attains 40 cm TL.



Arothron inconditus, 18 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION South Africa (Knysna) to southern Mozambique in WIO.

REMARKS Marine; found to ~153 m deep.

Arothron mappa (Lesson 1831)

Map puffer

PLATE 121

Tetraodon mappa Lesson 1831: 102, Pl. 5 (Doreh Bay, New Guinea).
Arothron mappa: SSF No. 268.5*; Debelius 1999*; Fricke 1999;
Fricke *et al.* 2009.

Dorsal fin 11 or 12 rays; anal fin 10 or 11 rays; pectoral fins 17–19 rays.

Head and body brownish grey, with many irregular dark lines dorsally forming many reticulations (which develop with growth, creating different colour patterns in juveniles and adults); radiating dark lines around eyes at every stage of growth; head and body white ventrally, but anus black. Attains 60 cm TL.



Arothron mappa, 31 cm TL (N Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Mozambique and South Africa (KwaZulu-Natal), Madagascar, Comoros, Seychelles, Réunion, Mauritius and Maldives; elsewhere

to Japan (Ryukyu Is.), Marshall Is., New Guinea, northern Australia, New Caledonia and Samoa.

REMARKS Found in clear lagoons and sheltered seaward reefs, to ~30 m deep. Adults usually occur along deep drop-offs, usually close to shelter; juveniles occasionally found in estuaries. Feeds on algae, sponges and benthic invertebrates.

Arothron meleagris (Anonymous 1798)

Guineafowl puffer

PLATE 121

Tetrodon meleagris Anonymous (ex Commerson in Lacepède) 1798: 684 [Indo-Pacific].

Arothron meleagris: SSF No. 268.6*; Winterbottom *et al.* 1989*; Randall 1995*; Debelius 1999*; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 10–13 rays; anal fin 11–13 rays; pectoral fins 8–21 rays.

Two colour phases: body and fins usually entirely dark brown to black, covered with many tiny white spots; less commonly, yellow-phase individuals with bright yellow body and few widely scattered dark brown spots, and fins usually remain black with many white spots, but mouth not surrounded by dark area. Attains 35 cm TL.



Arothron meleagris, 22 cm SL (Mauritius). © JE Randall, Bishop Museum

DISTRIBUTION Indo-Pacific to eastern Pacific. WIO: Arabian Sea, Oman, Mozambique, South Africa (KwaZulu-Natal), Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; elsewhere to Indonesia, Japan (Ryukyu Is.), New Caledonia, Lord Howe I., Hawaii and Easter I.

REMARKS Inhabits coral reefs, at 2–24 m. Feeds mainly on tips of branching corals, but also on sponges, molluscs, bryozoans, tunicates, foraminifera, algae and detritus.

Arothron multilineatus Matsuura 2016

Many-lined puffer

PLATE 122

Arothron multilineatus Matsuura 2016: 481, Pls. 1–3 (Japan).

Arothron reticularis (non Bloch & Schneider 1801): Schroeder 1980* (Philippines).

Dorsal fin 9–11 rays; anal fin 9–11 rays; pectoral fins 18 or 19 rays.

Lateral and dorsal surfaces of head and body dark greenish-brown covered with many longitudinal white lines; ventral surface of head and body white with light yellowish tinge. Attains 54 cm SL.

DISTRIBUTION WIO: Red Sea and southern Mozambique (photograph only); elsewhere, Japan and Philippines.

REMARKS Observed by divers over sandy bottom from 10–25 m.

Arothron nigropunctatus (Bloch & Schneider 1801)

Blackspotted puffer

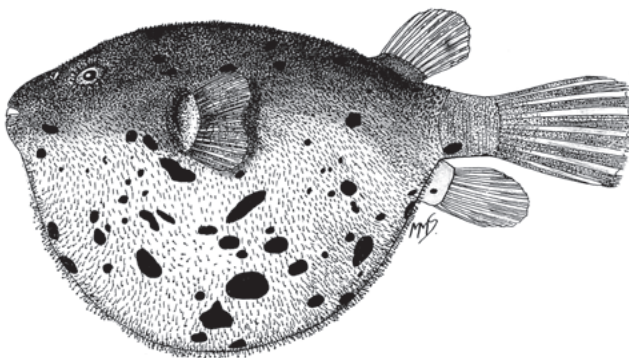
PLATE 121

Tetodon nigropunctatus Bloch & Schneider 1801: 507 (Tharangambadi, India).

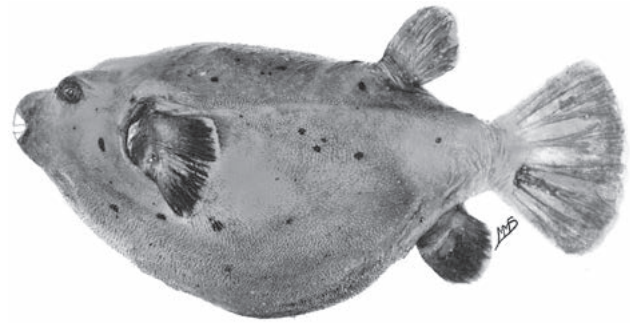
Arothron nigropunctatus: SSF No. 268.7*; Winterbottom *et al.* 1989*; Goren & Dor 1994; Randall 1995*; Debelius 1999*; Fricke 1999; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 9–11 rays; anal fin 10 or 11 rays; pectoral fins 17–20 rays.

Two colour phases: body brown or grey dorsally, paler ventrally, scattered with variously sized dark brown or black spots; yellow form similar to that of *A. meleagris* but differs in always having dark area around mouth. Attains 36 cm TL.



Arothron nigropunctatus, 10 cm TL (Seychelles). Source: SFSA



Arothron nigropunctatus, 36 cm TL (Seychelles). Source: Smith & Smith 1963

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Oman, Kenya to South Africa, Madagascar, Comoros, Mascarenes, Seychelles, Chagos and Maldives; elsewhere to southeastern India, Indonesia, Micronesia, Japan (Ryukyu Is.), Australia, Fiji and Samoa.

REMARKS Generally common; inhabits coastal reefs to outer reef crests and slopes with rich invertebrate growth, at 3–25 m. Adults often occur in pairs. Feeds on corals (usually *Acropora* tips), crustaceans, molluscs, sponges, tunicates and algae.

Arothron stellatus (Anonymous 1798)

Star puffer

PLATE 121

Tetodon stellatus Anonymous (ex Commerson in Lacepède) 1798: 683 (Mauritius, Mascarenes).

Tetodon lagocephalus var. *stellatus* Bloch & Schneider 1801: 503 (Mauritius, Mascarenes).

Tetodon punctatus Bloch & Schneider 1801: 506 ('East India' [not Brazilian seas]).

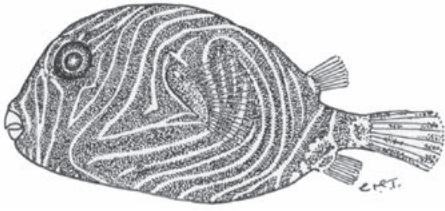
Diodon asper Cuvier 1818: 138, Pl. 6 [no locality given].

Tetodon aerostaticus Jenyns 1842: 152 [no locality given].

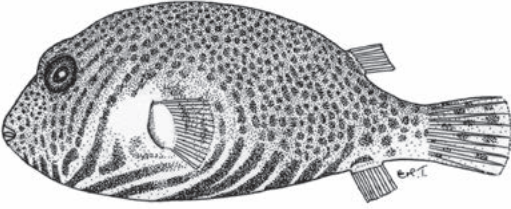
Arothron stellatus: SSF No. 268.8*; Goren & Dor 1994; Randall 1995*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 11 or 12 rays; anal fin 11 rays; pectoral fins 17–20 rays.

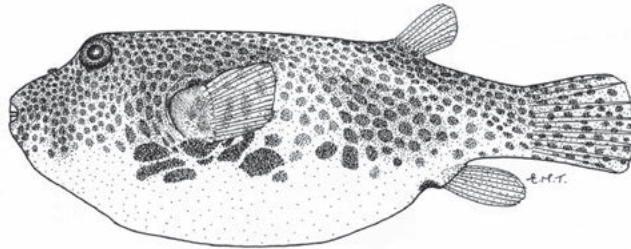
Colour patterns differ considerably with growth. Juveniles yellow to orange, with many black spots dorsally and irregular oblique lines on belly. Adults white, with many close-set black spots dorsally on head and body forming network pattern; underside of head and body white, but anus black; dorsal fin and anal fin usually with some diffuse black spots; pectoral-fin bases and area around gill opening with black spots larger than spots elsewhere. Attains 100 cm TL.



Arothron stellatus, 3 cm TL (South Africa). Source: SSF



Arothron stellatus, 7 cm TL (S Mozambique). Source: SSF



Arothron stellatus, 17 cm TL (S Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Oman, Kenya to South Africa (south coast), Madagascar, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, Japan (Ryukyu Is.), Lord Howe I. and Tuamotu Is.

REMARKS Relatively large-sized. Occurs at 3–58 m. Juveniles found in sandy and weedy inner reefs and often on muddy substrates in estuaries; adults found in clear lagoons, on deep slopes, and on seaward to outer reefs, sometimes swimming high above the substrate and just below the surface.

GENUS *Canthigaster* Swainson 1839

Body and head somewhat compressed, and usually with scattered tiny spinules; dorsal surface of head and nape with fleshy ridge; single inconspicuous nostril (barely visible without magnification); lateral line usually not apparent; caudal fin truncate or slightly rounded. Thirty-eight species, 13 in WIO.

KEY TO SPECIES

- | | | |
|-----|---|------------------------|
| 1a | Dorsal fin 11 or 12 rays; anal fin 11 rays | <i>C. amboinensis</i> |
| 1b | Dorsal fin and anal fin each with 8–10 rays | 2 |
| 2a | Sides of body with 1 or 2 dark longitudinal bands (sometimes fragmented) from pectoral-fin region to peduncle | 3 |
| 2b | Sides of body without longitudinal bands | 6 |
| 3a | Sides of body with 2 parallel, dark, longitudinal bands | 4 |
| 3b | Sides of body with 1 dark longitudinal band (its width about equal to eye diameter) from upper gill opening to upper caudal-fin base; dark brown spot (about equal to eye diameter) on lower side of body | <i>C. inframacula</i> |
| 4a | Body uniformly brown dorsally; 2 dark bands on each side never join each other | <i>C. smithae</i> |
| 4b | Body covered with dark vermiculated pattern or dark spots; 2 dark bands on each side joining together in front of gill opening | 5 |
| 5a | Body with brown vermiculated pattern from snout to peduncle; no vertical wavy lines on caudal fin | <i>C. rivulata</i> |
| 5b | Body with dark spots from nape to peduncle; caudal fin with vertical wavy dark lines | <i>C. punctata</i> |
| 6a | Upper head and body with dark transverse bars | 7 |
| 6b | No dark transverse bars on upper head and body | 8 |
| 7a | Midside of body with 2 prominent dark bars extending to belly | <i>C. valentini</i> |
| 7b | Midside of body with 2 prominent dark bars slightly below pectoral-fin base, but not reaching belly | <i>C. cyanospilota</i> |
| 8a | Caudal fin with pattern of spots or vertical lines | 9 |
| 8b | No spots or vertical lines on caudal fin | 10 |
| 9a | Dorsal fin and anal fin each with 8 or 9 (usually 8) rays; <10 horizontal rows of spots on peduncle | <i>C. margaritata</i> |
| 9b | Dorsal fin and anal fin each with 8–10 (usually 9) rays; >10 horizontal rows of spots on peduncle | <i>C. petersii</i> |
| 10a | Vertical blue lines on head below eyes; pectoral fins usually 17 (occasionally 16) rays | <i>C. pygmaea</i> |
| 10b | No vertical blue lines on head | 11 |

Continued...

KEY TO SPECIES

- 11a Body with uniform pattern of rounded spots, either whitish, bluish, brown or grey; dorsal part of body same colour as sides 12
- 11b Body without uniform pattern of rounded spots; dorsal part of body darker than adjacent region on sides *C. bennetti*
- 12a Sides of head and body with many dark spots; no lines on head below eyes *C. tyleri*
- 12b Sides of head and body with many white spots; head with spoke-like lines radiating from eyes; several horizontal wavy lines on cheek *C. janthinoptera*

Canthigaster amboinensis (Bleeker 1864)

Spotted toby PLATE 121

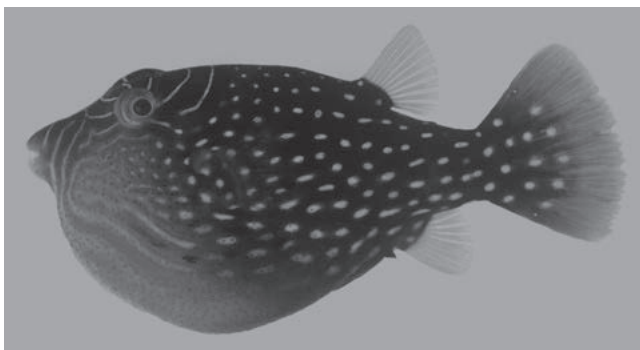
Psilonotus amboinensis Bleeker 1864: 180 (Ambon I., Moluccas, Indonesia).

Tetrodon amboinensis var. *natalensis* Günther 1870: 303 (Durban, KwaZulu-Natal, South Africa).

Canthigaster amboinensis: SSF No. 268.9*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 10–12 rays; anal fin 10 or 11 rays; pectoral fins 16 or 17 rays.

Body brown with numerous white spots; several white lines radiating from eyes; cheek with many pale blue spots or lines; snout with several narrow pale blue lines; dorsal, anal and pectoral fins pale with brown base; caudal fin brown with pale blue spots proximally. Attains 15 cm TL.



Canthigaster amboinensis, 5 cm SL (Mauritius). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Kenya, Mozambique Channel, South Africa (KwaZulu-Natal), Madagascar, Seychelles, Réunion, Mauritius and Maldives; elsewhere to Indonesia, Japan (Ryukyu Is.), Great Barrier Reef, Fiji, Society Is. and Hawaii.

REMARKS Inhabits very shallow water, to ~16 m deep; frequently found in the lower reaches of surge zones, and is one of the faster-swimming species in the genus. Feeds mostly on small invertebrates.

Canthigaster bennetti (Bleeker 1854)

Exquisite toby PLATES 121 & 122

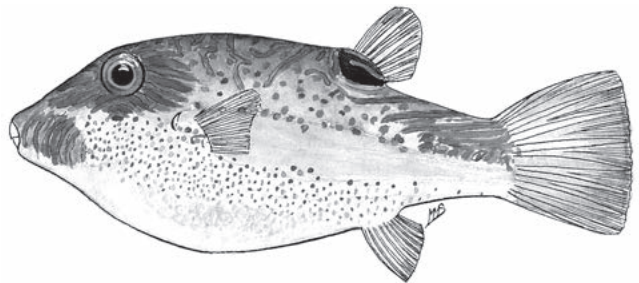
Tropidichthys bennetti Bleeker 1854: 504 (Ambon I., Moluccas, Indonesia).

Tropidichthys oxylophius Smith 1931: 159, Pl. 16 (near Port Alfred, Eastern Cape, South Africa).

Canthigaster bennetti: Allen & Randall 1977*; SSF No. 286.10*; Winterbottom *et al.* 1989*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin 9–11 rays; anal fin 8–10 rays; pectoral fins 14–16 rays.

Head and body greenish brown dorsally, with orange spots overall, and some white spots on sides and dorsum posterior to pectoral fins; sides usually with diffuse dark brown band from upper gill opening to peduncle; body white ventrally, with mostly pale blue spots; eyes with radiating blue lines, and area just behind mouth with a few irregular orange and blue vertical lines; dorsal-fin base with black ocellus and irregular pale blue lines (creating saddle marking); dorsal, anal and pectoral fins transparent; caudal fin usually greenish brown. Attains 10 cm TL.



Canthigaster bennetti, 10 cm TL (Kenya). Source: Smith & Smith 1963

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Eastern Cape), Madagascar, Comoros, Seychelles, Réunion, Mauritius, Chagos and Maldives; elsewhere to Indonesia, Taiwan, Japan (Tanabe Bay), Australia and Tuamotu Is.

REMARKS Inhabits inner reef flats and sheltered lagoons, often found on algal or silty reefs and among attached *Sargassum* in shallow rubble flats. Feeds mainly on filamentous green algae, sponges and benthic invertebrates.

Canthigaster cyanospilota

Randall, Williams & Rocha 2008

Saddle toby

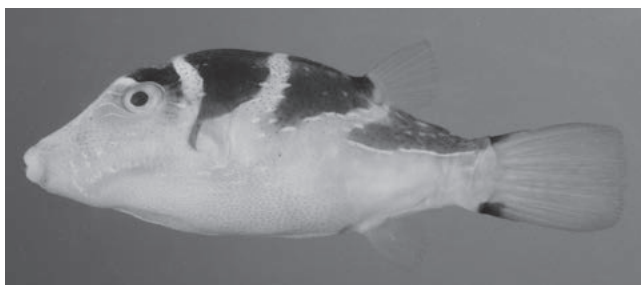
PLATES 122 & 123

Canthigaster cyanospilota Randall, Williams & Rocha 2008: 7, Pl. 2c–h (Eilat, Israel, Gulf of Aqaba, Red Sea); Fricke *et al.* 1999; Williams *et al.* 2012.

Canthigaster coronata (*non* Vaillant & Sauvage 1875) Tyler 1967: 62.
Canthigaster coronata: Allen & Randall 1977*; SSF No. 268.11*; Goren & Dor 1994; Randall 1995*; Manilo & Bogorodsky 2003; Heemstra & Heemstra 2004.

Dorsal fin 9 or 10 rays; anal fin 8–10 rays; pectoral fins 16 or 17 rays.

Head and back with 4 saddle-like black bars (on top of head, between pectoral-fin bases, and on midbody and peduncle), the 2 middle bars extending ventrally to level of pectoral-fin base and not reaching belly; lower half of body white with many pale blue spots; eyes with several radiating pale blue lines; cheeks with pale blue spots; several vertical pale blue lines just behind mouth; dorsal, anal and pectoral fins pale; caudal fin pale with black spot at top and bottom of fin base. Attains 13 cm TL.



Canthigaster cyanospilota, 5 cm SL (Seychelles). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Oman, Red Sea, Gulf of Aden to South Africa (Sodwana Bay), Seychelles and Mascarenes.

REMARKS Randall, Williams & Rocha (2008) divided *C. coronata* (with an original distribution from the Red Sea and East Africa to Hawaii and Tonga) to recognise a complex of 3 species: *C. coronata*, endemic to Hawaii; *C. axiologus* from the Pacific Ocean west of Hawaii, and *C. cyanospilota* from the Indian Ocean and Red Sea. Inhabits seaward reefs on sand and rubble bottom, at 10–80 m. Feeds on a wide variety of benthic organisms, especially molluscs.

Canthigaster inframacula Allen & Randall 1977

Spotbelly toby

PLATE 122

Canthigaster inframacula Allen & Randall 1977: 493, Fig. 7c (Oahu I., Hawaii); Matsuura & Yoshino 1994*; Matsuura & Nguyen 2008*; Fricke *et al.* 2009; Durville *et al.* 2011*.

Dorsal fin 10 rays; anal fin 10 or 11 rays; pectoral fins 16–18 rays.

Body pale brown dorsally, whitish ventrally; dark brown stripe from eyes to upper caudal-fin base; dark brown spot (subequal to eye diameter) on lower sides of body; dark brown lines radiating anteriorly, dorsally and posteriorly from eyes; dorsal, anal and pectoral fins pale with yellow tinge; caudal fin pale, with several dark yellowish spots in transverse rows on rays. Attains 9 cm TL.

DISTRIBUTION Indo-Pacific. WIO: South Africa (Sodwana Bay), Madagascar and Réunion; elsewhere, South China Sea (Vietnam), Japan (Ogasawara Is.) and Hawaii.

REMARKS Benthopelagic; found over rocks and sand, at 120–274 m.

Canthigaster janthinoptera (Bleeker 1855)

Honeycomb toby

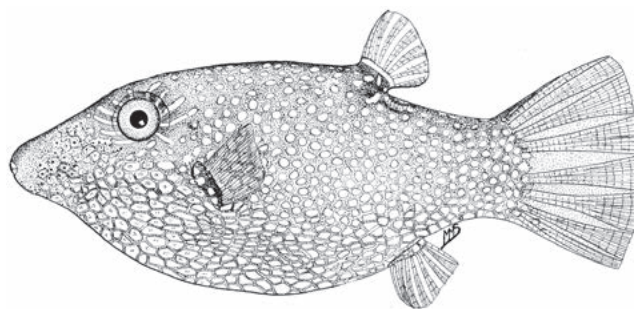
PLATE 123

Tropidichthys janthinopterus Bleeker 1855: 429 (Ambon I., Moluccas, Indonesia).

Canthigaster janthinoptera: Randall & Allen 1977*; SSF No. 268.12*; Winterbottom *et al.* 1989*; Heemstra *et al.* 2004; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin and anal fin each with 8–10 rays; pectoral fins 15–18 rays.

Body reddish brown, with many white spots on sides of head and body, creating reddish brown reticulations; eyes with several radiating reddish brown lines; dark ocellus sometimes present at dorsal-fin base; dorsal, anal and pectoral fins pale; caudal fin reddish brown or brown. Attains 9 cm TL.



Canthigaster janthinoptera (WIO).

DISTRIBUTION Indo-Pacific. WIO: Kenya to South Africa (Transkei region), Madagascar, Comoros, Seychelles, Mascarenes, Chagos and Maldives; elsewhere to Indonesia, southern Japan, New Caledonia, Lord Howe I., Line Is., Marquesas Is. and Oeno I. (Pitcairn Is.).

REMARKS Occurs in clear lagoons and on seaward reefs, to ~55 m deep; solitary or in pairs. Feeds on sponges, polychaetes, other invertebrates and filamentous algae.

Canthigaster margaritata (Rüppell 1829)

Pearl toby

PLATES 122 & 123

Tetraodon margaritatus Rüppell 1829: 66 (El Tur, Egypt, Gulf of Suez, Red Sea).

Canthigaster margaritata: Allen & Randall 1977*; Goren & Dor 1994; Randall 1995*.

Dorsal fin and anal fin each with 8 or 9 rays; pectoral fins 16–18 rays.

Head and body brown dorsally, with many longitudinal short pale blue lines, including radiating pale blue lines from eyes; sides of body and caudal fin darker brown, with many bluish white spots; belly white with many pale blue spots; diffuse black ocellus at dorsal-fin base; dorsal, anal and pectoral fins pale. Attains 11 cm TL.



Canthigaster margaritata, 7 cm SL (Red Sea). © JE Randall, Bishop Museum

DISTRIBUTION WIO: Endemic to Red Sea.

REMARKS Common in tidepools and shallow reef waters. Skin near the dorsal and ventral ridges can be inflated, as for territorial displays among males.

Canthigaster petersii (Bianconi 1854)

False-eye toby

PLATE 123

Tetrodon petersii Bianconi 1854: 68 (Mozambique).

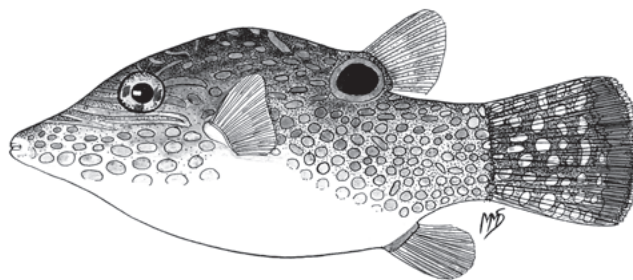
Canthigaster petersii: Allen & Erdmann 2012.

Canthigaster solandri: Allen & Randall 1977*; SSF No. 268.15*;

Randall 1995*; Manilo & Bogorodsky 2003; Fricke *et al.* 2009.

Dorsal fin and anal fin each with 8–10 rays; pectoral fins 16–18 rays.

Body greenish to reddish brown, with many blue spots; eyes with radiating blue lines; bluish-white lines on dorsum and snout; black ocellus at dorsal-fin base; dorsal, anal and pectoral fins pale; caudal fin orange with many blue spots. Attains 11 cm TL.



Canthigaster petersii, 10 cm TL (Mozambique). Source: SFSA

DISTRIBUTION Indian Ocean. WIO: Gulf of Oman, Kenya to South Africa (Eastern Cape), Mozambique Channel, Comoros, Seychelles, Réunion, Mauritius and Maldives; elsewhere, Andaman Sea.

REMARKS Common in shallow waters, at 1–25 m; inhabits intertidal reef flats, lagoons, sheltered rocky reefs and seaward reefs, over open barren areas, among corals or under ledges; often found in pairs, sometimes in small groups. Feeds mainly on filamentous red and green algae and coralline red algae, but also on corals, tunicates, molluscs, echinoderms, polychaetes, crustaceans and bryozoans. Closely related to *C. solandri* (Richardson 1845) from the western and central Pacific and *C. papua* (Bleeker 1848) from the Andaman Sea to New Caledonia.

Canthigaster punctata Matsuura 1992

Darkspotted toby

PLATE 122

Canthigaster punctata Matsuura 1992: 127, Figs. 1–2 (Mascarene Submarine Ridge).

Dorsal fin, anal fin and pectoral fins each with 10 rays.

Head and body pale brownish grey dorsally, with many dark blue spots; eyes with radiating yellow lines; sides and belly white, with 2 parallel dark lines running from pectoral-fin bases to peduncle, joining just in front of gill opening, and narrower yellow lines between dark lines; dorsal, anal and pectoral fins pale; caudal fin with yellow rays and vertical, wavy, dark blue lines. Attains at least 6 cm SL.

*Canthigaster punctata*, 6 cm SL (Seychelles). © JE Randall, Bishop Museum**DISTRIBUTION** WIO: Mascarene Ridge and Seychelles.**REMARKS** Type specimens collected at ~92 m.*Canthigaster pygmaea* Allen & Randall 1977

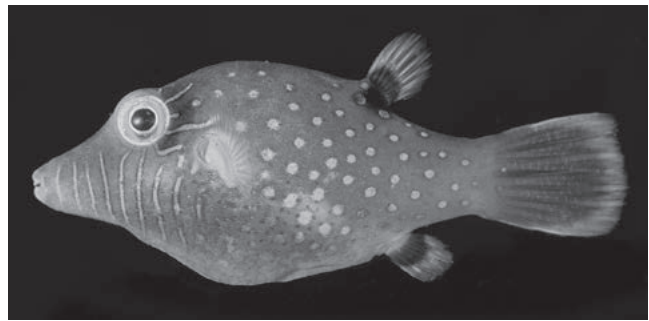
Pygmy toby

PLATES 123 & 124

Canthigaster pygmaea Allen & Randall 1977: 498, Fig. 15 (Eilat, Israel, Gulf of Aqaba, Red Sea).

Dorsal fin 8–10 rays; anal fin 9 or 10 rays; pectoral fins 14–16 rays.

Body brown with blue spots; eyes with posteriorly radiating blue lines; 8 or 9 vertical blue lines from mouth to gill openings; dorsal fin and anal fin pale with dark bases; pectoral fins pale; caudal fin brown with pale blue margins. Attains 6 cm TL.

*Canthigaster pygmaea*, 3 cm SL (Red Sea). © JE Randall, Bishop Museum**DISTRIBUTION** WIO: Red Sea (Gulf of Aqaba).**REMARKS** Known only from the type locality, at 2–30 m.*Canthigaster rivulata* (Temminck & Schlegel 1850)

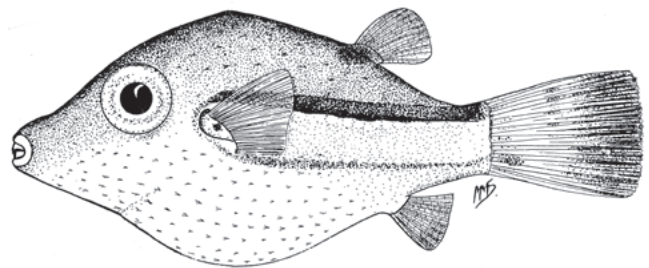
Doubleline toby

PLATES 123 & 124

Tetraodon rivulatus Temminck & Schlegel 1850: 285, Pl. 124, Fig. 3 (Nagasaki Bay, Japan).*Canthigaster rivulata*: SSF No. 268.13*.

Dorsal fin and anal fin each with 9 or 10 rays (dorsal fin usually 10 rays; anal fin usually 9 rays); pectoral fins 16–18 (usually 17) rays.

Head and body brownish grey dorsally, with many short, wavy, dark blue lines creating vermiculate pattern; lower half of body white; sides with 2 parallel dark bands, joined by vertical section curving around front of gill opening; dark blotch at dorsal-fin base; dorsal, anal and pectoral fins pale; caudal fin with yellowish brown rays and dark mark at base of lower rays. Attains 20 cm TL.

*Canthigaster rivulata*, 3 cm TL, juvenile (South Africa). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Mozambique, South Africa (KwaZulu-Natal), Réunion and Mauritius; elsewhere to southern Japan, northwestern Australia and Hawaii.

REMARKS Collected at 20–350 m, although commonly found on shallow coral and rocky reefs.

Canthigaster smithae Allen & Randall 1977

Bicoloured toby PLATE 123

Canthigaster rostratus (non Bloch 1786): Smith 1965.

Canthigaster smithae Allen & Randall 1977: 489, Fig. 5c (off Flic-en-Flac, Mauritius, Mascarenes); SSF No. 268.14*; Fricke 1999; Fricke *et al.* 2009.

Dorsal fin 9 or 10 rays; anal fin 9 rays; pectoral fins 16 or 17 rays.

Upper half of head and body dark brown, with yellow spots from dorsal-fin base to peduncle; sides and belly white, with narrow dark brown line running from region below eyes to peduncle; eyes surrounded by narrow yellow region with radiating blue lines; dorsal, anal and pectoral fins transparent; caudal fin pale, but upper and lower edges dusky. Attains 13 cm TL.



Canthigaster smithae, 7 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Mozambique to South Africa (Protea Banks), Comoros, Seychelles, Réunion, Mauritius, Saya de Malha Bank, Agaléga Is., Chagos and Maldives.

REMARKS Solitary; found on clear inner reefs, on outer reef slopes and near bases of steep walls with mixed rubble, to ~64 m deep.

Canthigaster tyleri Allen & Randall 1977

Tyler's toby PLATES 123 & 124

Canthigaster tyleri Allen & Randall 1977: 497, Fig. 6c (off Flic-en-Flac, Mauritius, Mascarenes); Winterbottom *et al.* 1989*; Fricke 1999.

Dorsal fin and anal fin each with 9 rays; pectoral fins 16 or 17 rays.

Body white, with many dark brown spots (but no spots on belly); dorsal surface of head and body from mouth to above pectoral fins yellowish brown, with several narrow longitudinal dark blue lines behind eyes; snout with 9 or 10 thin transverse dark blue lines; dorsal, anal and pectoral fins pale; caudal fin pale, some rays may be darker. Attains 9 cm TL.



Canthigaster tyleri, 6 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: South Africa, Comoros, Seychelles, Mauritius, Chagos and Maldives; elsewhere to Christmas I. and Indonesia (Banda Sea).

REMARKS Found at 23–43 m.

Canthigaster valentini (Bleeker 1853)

Model toby PLATE 123

Tetraodon valentini Bleeker 1853: 130 (Ambon I., Moluccas, Indonesia).

Tetrodon taeniatus Peters 1855: 462 (Mozambique).

Canthigaster valentini: Allen & Randall 1977*; SSF No. 268.16*;

Winterbottom *et al.* 1989*; Randall 1995*; Manilo & Bogorodsky 2003; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009; Fricke *et al.* 2013.

Dorsal fin and anal fin each with 9 rays; pectoral fins 16 or 17 rays; no spinules.

Body white with 4 distinctive large blackish saddle-like bars (1st on top of head connecting eyes, 2nd and 3rd extend ventrally to belly, and 4th on upper peduncle); dark yellow

spots on sides from pectoral-fin bases to caudal fin; belly white; several dark yellow lines in interorbital region, and 5–7 transverse lines on snout; males with radiating blue lines from eyes; dorsal, anal and pectoral fins pale, with yellowish orange base; caudal fin yellow-orange. Attains 11 cm TL.



Canthigaster valentini, 6 cm SL (South Africa). PC Heemstra © NRF-SAIAB

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Gulf of Oman, Kenya to South Africa (Aliwal Shoal), Mozambique Channel, Comoros, Seychelles, Mascarenes, Saya de Malha Bank, Chagos and Maldives; elsewhere to Indonesia, Japan (Ryukyu Is.), Australia, Lord Howe I. and Tuamotu Is.

REMARKS Common on coastal reefs, at various depths. Demersal spawners; males harem and territorial and often seen fighting; all sexually mature females are territorial. This species is the model mimicked by the filefish *Paraluteres prionurus*, with which it often forms shoals.

GENUS *Chelonodontops* Smith 1958

Mouth below horizontal line through upper end of gill opening; nasal-organ depressions with raised expanded anterior and posterior margins forming pair of elongate flaps; 2 lateral lines: upper line joins lower line in region above or behind anal fin, and lower line extends forward above anal fin; caudal fin truncate with rounded corners; no skin fold along ventrolateral part of peduncle. Four species, 3 in WIO.

Although *Chelonodon* Müller 1841 (type species, *Tetrodon cutcutia* Hamilton 1822) has long been used by many authors, Kottelat (2013: 474–475) clarified that *Chelonodon* cannot be applied to puffers, which should be placed in *Chelonodontops* Smith 1958 (type species, *Chelonodontops pulchellus*

Smith 1958). As shown below *C. pulchellus* is a junior synonym of *Tetrodon pleurospilus* Regan 1919).

KEY TO SPECIES

- 1a Spinules present on upper body; nasal organ a depression with slightly raised margin expanded in front and behind into pair of elongate triangular flaps; body brownish grey with many round white spots, and longitudinal yellow line along ventrolateral part of body, from below mouth to peduncle 2
- 1b No spinules on upper body, but spinules on ventral surface only, from beneath eyes to anus; nasal organ cup-like, with front and rear margins produced into flaps; body white and covered with irregular brown markings *C. pleurospilus*
- 2a Spinules on dorsum from interorbital region to just above pectoral-fin bases; anal fin usually 7–9 (usually 8 or 9) rays; distance between nasal organ and eye 3.5–5% SL *C. laticeps*
- 2b Dorsal surface of body covered with spinules from interorbital region to between rear of pectoral fins and dorsal fin; anal fin usually 8 rays; distance between nasal organ and eye 5.8–7.7% SL *C. patoca*

Chelonodontops laticeps (Smith 1948)

Bluespotted puffer

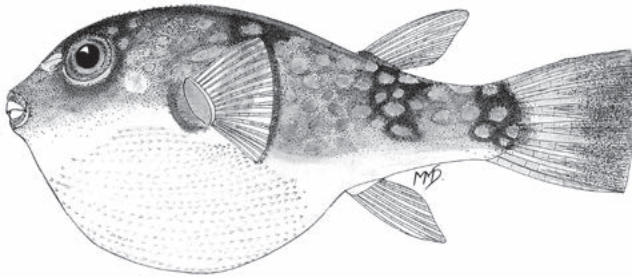
PLATES 123 & 124

Chelonodon laticeps Smith 1948: 344, Fig. 3 (Xora River mouth, Eastern Cape, South Africa); SSF No. 268.17*; Manilo & Bogorodsky 2003.

Chelonodon patoca (non Hamilton 1822): SFSA No. 1201*; Matsuura 2002*.

Dorsal fin 10 rays; anal fin 7–9 rays; pectoral fins 16–18 rays; distance between nasal organ and eye 2.5–5% SL. Spinules on upper body from interorbital region to just above pectoral-fin bases; ventral surface with spinules between throat and anus.

Body brownish grey, with many small white spots; 4 relatively wide dark blotches on dorsal body (first between eyes, and last on peduncle); longitudinal yellow line along ventrolateral part of body, from below mouth to peduncle; all fin margins pale, but fin bases may be slightly darker. Attains 20 cm TL.



Chelonodontops laticeps, 10 cm TL (S Mozambique). Source: SFSA



Chelonodontops laticeps, 10 cm SL (S Mozambique).
PC Heemstra © NRF-SAIAB

DISTRIBUTION WIO: Tanzania to South Africa (Eastern Cape).

REMARKS Found in quiet water among seagrasses.

Chelonodontops patoca (Hamilton 1822)

Milkspotted puffer PLATE 124

Tetodon patoca Hamilton 1822: 7, 362, Pl. 18 (Ganges River estuaries, India).

Tetraodon kappa Bleeker 1850: 16 (India; Java and Sumatra, Indonesia).

Chelonodon patoca: Randall 1995*.

Dorsal fin 10 rays; anal fin 8–10; pectoral fins 16–19 rays; distance between nasal organ and eye 5.8–7.7% SL. Dorsal surface of body covered with spinules from interorbital region to area between tips of pectoral fins and dorsal fin; ventral surface with spinules from throat to just in front of anus.

Body brownish grey, with many large roundish white spots and 4 relatively wide dark bars (1st across eyes and last on peduncle); longitudinal yellow area from below mouth to peduncle; all fins pale, but wide margin of caudal fin dark. Attains 33 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Oman, Persian/Arabian Gulf to India; elsewhere to east coast of India, Indonesia, Japan (Ryukyu Is.), northern Australia and French Polynesia.

REMARKS Occurs in quiet waters, such as among mangroves and seagrasses.

Chelonodontops pleurospilus (Regan 1919)

Beautiful puffer PLATE 123

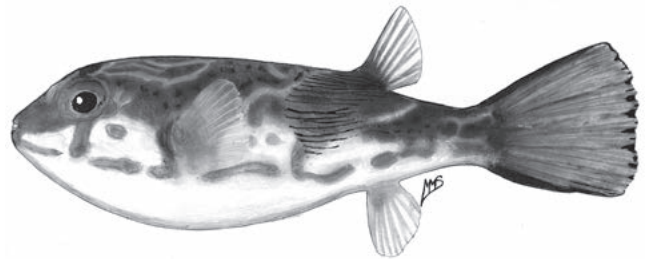
Tetodon pleurospilus Regan 1919: 203 (Durban, KwaZulu-Natal, South Africa).

Chelonodontops pulchellus Smith 1958: 156, Pl. 2 (Xora River mouth, South Africa).

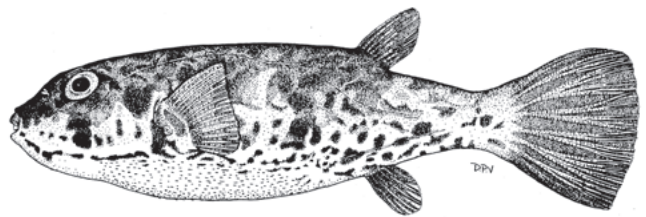
Chelonodon pleurospilus: SSF No. 268.18*.

Dorsal fin 8 or 9 rays; anal fin 8 rays; pectoral fins 15 or 16 rays. Nasal organ cup-like. Spinules on ventral surface of body only, from beneath eyes to anus.

Body more olive-yellow dorsally and more white ventrally, covered overall with irregular white and brown-edged markings and spots; belly white (no longitudinal yellow area); all fin yellowish brown (as body colour). Attains at least 20 cm TL.



Chelonodontops pleurospilus, 7 cm TL (Mozambique). Source: SSF



Chelonodontops pleurospilus, 15 cm TL, holotype (South Africa). Source: SSF

DISTRIBUTION WIO: Rare; South Africa (Durban, KwaZulu-Natal, to Xora River mouth, Eastern Cape) and Mozambique.

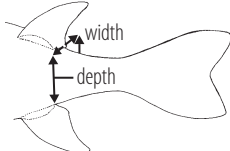
GENUS *Lagocephalus* Swainson 1839

Body oblong; longitudinal skin fold along ventrolateral part of body; dorsal fin and anal fin pointed, the minute ray at origins of these fins usually hidden in skin (and therefore not included

in counts here); caudal fin usually emarginate or truncate; lower lateral line not apparent; sides and belly typically silvery. About 11 species, 6 in WIO.

KEY TO SPECIES

- 1a Peduncle depressed, wider than deep 2
 1b Peduncle compressed, deeper than wide 3



Caudal peduncle measurements

- 2a Dorsal surface of body bluish grey with many black spots; dorsal fin 12 or 13 (usually 12) rays, anal fin 10 or 11 (usually 11) rays, and pectoral fins 16 or 17 (usually 17) rays *L. sceleratus*
 2b Dorsal surface of body brownish grey with irregular brown markings and small brown spots; dorsal fin 10–12 (usually 11) rays, anal fin 8–10 rays, and pectoral fins 14–16 (usually 15) rays *L. suezensis*
- 3a No spinules on dorsal surface of head or body 4
 3b Spinules present on dorsal surface of head and body 5
- 4a Ventral surface of body with prominent spinules; lower sides of body silvery with yellow tinge; lower third of pectoral fins white, contrasting with black upper part; caudal-fin lower lobe longer than upper lobe; distance from dorsal-fin origin to caudal-fin base 2.2–3 in distance from dorsal-fin origin to front of upper jaw *L. lagocephalus*
 4b Ventral surface of body with minute tubercles; lower sides of body silvery white; pectoral fins pale; caudal-fin lower lobe equal in length to upper lobe; distance from dorsal-fin origin to caudal-fin base 1.8–2.3 in distance from dorsal-fin origin to front of upper jaw *L. inermis*
- 5a Spinules on dorsal surface reaching to or beyond dorsal-fin origin *L. lunaris*
 5b Spinules on dorsal surface not reaching to dorsal-fin origin *L. guentheri*

Lagocephalus guentheri Miranda Ribeiro 1915

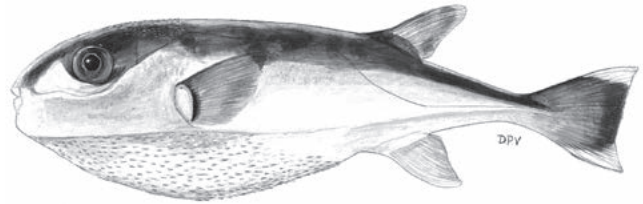
Blackback puffer

PLATE 124

Lagocephalus guentheri Miranda Ribeiro 1915: 5 (Brazil [probably erroneous]); SSF No. 268.19* [as '*guentheri*?']; Randall 1995*; Manilo & Bogorodsky 2003; Matsuura *et al.* 2011; Bogorodsky *et al.* 2014.

Dorsal fin 12–15 rays; anal fin 11–14 rays; pectoral fins 15–19 rays. Patch of spinules on dorsal surface of head and body, from above front of eyes to rear part of pectoral fins.

Upper body grey to greenish grey, with 5 dark saddle-like bands (1st on interorbital area, 2nd above gill opening, 3rd above rear of pectoral fin, 4th at dorsal-fin base, and last on peduncle); sides of head and body broadly silvery, and belly white; caudal fin dark grey with white tips. Attains 40 cm TL.

*Lagocephalus guentheri*, 12 cm SL (South Africa). Source: SSF

DISTRIBUTION Indian Ocean. WIO: Gulf of Oman, Red Sea, Mozambique to South Africa (Tsitsikamma), Madagascar and Pakistan.

REMARKS Similar to *L. cheesemanii* (Clarke 1897) (from Indo-Pacific east of Andaman Sea) and *L. spadiceus* (Richardson 1845) (also from Indo-Pacific), but differs from the former in having a moderately emarginate caudal fin with the slightly produced middle rays (double emarginate caudal fin in *L. cheesemanii*), and from the latter in having the dark caudal fin and the patch of spinules on back extend well behind pectoral fins.

Lagocephalus inermis (Temminck & Schlegel 1850)

Smooth puffer

PLATE 124

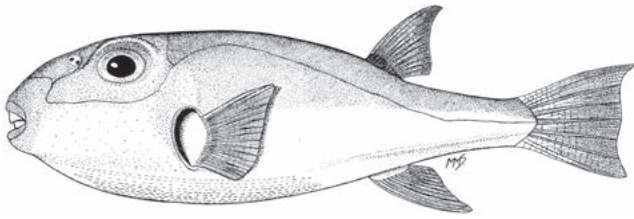
Tetraodon inermis Temminck & Schlegel 1850: 278, Pl. 122, Fig. 2

(Bay of Simabara, Japan).

Lagocephalus inermis: SSF No. 268.20*; Manilo & Bogorodsky 2003.

Dorsal fin 12 or 13 rays; anal fin 11–13 rays; pectoral fins 15–17 rays. Upper body smooth, without spinules; belly with spinules.

Body greenish brown or dark grey above, broadly silvery white on sides, and belly white; gill openings black internally. Attains 56 cm TL.



Lagocephalus inermis, 25 cm TL (WIO). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Kenya, Mozambique to South Africa (Algoa Bay, Eastern Cape); elsewhere to east coast of India, Indonesia, Korea, southern Japan and eastern Australia.

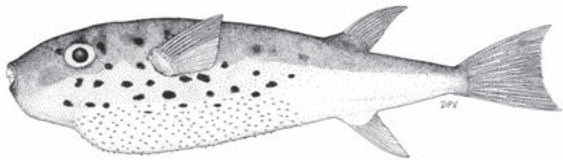
Lagocephalus lagocephalus (Linnaeus 1758)

Ocean puffer

Tetraodon lagocephalus Linnaeus 1758: 332 (India [Indian Ocean]).
Lagocephalus lagocephalus: SSF No. 268.21*; Manilo & Bogorodsky 2003;
 Fricke *et al.* 2009.

Dorsal fin 13–15 rays, anal fin 12 or 13 rays, pectoral fins 13–16 rays.

Body blackish grey to dark bluish grey dorsally, but juveniles also with darker transverse bands; sides silvery between upper margin of eyes and ventrolateral body; belly white, but with dark brown or black spots near pectoral-fin bases continuing onto underside of body; all fins dark, but lower third of pectoral fins white. Attains 70 cm TL.



Lagocephalus lagocephalus, 15 cm SL (South Africa). Source: SSF



Lagocephalus lagocephalus, 38 cm TL. Source: SFSA

DISTRIBUTION Circumglobal in warm-temperate to temperate seas, including Mediterranean Sea. WIO: South Africa, Mozambique (Beira), Réunion, Mauritius and Maldives.

REMARKS Marine; primarily pelagic, to ~476 m deep, but occasionally enters estuaries. Suspected responsible for fatal tetrodotoxin poisoning and should not be eaten.

Lagocephalus lunaris (Bloch & Schneider 1801)

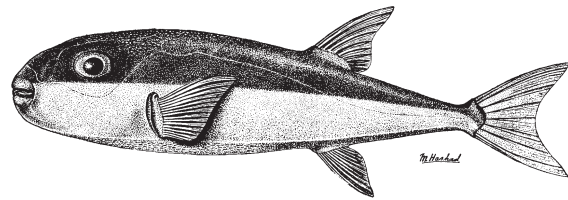
Moontail puffer

PLATE 124

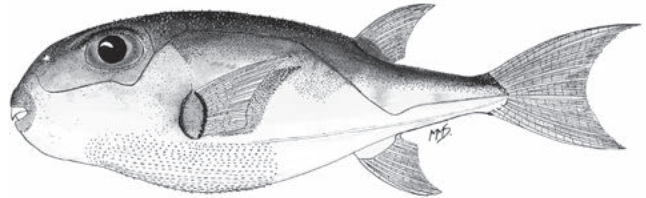
Tetrodon lunaris Bloch & Schneider 1801: 505 (Tharangambadi, India).
Lagocephalus lunaris: SSF No. 268.22*; Goren & Dor 1994; Randall 1995*;
 Fricke 1999; Manilo & Bogorodsky 2003.

Dorsal fin 16 or 17 rays; anal fin 11 or 12 rays; pectoral fins 16 or 17 rays; caudal-fin margin concave. Upper body covered with spinules, from behind nostrils to dorsal-fin origin.

Head and body brownish grey dorsally, sides broadly silvery, and belly white; dorsal, anal and pectoral fins pale; upper half of caudal fin yellowish grey, and lower half bluish white. Attains 45 cm SL.



Lagocephalus lunaris, 13 cm SL (Red Sea). Source: Clark & Gohar 1953



Lagocephalus lunaris, 23 cm TL (S Mozambique). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Gulf of Oman, Red Sea, East Africa to South Africa (Knysna), Madagascar and Mauritius; elsewhere to southeastern India, Indonesia, Philippines, southern Japan and eastern Australia.

REMARKS Every part of this fish, including the muscle, is highly toxic.

Lagocephalus sceleratus (Gmelin 1789)

Silverstripe puffer

PLATE 125

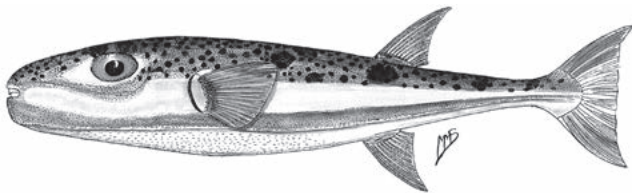
Tetodon sceleratus Gmelin (ex Forster) 1789: 1444 (American [in error] and Pacific oceans).

?*Tetraodon blochii* Castelnau 1861: 75 (Kalk Bay, Western Cape, South Africa).

Lagocephalus sceleratus: SSF No. 268.23*; Goren & Dor 1994; Randall 1995*; Manilo & Bogorodsky 2003; Fricke *et al.* 2009.

Dorsal fin 12 or 13 rays; anal fin 10 or 11 rays; pectoral fins 16 or 17 rays.

Upper body dark greenish grey, with moderately dense array of irregularly scattered black spots from snout to peduncle; sides bluish grey, with broad silvery band from corner of mouth, becoming thinner below eyes, and then broadening and passing through pectoral-fin bases, tapering along sides and ending at caudal-fin base; belly white or greyish white; dorsal fin and pectoral fins dark greyish; anal fin whitish; caudal fin yellowish grey. Attains 97 cm TL.



Lagocephalus sceleratus, 23 cm TL (S Mozambique). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Oman, Red Sea, Tanzania to South Africa (south coast), Madagascar, Réunion, Mauritius and Maldives; Lessepsian migrant to Mediterranean Sea; elsewhere to Indonesia, southern Japan and Samoa.

REMARKS Every part of this fish, including the muscle, is highly toxic.

Lagocephalus suezensis Clark & Gohar 1953

Suez puffer

PLATE 125

Lagocephalus suezensis Clark & Gohar 1953: 56, Fig. 16 (Gulf of Suez, Red Sea); Kuitert & Debelius 1994* [labelled *L. sceleratus* in photograph of dorsolateral view, p. 647]; Nakabo 2001*; Ben-Abdallah *et al.* 2011*; Bogorodsky *et al.* 2014.

Dorsal fin 10–12 rays; anal fin 9 or 10 rays; pectoral fins 14–16 (usually 15) rays.

Body brownish grey dorsally, with many irregular brown dots and spots; sides with broad silvery band from corners of

mouth, becoming thinner under eyes, broadening and passing over pectoral-fin bases, tapering along sides and ending at caudal-fin base; belly greyish white; dorsal fin and pectoral fins greyish; anal fin whitish; caudal fin yellowish grey. Attains at least 19 cm TL.



Lagocephalus suezensis, 9 cm SL (Red Sea). © SV Bogorodsky

DISTRIBUTION Indo-Pacific (patchy records; range uncertain). WIO: Red Sea, Mozambique and South Africa (Plettenberg Bay); Lessepsian migrant to Mediterranean Sea (Libya); elsewhere, Indonesia, Japan, northern Australia and Great Barrier Reef.

REMARKS Benthic, on sandy, muddy or rocky bottom, to ~40 m deep. Probably toxic. Because this species has frequently been confused with *L. sceleratus*, many distribution records in the literature are unreliable.

GENUS *Pelagocephalus* Tyler & Paxton 1979

Nasal organ a plate-like, wrinkled, shallow depression, barely elevated above surface of snout, its floor with irregular corrugated folds of loose skin, and the rim with narrow inner border of transparent skin; with or without single lateral line; spinules present. Two species, 1 in WIO.

Pelagocephalus marki Heemstra & Smith 1981

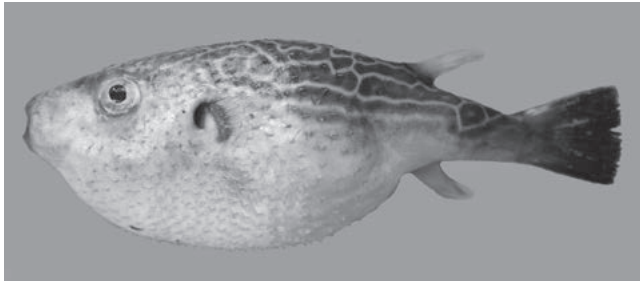
Rippled puffer

PLATE 125

Pelagocephalus marki Heemstra & Smith 1981: 911 (Port Alfred, Eastern Cape, South Africa); SSF No. 268.24*.

Diagnosis as for genus. Dorsal fin and anal fin each with 9 rays; pectoral fins 14 rays. Body depth (uninflated) 2.6–3 in SL; nasal organ large, diameter of each depression 1.5–1.7 in distance between them, and 2.9–4 into eye diameter; no lateral line; spinules cover head and body, except for snout and peduncle; gill opening a crescent-shaped slit before upper 7–10 rays of pectoral fins.

Body with emerald green reticulations on back and peduncle, giving appearance of entirely pale luminous green back fading to black laterally; silvery ventrally. Attains 12 cm TL.



Pelagocephalus marki, 8 cm SL (Mozambique). © Alvheim © IMR

DISTRIBUTION Southeastern Atlantic (Cape of Good Hope) and Indo-Pacific. WIO: South Africa (False Bay to KwaZulu-Natal) and Mozambique; elsewhere, New Zealand.

REMARKS Probably pelagic, although the holotype was found in a tidepool. *Pelagocephalus coheni* Tyler & Paxton 1979 (from Norfolk I. in South Pacific) differs in having a lateral line, smaller nasal organ (diameter of each depression twice into distance between them), uninflated body depth 5–6 in SL, and dermal spinules only on belly.

GENUS *Sphoeroides*

Anonymous [Lacepède] 1798

One lateral line; nasal organ covered by small sac with 2 nostrils; anal-fin origin at or behind vertical through last dorsal-fin ray; caudal fin truncate; no spinules on head or body; no raised skin fold along ventrolateral part of body. Vertebrae 17–20. About 20 species, 1 in WIO.

Sphoeroides pachygaster (Müller & Troschel 1848)

Blunthead puffer PLATE 125

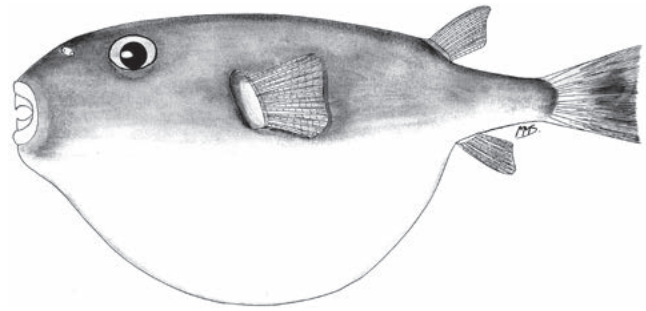
Tetrodon (Cheilichthys) pachygaster Müller & Troschel in Schomburgk 1848: 677 [20] (Barbados, West Indies).

Sphoeroides dubius Von Bonde 1923: 40, Pl. 2, Fig. 3 (KwaZulu-Natal, South Africa).

Sphoeroides pachygaster: SSF No. 268.25*; Manilo & Bogorodsky 2003.

Diagnosis as for genus. Dorsal fin and anal fin each with 8 or 9 rays; pectoral fins 14–17 rays.

Upper body greenish grey, belly white; usually with several diffuse dark spots on flanks; fins pale, except caudal fin dusky with white lower tip. Attains 40 cm TL.



Sphoeroides pachygaster, 23 cm TL, inflated specimen (South Africa). Source: SSF

DISTRIBUTION Circumglobal in tropical to subtropical seas, including Mediterranean Sea. WIO: Arabian Sea, Kenya to South Africa (KwaZulu-Natal), and Saya de Malha Bank.

REMARKS Occurs on continental shelf and slope, in relatively deep water, over sandy, muddy or rocky bottom, at 50–480 m (usually <250 m). Feeds mainly on squid.

GENUS *Takifugu* Abe 1949

Two lateral lines, lower line on low skin ridge along ventrolateral part of peduncle; nasal organs covered by small sac with 2 nostrils; anal-fin origin below middle of dorsal fin; caudal fin truncate to rounded. About 25 species in Indo-Pacific, mostly occurring in the seas around China and Japan; 1 species in WIO.

Takifugu oblongus (Bloch 1786)

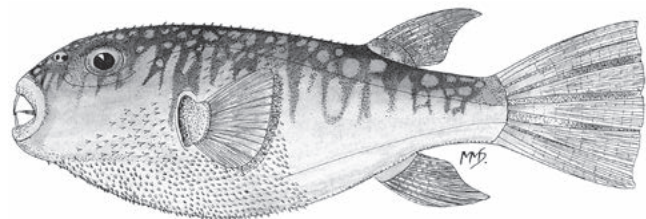
Lattice puffer

PLATE 126

Tetrodon oblongus Bloch 1786: 6, Pl. 146, Fig. 1 (Coromandel coast, India). *Takifugu oblongus*: Matsuura 1984*; SSF No. 268.26*.

Diagnosis as for genus. Dorsal fin 12–14 rays; anal fin 10–12 rays; pectoral fins 14–16 rays. Spinules on top of head, front half of back, and belly.

Head and body with many alternating transverse brown and white bands between snout and peduncle. Attains 35 cm TL.



Takifugu oblongus, 23 cm TL (South Africa). Source: SFS

DISTRIBUTION Indo-Pacific. WIO: East Africa to South Africa (KwaZulu-Natal), Madagascar and Réunion; elsewhere to east coast of India, Indonesia, southern Japan and northern Australia.

REMARKS Inhabits shallow coastal waters; possibly enters estuaries.

GENUS *Torquigener* Whitley 1930

Two lateral lines, lower line on low skin ridge along ventrolateral part of peduncle; nasal organs covered by small sac with 2 nostrils; eyes dorsally adnate only; chin prominent; anal-fin origin below middle of dorsal fin; caudal fin truncate to rounded. Nineteen species in Indo-Pacific, 3 in WIO.

KEY TO SPECIES

- | | | |
|----|--|--------------------------|
| 1a | Spinules restricted to region above and forward of pectoral-fin bases | <i>T. marleyi</i> |
| 1b | Spinules present from nasal organs to just before dorsal-fin origin | 2 |
| 2a | Solid dark lateral band from above pectoral-fin bases to caudal-fin base; ~16 or 17 spinules across belly between pectoral-fin bases | <i>T. hypselogeneion</i> |
| 2b | Lateral band of ~20 small yellow or brownish yellow spots from pectoral-fin bases to caudal-fin base; ~20 spinules across belly between pectoral-fin bases | <i>T. flavimaculosus</i> |

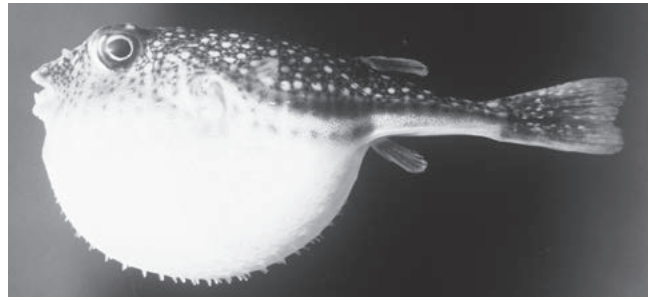
Torquigener flavimaculosus Hardy & Randall 1983

Yellowspotted puffer PLATE 126

Torquigener flavimaculosus Hardy & Randall 1983: 14, Figs. 1–2
(Gulf of Aqaba, Red Sea); Golani 1998; Manilo & Bogorodsky 2003.

Dorsal fin 9 rays; anal fin 7 or 8 rays; pectoral fins 15 or 16 rays. Spinules present between nasal organs and dorsal-fin origin.

Dorsal surface of head and body with many small brownish dots, forming rosettes enclosing larger white spots; areas of small yellowish brown spots on cheek may form broad vertical bands, separated by irregular narrow white bands; belly white; fins pale. Attains 13 cm TL.



Torquigener flavimaculosus, 4 cm SL (Red Sea). PC Heemstra © NRF-SAIAB



Torquigener flavimaculosus, 11 cm SL (Mozambique). O Alnheim © IMR

DISTRIBUTION WIO: Red Sea to Mozambique, and Seychelles; Lessepsian migrant to Mediterranean Sea.

REMARKS Found at 3–287 m.

Torquigener hypselogeneion (Bleeker 1852)

Darkstriped puffer

PLATE 126

Tetraodon hypselogeneion Bleeker 1852: 24 (Ambon I., Moluccas, Indonesia; Wahai, Seram I., Indonesia).

Torquigener sp. Matsuura 1984: 364, Pl. 330j.

Torquigener hypselogeneion: Hardy 1983*; SSF No. 268.27*.

Dorsal fin 8 or 9 rays; anal fin 7 or 8 rays; pectoral fins 13–15 rays. Spinules present between nasal organs and dorsal-fin origin.

Upper body with dark brown reticulations; distinctive solid dark brown band from above pectoral-fin bases to caudal-fin base; many small dark brown spots on cheek form broad vertical bands separated by irregular narrow white bands; belly white. Attains 11 cm TL.

DISTRIBUTION Indo-Pacific. WIO: Tanzania, Mozambique, South Africa (Knysna) and Madagascar; elsewhere to Indonesia, Japan (Ryukyu Is.) and Samoa.

REMARKS Lives in small loose groups on shallow coastal sand flats and in estuaries; often buries itself in the sand during the day, with just its eyes exposed.

Torquigener marleyi (Fowler 1929)

Slender puffer

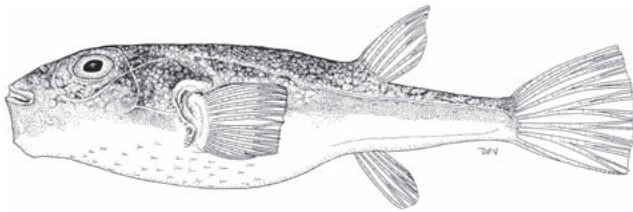
Spherooides marleyi Fowler 1929: 263, Fig. 6 (Thukela River mouth, KwaZulu-Natal, South Africa).

Torquigener balteus Hardy 1989: 120, Fig. 1 (off Durban, KwaZulu-Natal, South Africa).

Torquigener marleyi: Heemstra & Heemstra 2004.

Dorsal fin 8 or 9 rays; anal fin 7 rays; pectoral fins 13–16 rays. Spinules present only in region above and forward of pectoral-fin bases.

Preserved specimens greyish brown dorsally, with small to tiny pale spots and dots; white stripe along rear part of upper lateral line; belly and fins white. Attains at least 11 cm TL.



Torquigener marleyi, 8 cm SL, holotype of *T. balteus* (South Africa).

Source: SSF

DISTRIBUTION WIO: Endemic to South Africa (records from off Durban and Thukela River mouth, KwaZulu-Natal).

GENUS *Tylerius* Hardy 1984

Head and body covered with spinules, except for peduncle and all fin bases; lips papillose; body short, its width at pectoral-fin bases greater than its depth at end of dorsal-fin base; caudal fin longer than distance between anal-fin origin and caudal-fin base; no ventrolateral skin fold. One species.

Tylerius spinosissimus (Regan 1908)

Spiny puffer

PLATE 123

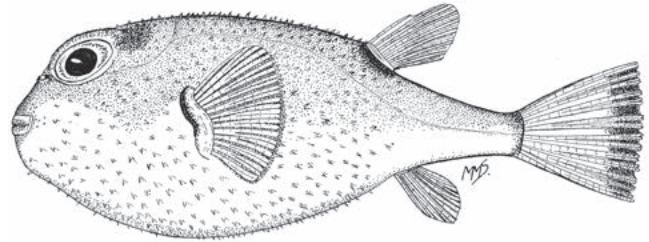
Spherooides spinosissimus Regan 1908: 253, Pl. 31, Fig. 5 (Saya de Malha Bank).

Spherooides unifasciatus Von Bonde 1923: 39, Pl. 2, Fig. 1 (KwaZulu-Natal, South Africa).

Tylerius spinosissimus: Sainsbury *et al.* 1984*; SSF No. 268.29*; Goren & Dor 1994; Fricke *et al.* 2009.

Diagnosis as for genus. Dorsal fin 8 or 9 rays; anal fin 6 or 7 rays; pectoral fins 14 or 15 rays.

Upper body brownish grey, and lower half whitish with black specks; dark blotch above and behind eyes, another at dorsal-fin base; fins pale, but caudal-fin margin dusky. Attains 12 cm TL.



Tylerius spinosissimus, 8 cm TL (South Africa). Source: SFSA

DISTRIBUTION Indo-Pacific. WIO: Red Sea, Mozambique to South Africa (East London, Eastern Cape), Réunion and Saya de Malha Bank; Lessepsian migrant to Mediterranean Sea; elsewhere to Indonesia, South China Sea, northwestern Australia and New Caledonia.

GLOSSARY

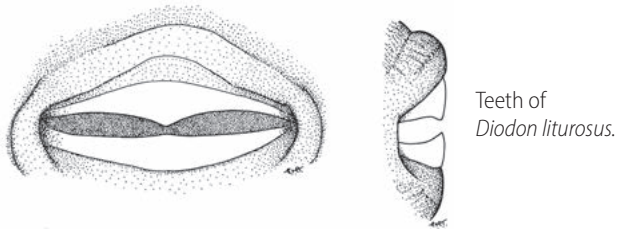
antitropical – the distribution pattern where a group is found north and south of, but not in, the tropics (also anti-equatorial).
spinules – small, spine-like structures.

FAMILY DIODONTIDAE

Burrfishes and porcupinefishes

Jeffrey M Leis

Body globular and highly inflatable by swallowing water or air to deter predators; scales modified into large sharp spines with large subdermal bases; teeth fused into single beak-like plate in each jaw; jaws without median suture. Dorsal fin and anal fin more or less rounded and set far back on body; no pelvic fins; no fin spines. Gill opening a small vertical slit immediately before pectoral-fin base. Lateral line inconspicuous. Vertebrae 18–23.

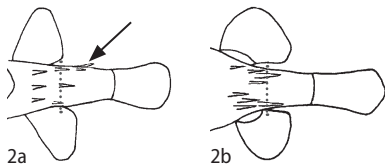
Teeth of *Diodon liturosus*.

Moderately sized (up to ~100 cm SL), occurring worldwide in warm-temperate to tropical waters. Identification of juveniles (<5 cm) is difficult because all species have similar colouring at this size (often blue), and their dermal spines tend to be small and similarly sized; however, the mobility (moveable or fixed) and positions of the spines are the best characters to use for small specimens. Juveniles are usually coloured differently from adults, epipelagic, and often thrown ashore during storms, particularly in higher latitudes. Adults are typically benthic and associated with reefs or continental-shelf waters to ~100 m deep. Feed primarily on hard-shelled invertebrates. Reputed to be poisonous yet some species are safely eaten in the Pacific region. Of little commercial importance except as dried curios.

Six genera and ~19 species; 4 genera and 8 species in WIO.

KEY TO GENERA

- 1a Dermal spines usually longer than eye diameter, slender and basically round in cross-section; spines on head moveable (erectile) 3
- 1b Dermal spines shorter than eye diameter, and triangular to flattened in cross-section; spines on head fixed in erect position 2
- 2a At least one small spine situated wholly on dorsum of caudal peduncle; spines short, less than pupil diameter, and some reduced to subdermal bases only; caudal fin usually with 10 rays; fins spotted in adults; nostrils of adults an open cup with pitted surface, and nostrils of juveniles a short tube with 2 openings *Chilomycterus*
- 2b No spine situated wholly on dorsum of caudal peduncle; spines moderate in length, equal to or longer than pupil diameter; caudal fin usually with 9 rays; fins may be banded but never spotted; nostrils always a short tube with 2 openings *Cyclichthys*



Continued ...

KEY TO GENERA

- 3a All spines moveable (erectile) (except a few fixed spines around gill opening, dorsal-fin base, and on caudal peduncle) *Diodon*
- 3b Most spines on head and belly moveable (erectile), and those on dorsum and sides fixed *Lophodiodon*

GENUS *Chilomycterus*

Brisout de Barneville 1846

All dermal spines fixed in erect position, and base of each spine with at least 3 roots, some spines on top of head with 4 roots; at least one spine situated wholly on dorsum of caudal peduncle. Nostril of adults an open cup with pitted surface, and nostrils of juveniles a short tube with 2 openings. Fins of adults spotted. Caudal fin 10 rays. Vertebrae 21–23. One species.

Chilomycterus reticulatus (Linnaeus 1758)

Spotfin burrfish

PLATE 127

Diodon reticulatus Linnaeus 1758: 334 (India).

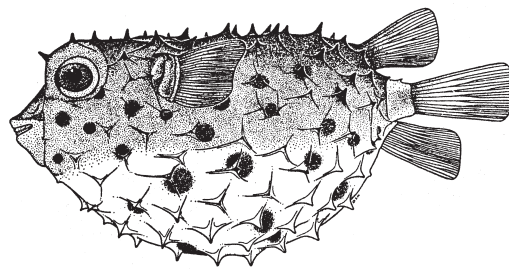
Diodon echinatus Linnaeus 1758: 335 (India).

Chilomycterus affinis Günther 1870: 314 [no locality given].

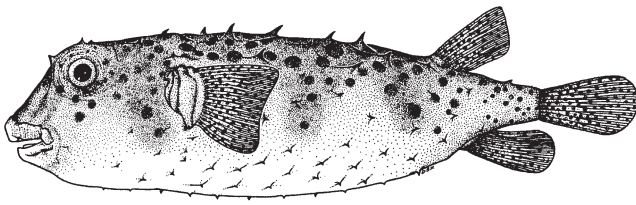
Chilomycterus reticulatus: SSF No. 269.1*; Randall & Anderson 1993; Fricke 1999; Leis 2006; Fricke *et al.* 2009.

Diagnosis as for genus. Dorsal fin 12–14 rays; anal fin 11–14 rays; pectoral fins 19–22 rays; 8–10 spines in an irregular line from snout to dorsal-fin base. No fleshy tentacles extending from spines or anywhere else.

Pelagic juveniles blue dorsally, with pupil- to eye-sized dark spots extending onto belly. Benthic adults grey to brown, with small black spots on upper surfaces (variable in number, size and occurrence), including fins, and sometimes also with diffuse dark blotches on flanks; black gular band. Attains 75 cm SL.



Chilomycterus reticulatus, 7 cm TL, juvenile (South Africa). Source: SSF



Chilomycterus reticulatus, 26 cm TL, adult (South Africa). Source: SSF

DISTRIBUTION Circumglobal in warm-temperate to tropical seas (patchy). Probably throughout WIO, but records so far from Tanzania, South Africa (False Bay to Salt Vlei), Seychelles, Mauritius, Réunion and Maldives.

REMARKS *Diodon atringa* Linnaeus 1758 is often regarded as the valid name. However, *D. atringa* Linnaeus (often misspelt *atinga*) is not identifiable: there is no type, and both Linnaeus' description and those of earlier authors cited by him or by Artedi could apply to any of several species of *Chilomycterus* or *Cyclichthys*. Brisout de Barneville (1846) was the first author to express a clear opinion and considered *D. atringa* Linnaeus to be synonymous with *D. orbe* Lacepède 1798 (the latter based on a specimen from Brazil that is clearly identifiable as *Diodon spinosus* Linnaeus 1758, an Atlantic species) (Leis 2006). Juveniles (<20 cm TL) oceanic in surface waters; adults found on reefs and soft bottom, to ~100 m deep, but may occur deeper in the tropics.

GENUS *Cyclichthys* Kaup 1855

Dermal spines with at least 3 roots and fixed in erect position, except a few moveable (erectile) spines near mouth or in pectoral-fin axil; no spine situated wholly on dorsum of caudal peduncle; pelagic juveniles of some species with fleshy tentacle extending from base of each spine. Nasal organ always a short tube with 2 openings. Caudal fin 9 rays. Vertebrae 18–20. Fins unspotted in Indo-Pacific species. Sometimes regarded as a subgenus of *Chilomycterus*, but distinguishable by several osteological characters (Tyler 1980), namely: number of caudal-fin rays and vertebrae, nostril structure, and some spine characters. The type-species, *C. orbicularis*, differs in a number of characters from other species often placed in *Cyclichthys*, and these other species may eventually be placed in other genera (Leis 2006). The Atlantic species occasionally placed in *Cyclichthys* apparently do not belong here, and are instead placed in Tyler's 'Atlantic *Chilomycterus*' group pending further work (Leis 2006). Three species, 2 in WIO.

KEY TO SPECIES

- 1a Some spines on top of head with 4 subdermal roots; no moveable (erectile) spines; colour pattern includes unclustered spots smaller than eye, but no large blotches *C. pilostylus*
- 1b All spines with 3 subdermal roots; a small moveable spine below and behind corner of mouth, and a longer one in pectoral-fin axil; colour pattern includes large blotches or clusters of spots on back and sides *C. orbicularis*

Cyclichthys orbicularis (Bloch 1785)

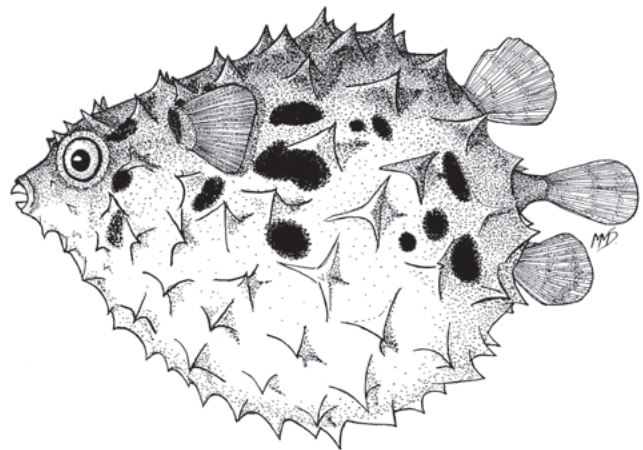
Birdbeak burrfish

PLATE 127

Diodon orbicularis Bloch 1785: 73, Pl. 127 (Sea of Jamaica?; Cape of Good Hope, South Africa; Moluccas, Indonesia).
Chilomycterus parcomaculatus Von Bonde 1923: 38, Pl. 9, Fig. 2 (KwaZulu-Natal, South Africa).
Cyclichthys orbicularis: SFSa No. 1189*; SSF No. 269.2*; Randall & Anderson 1993*; Randall 1995*; Leis 2006.

Dorsal fin 11–13 rays; anal fin 10–12 rays; pectoral fins 18–21 rays. Dermal spines slightly recurved, with 3 roots at bases; 8 spines in an irregular line from snout to dorsal-fin base; no spine situated on dorsum of caudal peduncle; small moveable spine below and behind corner of mouth, and longer one in pectoral-fin axil. No fleshy tentacles extending from bases of spines.

Pelagic juveniles covered with pupil- to eye-sized black spots. Benthic individuals (juveniles and adults) brown to grey (darker dorsally), with blotches or clusters of black spots on back and sides, and dusky irregular bands on median fins; belly whitish. Attains 30 cm SL.



Cyclichthys orbicularis, 15 cm TL (South Africa). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Persian/Arabian Gulf, Oman, Red Sea, Mozambique, South Africa (to Knysna), Réunion, Maldives, India and Sri Lanka; elsewhere to Indonesia, Philippines, South China Sea, Japan, Australia and New Caledonia.

REMARKS Found on reefs and soft bottom, from shallow water to ~150 m deep.

Cyclichthys spilostylus (Leis & Randall 1982)

Spotbase burrfish

PLATE 127

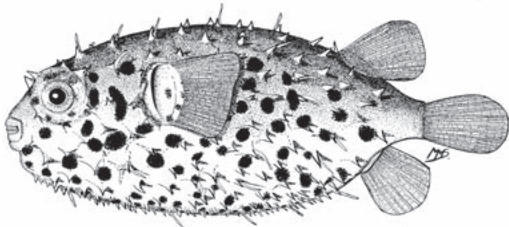
Chilomycterus spilostylus Leis & Randall 1982: 363, Figs. 1–2 (Eilat, Israel, Gulf of Aqaba, Red Sea).

Cyclichthys echinatus (non Linnaeus 1758): SFSA No. 1188*.

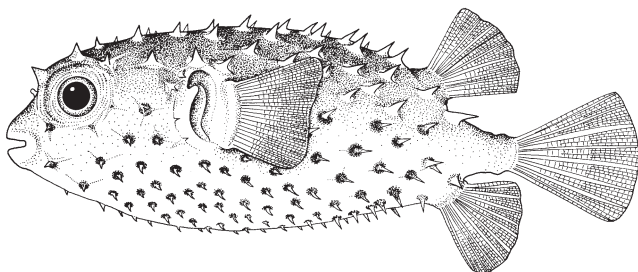
Cyclichthys spilostylus: SSF No. 269.3*; Randall 1995*; Leis 2006; Fricke *et al.* 2009.

Dorsal fin 11–13 rays; anal fin 10–12 rays; pectoral fins 20–22 rays. Dermal spines short, fixed, some on top of head with 4 roots; 11 or 12 spines in an irregular line from snout to dorsal-fin base, none on caudal peduncle. Pelagic juveniles (<13 cm SL) with fleshy tentacle extending from each spine; adults without fleshy tentacles.

Pelagic juveniles (<15 cm) with eye-sized dark spots scattered over body; fins unspotted. Benthic adults brownish dorsally, with white to yellow spots at bases of spines on upper body, and black spots at bases of spines on sides and belly; white ventrally; fins unspotted. Attains 35 cm SL.



Cyclichthys spilostylus, 11 cm SL, juvenile (S Mozambique). Source: SSF



Cyclichthys spilostylus, 14 cm SL (Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific to eastern Pacific. WIO: Oman, Red Sea, Mozambique, South Africa (southeast coast to False Bay), Mauritius, Réunion and India; Lessepsian migrant to Mediterranean Sea; elsewhere to Indonesia, Philippines, Hong Kong, Japan, Australia, New Caledonia and Galápagos Is. (one record).

REMARKS Found in coastal waters, often near reefs; juveniles pelagic. Nocturnal and solitary; feeds on hard-shelled invertebrates (Leis 2001).

GENUS *Diodon* Linnaeus 1758

Nearly all spines moveable (erectile), and each with 2 subdermal roots; nasal organ a flattened tube with 2 pores, at least in juveniles. Vertebrae 20 or 21. Genus revised by Leis (1978, 2006). Five species, 4 in WIO.

KEY TO SPECIES

- 1a One or more small dermal spines situated wholly on dorsum of caudal peduncle; adults with spotted fins (but anal fin with or without a few spots) but no large dark blotches on body; anal fin reaches to near midpoint of peduncle 2
- 1b No dermal spines situated wholly on dorsum of peduncle; no spots on fins; adults with large dorsal and lateral dark blotches on body and head; anal fin reaches nearly to caudal fin 3
- 2a Pectoral fins 19–22 rays; dorsal fin and anal fin each with 16–18 rays, and fins of adults bluntly pointed; 10–14 spines in an irregular line from lower jaw to anus; head width in adults 3.3–4 in SL *D. eydouxi*
- 2b Pectoral fins 22–25 (rarely 21) rays; dorsal fin 14–17 rays, anal fin 14–16 rays, and fins of adults rounded; 14–19 spines in an irregular line from lower jaw to anus; head width of adults 2.4–3.3 in SL *D. hystrix*
- 3a Length of forehead spines 10–25 in SL, much shorter than pectoral-fin-axil spines; 17–22 spines an irregular line from lower jaw to anus; small downward-pointing spine below front edge of eye; dark blotches of adults with pale border, but no blotch in interorbital space *D. liturosus*
- 3b Length of forehead spines 3.6–7.7 in SL, slightly shorter to much longer than pectoral-fin-axil spines; 12–15 spines in an irregular line from lower jaw to anus; small downward-pointing spine below front edge of eye only in Atlantic specimens; dark blotches lack pale border, and blotch present in interorbital space *D. holocanthus*

Diodon eydouxi Brisout de Barneville 1846

Pelagic porcupinefish

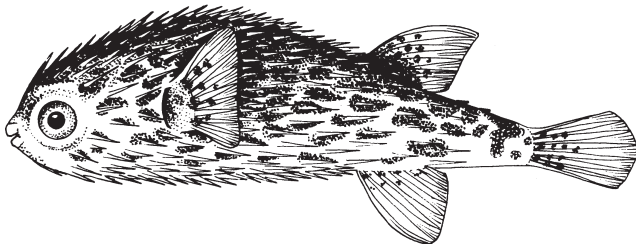
PLATE 127

Diodon eydouxi Brisout de Barneville 1846: 142 (eastern Pacific);
Leis 1978*; SSF No. 269.4*.

Diodon melanopsis Kaup 1855: 228 [no locality given].

Dorsal fin and anal fin each with 16–18 rays, and fins bluntly pointed; pectoral fins 19–22 rays. Dermal spines long, those in pectoral-fin axil usually longest; one or more small spines situated on dorsum of caudal peduncle; 13–17 spines in an irregular line from snout to dorsal-fin base; no tentacles on body.

All life stages with dark blue back and sides, covered with elongate black spots that extend onto fins as round, smaller spots; dark gular band; belly silvery white. Attains 27 cm SL.



Diodon eydouxi. © Food and Agriculture Organization of the United Nations, Original Scientific Illustrations Archive; reproduced with permission

DISTRIBUTION Circumglobal in tropical to subtropical seas. Probably widely distributed throughout WIO, but only a few confirmed records from South Africa (Knysna to Durban), Mozambique and Tanzania (Zanzibar).

REMARKS Entirely pelagic and schooling throughout its life history. Feeds on larger zooplankton and fish larvae.

Diodon holocanthus Linnaeus 1758

Longspine porcupinefish

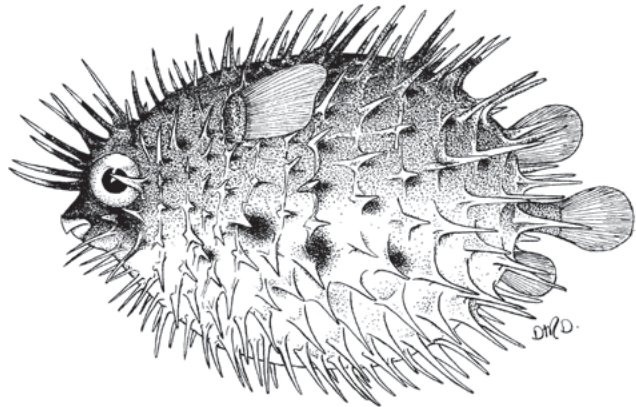
PLATE 127

Diodon holocanthus Linnaeus 1758: 335 (India); Leis 1978*; SSF No. 269.5*; Randall 1995*; Randall 2005*; Fricke *et al.* 2009.
?*Diodon maculifer* Kaup 1855: 229 (Cape of Good Hope, South Africa).
Diodon paraholocanthus Kotthaus 1979: 39, Fig. 492 (Bab-el-Mandeb [Straits of Somalia]).
Diodon holocanthus: SFSA No. 1183 [common misspelling of *D. holocanthus* Linnaeus 1758].

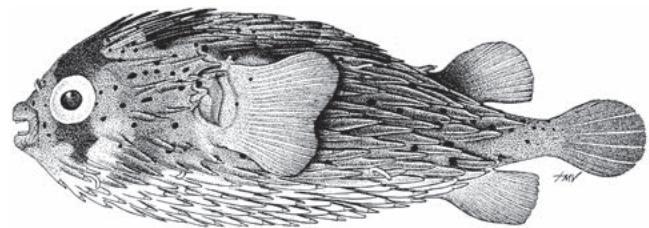
Dorsal fin and anal fin each with 13–15 rays; pectoral fins 20–24 rays. Dermal spines very long, those on forehead usually longest; no spine situated wholly on dorsum of caudal

peduncle; 12–16 spines in an irregular line from snout to dorsal-fin base. Some benthic adults with series of short fleshy tentacles on back, chin, over eyes and on lower sides.

Pelagic juveniles (6–9 cm) with pupil-sized spots, particularly prominent on belly, but no spots on fins. Benthic adults pale brown to grey, with series of large dark blotches across back, and smaller spots scattered between blotches; fins unspotted; belly white. Attains 29 cm SL.



Diodon holocanthus, 13 cm TL (South Africa). Source: SSF



Diodon holocanthus, 13 cm TL (South Africa). Source: SSF

DISTRIBUTION Circumglobal in tropical to subtropical seas. WIO: Oman, Red Sea, Mozambique, South Africa, Seychelles, Mauritius, Réunion and Sri Lanka.

REMARKS Found on reefs and soft bottom, from shallow water to ~100 m deep.

Diodon hystrix Linnaeus 1758

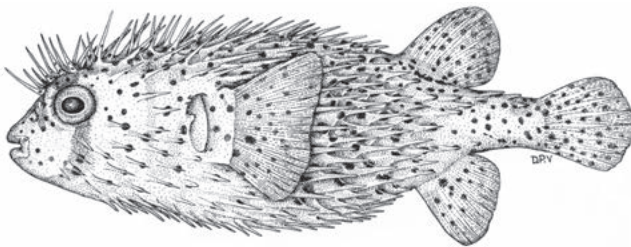
Spotfin porcupinefish

PLATE 128

Diodon hystrix Linnaeus 1758: 335 (India); Leis 1978*, 2006; SSF No. 269.6*; Winterbottom *et al.* 1989*; Randall & Anderson 1993; Randall 1995*; Fricke 1999; Heemstra *et al.* 2004; Heemstra & Heemstra 2004*; Fricke *et al.* 2009.
Diodon atinga Bloch 1785: 67, Pl. 125 (Tharangambadi, India).

Dorsal fin 14–17 rays, anal fin 14–16 rays, and fins rounded; pectoral fins 21–25 rays. Dermal spines long, those in pectoral-fin axil longest; one or more small spines situated on dorsum of caudal peduncle; 15–19 spines in an irregular line from snout to dorsal-fin base but with no fleshy tentacles.

Pelagic juveniles (<20 cm SL) dark blue dorsally (resembling *D. eydouxi*), with spots on dorsum, sides and fins. Benthic adults pale greyish to brown dorsally, with dorsum, sides and fins covered with small black spots; dark gular band; belly white. Attains at least 60 cm SL.



Diodon hystrix, 29 cm TL (South Africa).

DISTRIBUTION Circumglobal in tropical to subtropical seas. WIO: Pakistan, Oman, Red Sea, Mozambique, South Africa (Tsitsikamma), Seychelles, Mascarenes, Chagos, Maldives, India and Sri Lanka.

REMARKS Found on shallow reefs to open areas with rich soft bottom; generally solitary, but sometimes forming aggregations. Feeds on molluscs, sea urchins, hermit crabs, and crabs at night.

Diodon liturosus Shaw 1804

Blackblotched porcupinefish

PLATE 128

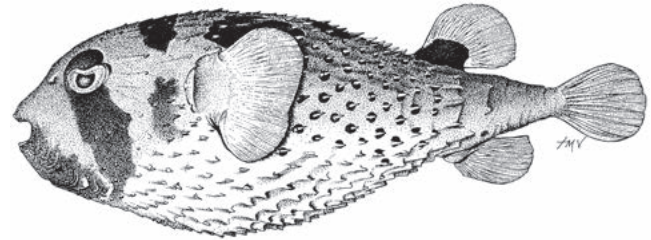
Diodon liturosus Shaw (ex Lacepède) 1804: 436 ('Indian Seas'); Leis 1978*, 2006; SSF No. 269.7*; Randall & Anderson 1993; Randall 1995*; Fricke *et al.* 2009.

Diodon holocanthus (*non* Linnaeus 1758): Kotthaus 1979*.

Dorsal fin and anal fin each with 14–16 rays; pectoral fins 21–25 rays. Dermal spines short, those on forehead much shorter than pectoral-fin-axil spines, none situated wholly on dorsum of caudal peduncle; short downward-pointing spine below front of eye; 16–21 spines in an irregular line from snout to dorsal-fin base. Some benthic adults with short fleshy tentacles on chin or over eyes.

Pelagic juveniles (<9 cm SL) with pupil-sized spots, particularly prominent on belly, but no spots on fins (similar

to *D. holocanthus*). Benthic adults olive brownish, with pale-edged large, dark blotches across dorsum and on sides; small black spots on sides associated with spine bases; dark gular band; fins unspotted but membranes often dark. Attains 50 cm SL.



Diodon liturosus, 44 cm TL (N Mozambique). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Oman, southern Red Sea, Mozambique, South Africa (southeast coast), Comoros, Seychelles, Mauritius, Réunion, Laccadives and Maldives; elsewhere to southern Japan, Australia and Society Is.

REMARKS Inhabits reef edges and slopes, to at least 30 m deep. Solitary, hides in caves and under ledges and coral plates during the day, and forages at night. Feeds on crustaceans and molluscs.

GENUS *Lophodiodon* Fraser-Brunner 1943

Dermal spines on head and belly mostly moveable (erectile), and spines on back and sides fixed; several forward-pointing spines between nostrils; some large spines present laterally, not dorsally, on caudal peduncle. One species.

Lophodiodon calori (Bianconi 1854)

Blacklip porcupinefish

PLATE 128

Diodon calori Bianconi 1854: 69 (Mozambique).

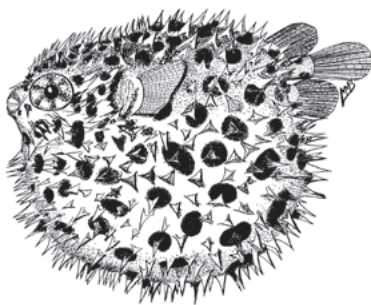
Lophodiodon nigropunctatus Smith 1957: 222, Fig. 4 (Port Alfred, Eastern Cape, South Africa).

Lophodiodon calori: Smith 1961*; SSF No. 269.8*; Randall 1995*; Leis 2006.

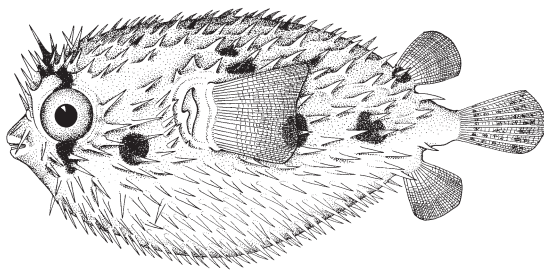
Dorsal fin 10–12 rays; anal fin 10–11 rays; pectoral fins 21–23 rays. Short erectile spines with 2 subdermal roots, and fixed spines with 3 roots; no spine situated wholly on dorsum of caudal peduncle, but some spines present laterally from dorsal-fin base to near caudal-fin base; ~16 spines in line from

snout to dorsal-fin base, with first 6 or so moveable (erectile); 2–4 forward-pointing spines between and in front of nostrils. Short tentacle above rear edge of eyes.

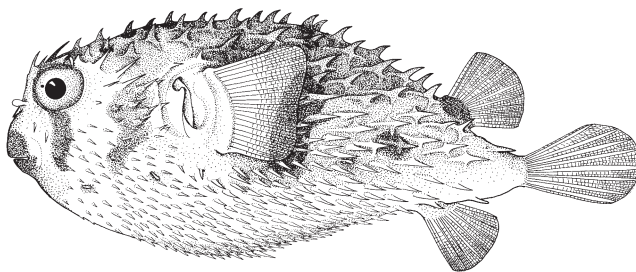
Pelagic stage (brief) with pupil-sized (or smaller) spots covering body. Benthic adults with 3 or 4 dark blotches on flanks, first blotch in front of pectoral-fin base; dark band running down from eyes; lower jaw and lips with blackish blotches; may have dark gular band; dermal spines on back may be black or white, contrasting to background colour; fins unspotted, pectoral fins tinged yellow. Attains 30 cm SL.



Lophodiodon calori, 4 cm TL, juvenile holotype of *L. nigropunctatus* (South Africa). Source: Smith 1957



Lophodiodon calori, 7 cm TL (Arafura Sea). Source: SSF



Lophodiodon calori, 16 cm SL (Tanzania). Source: SSF

DISTRIBUTION Indo-Pacific. WIO: Oman, Tanzania to South Africa (False Bay) and Seychelles; elsewhere, South China Sea and Australia.

REMARKS Uncommon; occurs on continental shelf, to ~100 m deep.

GLOSSARY

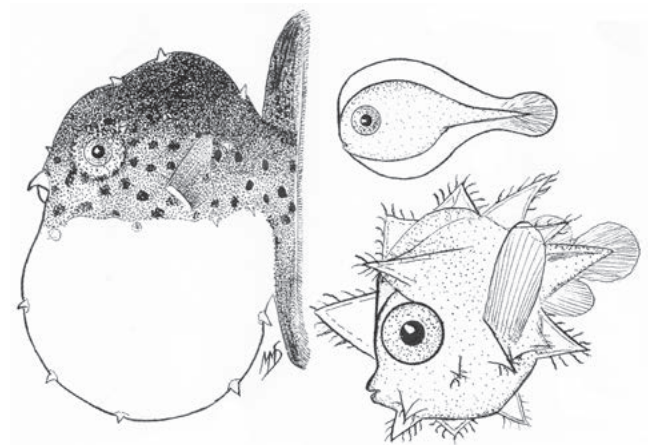
dorsum – the upper (dorsal) surface of the head or body.
gular – the area between the dentary bones; the throat.

FAMILY MOLIDAE

Molas or ocean sunfishes

Phillip C Heemstra

Body deep and orbicular or elongate-oval, strongly compressed, and abruptly truncated posteriorly; head length less than body depth. Caudal fin resorbed during metamorphosis of larvae and replaced by rudder-like structure called a clavus. Dorsal fin and anal fin both very high and stiff, with short base. No pelvic fins. Mouth very small; teeth of juveniles fused in each jaw, forming parrot-like beak, and adults with row of minute teeth behind thick lips. Gill opening reduced to small hole at base of pectoral fin; gill arches 4, with gill slit behind last arch. No swimbladder in adults. Transforming larval stages (<5 mm TL) with prominent spines on body and a normal caudal fin; these peculiar transforming larval forms were originally described as distinct species unrelated to the adults.

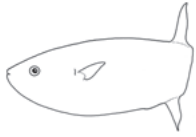


Development of *Mola mola*, 2 mm TL (top right); 3 mm TL (bottom right); and 25 mm TL (left) (South Africa). Source: SSF; drawn from Schmidt 1921

Pelagic in open ocean; while swimming, the dorsal and anal fins flap synchronously from side to side and can propel the fish at a fair speed; also observed drifting at the surface as if basking in the sun. Worldwide in tropical to temperate waters. Generally 3 genera recognised, with 5 species; 4 species in WIO.

KEY TO GENERA

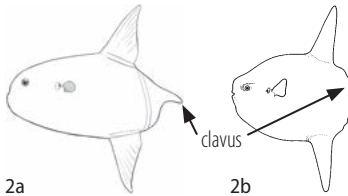
- 1a Body oblong and compressed; obliquely truncate posteriorly; body depth at dorsal-fin origin 2.1–2.6 in SL (length to base of clavus); skin tough but thin and smooth, comprising small fused hexagonal plates *Ranzania*



- 1b Body an oblong or oval disc; vertically truncate or convex posteriorly; body depth 0.8–1.8 in SL; skin thick and tough, with small rough denticles 2

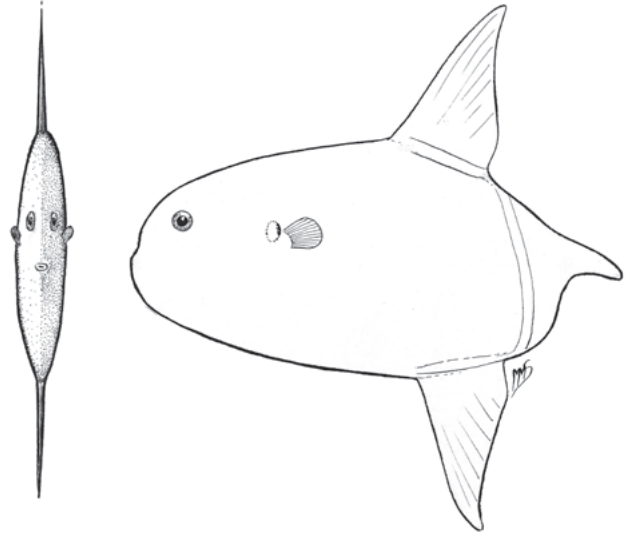
- 2a Body more or less convex posteriorly; rear of clavus distinctly produced and more or less pointed: the elongate projection stiff, conical, and fleshy in adults, filamentous in juveniles; no bony ossicles on margin of clavus *Masturus*

- 2b Body more vertically truncated posteriorly; clavus not pointed, but evenly rounded, and margin studded with bony ossicles *Mola*



dorsal fin and anal fin. Dorsal fin and anal fin each with 18 rays; clavus supported by 21 'rays.'

Body mostly silvery white, blackish dorsally, with irregular grey spots. Attains at least 2 m; reports of 3+ m TL, ~2 000 kg are unconfirmed estimates. A female specimen from Taiwan was 195 cm TL, 409 kg (Liu *et al.* 2009).



Masturus lanceolatus, 175 cm TL (South Africa). Source: SSF

GENUS *Masturus* Gill 1884

See key for diagnostic characters. One species (which seems more closely related to species of *Mola* than to *Ranzania*).

Masturus lanceolatus (Liénard 1840)

Sharptail ocean sunfish

PLATE 128

Orthogoriscus lanceolatus Liénard 1840: 291 (Port Louis, Mauritius, Mascarenes).

Masturus lanceolatus: Raven 1939*; Fraser-Brunner 1951*; King 1951*; SSF No. 270.1*; Goren & Dor 1994; Fricke *et al.* 2009.

Mola lanceolata: Smith 1961*; SFSA No. 1214*.

Body depth at dorsal-fin origin 1.5–1.7 in SL (length to base of clavus); HL ~2.8 in SL. Rear of clavus with fleshy pointed protuberance, and length of clavus subequal to lengths of

DISTRIBUTION Circumglobal in tropical to subtropical seas, except possibly eastern Pacific. WIO: Oman, Red Sea, South Africa (records from Cape Peninsula to East London), Mauritius, Maldives; photographs only from Réunion and India.

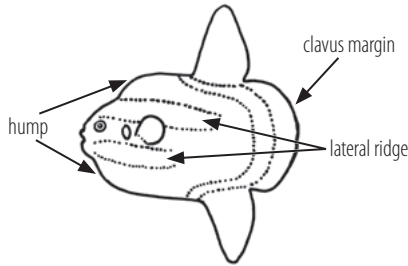
REMARKS Bathypelagic; rare. Feeds on jellyfish, salps, copepods and various other planktonic animals. Some basking or stranded individuals were found to be heavily parasitised by cestodes and nematodes; a 2-m individual found alive at East London, South Africa, in 2001, had the dorsal and anal fins cleanly bitten off by a large shark.

GENUS *Mola* Koelreuter 1766

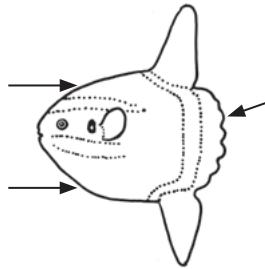
Body oblong oval and compressed; clavus not pointed, but evenly rounded, and rear margin studded with small or large bony ossicles. Lateral ridges above and below the eye develop with age in *Mola alexandrini* and in *M. mola*. Three species, at least 2 in WIO.

KEY TO SPECIES

- 1a Clavus supported by 14–24 swollen rays, of which 8–15 rays (in adults) bear ossicles that are broader than spaces between them, forming the smooth rear edge of clavus; noticeable bump on both head and chin develop with age *M. alexandrini*



- 1b Clavus supported by 11–14 swollen rays, of which 8 or 9 rays (in adults) bear ossicles; ossicles small, widely separated by skin, which (in large adults) extends beyond the ossicles to form distinct lobes; lateral profile smooth without head and chin bumps *M. mola*



Mola alexandrini (Ranzani 1839)

Bump-head sunfish PLATE 128

Orthragoriscus alexandrini Ranzani 1839: 78/75, Pl. 6 (left) (Adriatic Sea).

Orthragoriscus ramsayi Giglioli 1883: 315 (New South Wales, Australia); Fraser-Brunner 1951*.

Mola ramsayi: SSF No. 270.3*; Pequeño 1989; Thys *et al.* 2013*.

Mola alexandrini: Sawai *et al.* 2018*.

See key for diagnostic characters.

Body grey or reddish-brown dorsally, with pale blotches and spots; abdomen dusky white. Attains at least 3.3 m TL and 2 000+ kg.

DISTRIBUTION Occurs in all oceans, but not reported from polar seas. WIO: Red Sea, Oman and India.

REMARKS Appears to prefer warmer waters than *M. mola* (Sawai *et al.* 2018).

Mola mola (Linnaeus 1758)

Ocean sunfish PLATE 129

Tetraodon mola Linnaeus 1758: 334 (Mediterranean Sea).

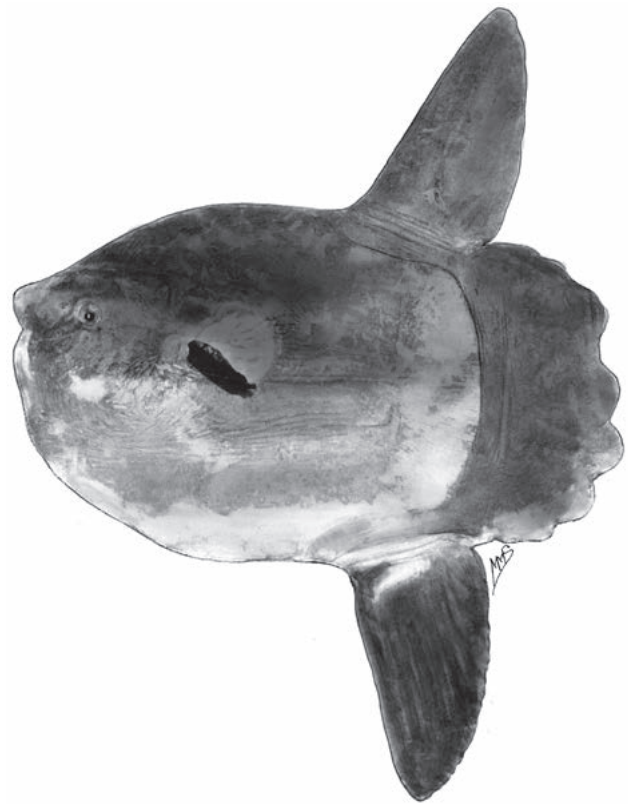
Pedalion capensis Castelnau 1861: 75 (Table Bay, South Africa, SE Atlantic).

Mola mola: Fraser-Brunner 1951*; SSF No. 270.2*; Fricke 1999;

Heemstra & Heemstra 2004*; Hays *et al.* 2009; Fricke *et al.* 2009.

See key for diagnostic characters. Rear edge of clavus with wavy, lumpy appearance in large individuals.

Dorsal body and fins dark bluish or brownish grey, body paler silvery grey or brownish ventrally; clavus may show irregular white spots and streaks. Attains ~3 m TL (species has been confused with *M. alexandrini*).



Mola mola, 92 cm TL (South Africa). Source: SSF

DISTRIBUTION Occurs in all oceans, but not reported from polar seas. WIO: South Africa.

REMARKS Generally epipelagic, occasionally descends as deep as ~600 m to feed, and rarely seen near shore. Highly fecund; a female can produce ~300 million eggs. Newly hatched larvae ~2.5 mm TL. Feeds on pelagic cnidarians, siphonophores, ctenophores and salps; when in shallow water, it also makes forays to the bottom to feed on benthic animals,

including fishes, crustaceans and brittlestars. A species of *Mola* was also seen from the submersible *JAGO*, near the bottom at ~195 m, at Grande Comore I. Using electronic tags in the open ocean, it was discovered that *Mola mola* spends much of its time (up to 20 times a day) diving to cold water (3 °C), below 600 m, to feed on abundant neuston and plankton of the deep scattering layer. These deep forays are followed by ascents to the surface, where the fish can raise its body temperature by floating on its side in direct sunlight in warmer surface water; the elevated body temperature would facilitate digestion and also increase the efficiency of its swimming muscles. Some basking individuals have been found to be heavily parasitised by cestode and nematode worms. Remoras are often found on molids, and small remoras can hide in the mola's oral or gill cavities. A frequent bycatch in drift gillnet fisheries. Not good to eat, but considered a delicacy in some regions.

GENUS *Ranzania* Nardo 1840

Distinguished from other genera by body obliquely truncate posteriorly. Skin thin but tough, resembling carapace of ostraciids (boxfishes): dermis incorporating bony scutella, and epidermis with minute embedded scales. One species.

Ranzania laevis (Pennant 1776)

Slender sunfish

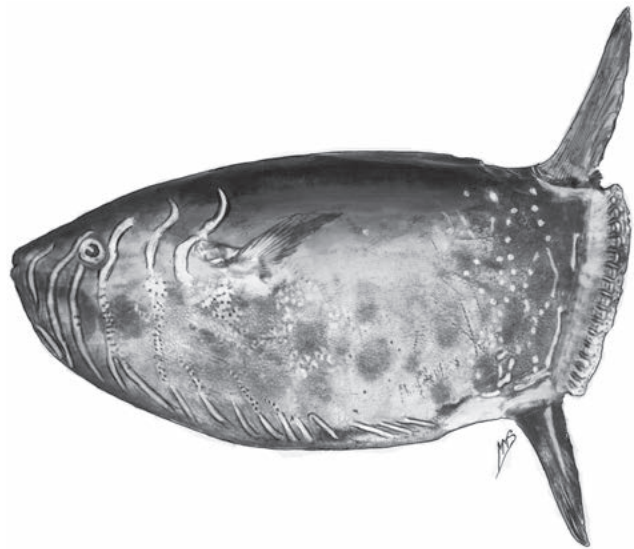
PLATE 129

Ostracion laevis Pennant 1776: 129, Pl. 19 (Cornwall, England, NE Atlantic).

Ranzania laevis: Fraser-Brunner 1951*; Robison 1975*; SSF No. 270.4*; Kar & Chakraborty 2000; Fricke *et al.* 2009.

Dorsal fin 18 rays, anal fin 20 rays, and fins relatively long and thin; pectoral fins 13 rays. Lips fleshy, forming oval mouth, with long vertical axis; 44-cm fish with teeth apparently absent, and mouth apparently unable to close. Body depth of 10-cm juvenile 4.2 in SL, and that of 44-cm juvenile 2.6 in SL.

Body silvery grey, dark bluish dorsally; head with vertical curvy dark-edged pale bands, and similar bands with dark blue spots on body ventrally; fins dark blue. Attains 85 cm TL.



Ranzania laevis, 56 cm TL (South Africa). Source: SSF

DISTRIBUTION Circumglobal in tropical to temperate seas. WIO: South Africa (Cape Peninsula to KwaZulu-Natal), Madagascar, Mauritius, Réunion and reported from Persian/Arabian Gulf (Iran); elsewhere, Taiwan, Japan, Philippines, Australia and New Zealand.

REMARKS Smallest species in family. Epipelagic; generally solitary. Feeds on planktonic crustaceans. Occasionally found stranded or caught in trawls; one was caught on fish bait in the Kowie River (Port Alfred, Eastern Cape), South Africa.

GLOSSARY

cnidarians – jellyfishes and relatives, of the phylum Cnidaria, characterised by the possession of special stinging cells called cnidocytes.

ctenophores – comb jellies, of the phylum Ctenophora, that live in all oceans.

neuston – small, aquatic organisms that live in the surface of the water.

ossicle – bony plate.

ostraciids – boxfishes.

pelagic – pertaining to the open ocean.

salps – a pelagic, barrel-shaped tunicate.

siphonophores – colonial, free-swimming or floating pelagic hydrozoans, mostly delicate and transparent with long filamentous tentacles.

CLASS

SARCOPTERYGII



*Lobe-finned
Fishes*



ORDER

COELACANTHIFORMES

Phillip C Heemstra

Superclass SARCOPTERYGII, Lobe-finned fishes (and tetrapods)

Bony fishes with lobe-like (fleshy) fins set off from the body on a moveable fleshy pedicel with a series of bony supports and a single basal bone articulating with pectoral and pelvic girdles. The Sarcopterygii comprises 2 subclasses, the Coelacanthimorpha, which includes the Order Coelacanthiformes (coelacanth, formerly Actinista), and the Dipnoi (living and extinct freshwater fossil fishes) known as lungfishes. The only 4 living species of lungfishes, one from South America, one from Australia and 2 from Africa, are all freshwater inhabitants.

The coelacanth is well-known in the fossil record from the middle Devonian (393–382 MYA) to the middle Cretaceous (~100 MYA). They once occurred worldwide in freshwater and marine habitats, with 83 fossil species recognised and categorised in 24 genera and ~6 families (Forey 1998). The fossil record also includes one giant coelacanth, estimated to have been 3.5 m in total length (Schwimmer *et al.* 1994). Today we know of at least two living marine species. The first species of living coelacanth, subsequently named *Latimeria chalumnae*, was caught accidentally by a trawler fishing off East London on the east coast of South Africa. It was discovered among the bycatch at the harbour by the curator of the East London Museum, Marjorie Courtenay-Latimer, who recognised it as something primitive and quite unusual. Courtenay-Latimer went to considerable effort to have the large fish preserved by a local taxidermist and meanwhile sent a sketch with a letter to Professor JLB Smith, a chemist with a passion for ichthyology, requesting his help in the identification of this strange fish. Smith was amazed as he recognised the fish as a living coelacanth, a group thought to have become extinct along with the dinosaurs some 70 MYA. The discovery of this supposedly extinct fossil fish caused quite a commotion in South Africa and worldwide in the zoological community.

FAMILY LATIMERIIDAE

Coelacanth

Phillip C Heemstra

Large-sized with robust body, covered with large, imbricate, bony scales, the exposed part of each scale with enamel, tooth-like tubercles. Second dorsal fin, anal fin and paired fins lobate, projecting from limb-like, muscular pedicels, each connected with a bony basal plate that supports the fin rays distally. The dorsal and ventral caudal-fin rays are supported internally by a

series of long tubular dorsal radials that extend from the neural spines to the base of the external fin rays. It was these hollow bony radials (from the Latin *coel* for hollow, and *acanthus* meaning a spine = ‘hollow spines’) that Agassiz (1839) noticed in his description of the fossil genus *Coelacanthus*. The external rays of the small midlateral supplementary caudal-fin lobe are connected directly to the tip of the notochord. First dorsal fin with 8 spinulose rays that fold back into a groove of the epaxial muscles. The lower jaw includes 2 elongate gular bones between the left and right dentaries; and the connection of the lower jaw to the cranium involves a unique tandem articulation with the palate and symplectic. No premaxilla, maxilla and branchiostegal rays. Upper-jaw teeth attached to bony tooth plates set around front and sides of the snout. Cranium divided into 2 hinged parts: an anterior (ethmo-sphenoid) part that contains the eyes, rostral organ and olfactory organs; and a posterior part, containing the brain and inner ear; the two parts are joined by an intracranial joint that allows for some dorso-ventral movement of the front part. Rostral organ located in the snout and presumed to have an electroreceptive function; the organ connects to the exterior by 3 small orifices on each side of the snout. Retina with a *tapetum lucidum* that reflects light to its source and enhances vision in dark habitats. Notochord a well-developed, fluid-filled, thick-walled tube of cartilage that supports the spinal cord and neural arches and extends into the cranium. Swimbladder a long tube filled with fat and confined to dorsal part of abdominal cavity.

Coelacanth is viviparous and give birth to live young, with litters of 5–26 pups that develop in separate compartments of the mother’s oviduct (rather like a string of sausages), and each foetus is provided with a huge (~9 cm diameter) external yolk sac to sustain its growth and development during their several-month gestation period. As their yolk supply is depleted, the yolk sac shrinks and eventually disappears into the abdomen of the new born pup. Another unusual feature of coelacanth anatomy is the negative allometry of the brain, whereby the brain of the new-born pup occupies about half its

cranial cavity, but in the adult coelacanth the brain occupies <1.5% of the cranial cavity volume.

One genus, *Latimeria* Smith 1939, with 2 species of living coelacanths known: *Latimeria chalumnae* and *Latimeria menadoensis* Pouyaud *et al.* 1999. The latter West Pacific species was discovered in a fish market at Sulawesi, Indonesia, by Arnaz Mehta and Mark Erdmann, and subsequently by two captures, followed by sightings from a submersible. IUCN Red List conservation status of the species is Critically Endangered and Vulnerable, respectively.

Latimeria chalumnae Smith 1939

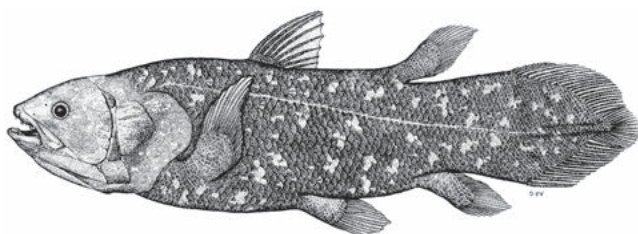
Coelacanth

PLATE 129

Latimeria chalumnae Smith 1939: 455 (southwest of East London, South Africa); Smith 1940; Millot 1953; Millot & Anthony 1958*; SSF No. 35.1*; Heemstra & Heemstra 2004*.

Body robust, with 8 fins: 2 separate dorsal fins: 1st with 8 spinulose spines, 2nd lobate with thick muscular pedicel protruding from body midway between 1st dorsal fin and caudal fin, and with 30–31 segmented rays; anal fin lobate and similar to 2nd dorsal fin, with 27–31 segmented rays; pectoral and pelvic fins lobate and highly moveable, each with 29–33 segmented rays; pelvic fins midway between pectoral and anal-fin bases. Head bones exposed; opercle with thick, flexible skin margin. The structure that looks like a maxillary bone is a thick ligament joining the front of the skull to the rear end of the lower jaw.

Head and body dark metallic blue, covered with irregular white blotches unique to individual specimens. Attains 190 cm TL and ~98 kg.



Latimeria chalumnae, 155 cm TL, male (Comoros). Source: SSF

DISTRIBUTION Appears to be confined to WIO: Kenya, Tanzania, Mozambique, South Africa (KwaZulu-Natal and possibly Eastern Cape), Madagascar (west coast) and Comoros.

REMARKS Lethargic and nocturnal. Spends most of the day resting in groups of 2–17 fish, in caves, in ~50–200 m; emerges at night to look for food (squid and fishes) and slowly drifts or swims near the bottom at depths of 48–600 m. The coelacanth has survived 80 million years with this lethargic

lifestyle. It has a very low metabolic rate, as indicated by the small gill lamellae; consequently the sparse fish community on barren rocky canyons is adequate to provide the coelacanths' food requirements. Because of its small gill area, *Latimeria* must remain in deeper water, which carries more oxygen than shallow water and also provides the best temperature (15–20 °C) for maximum oxygen saturation of coelacanth haemoglobin. The depth restrictions for *Latimeria* are also imposed by a need to avoid large predators, and the white-blotched dark blue colour pattern of the fish is very effective camouflage against the black cave walls encrusted with white oyster shells and sponges.

In November 2000 and May 2001, a group of scuba divers led by Peter Timm and Pieter Venter filmed at least 5 coelacanths at 104–118 m in Jesser Canyon off Sodwana Bay, South Africa. South African researchers, with Hans Fricke, Jürgen Schauer and Karen Hissmann, later identified a further 19 individuals, with a total of 24 coelacanths recognised between 2002 and 2004, in submarine canyons of the iSimangaliso Wetland Park. The African Coelacanth Ecosystem Programme (ACEP), a programme of the South African Institute for Aquatic Biodiversity (NRF-SAIAB), funded by the Department of Science and Innovation, runs the largest inter-institutional, multidisciplinary east coast marine programme in South Africa, including the research projects investigating African coelacanths, their ecosystems and surrounding deepwater environments, conducted since 2002. Recreational trimix divers have also undertaken several surveys to help document individual coelacanths, with 34 individuals currently known from South Africa.

GLOSSARY

epaxial muscles – muscles that lie dorsal to a horizontal plane through the body of a vertebrate (except humans).

gular bones – the median dermal bones that lie between the dentaries.

imbricate – overlapping evenly.

neural arch – the bony arch on the dorsum of a vertebra through which the spinal cord runs.

neural spine – the spine on the neural arch of a vertebra.

notochord – the cartilaginous rod in the embryo that runs from head to tail and supports the nerve cord; in most fishes the notochord is replaced in the larval stage by the developing vertebrae, but in some primitive fishes (e.g., *Latimeria*, hagfishes, chimaeras) the notochord persists in the adult and serves as the vertebral column or 'backbone' of these species.

rostral organ – an organ on the snout.

spinulose rays – rays with spines on them.

symplectic – a bone that lies between the hyomandibular and quadrate in the suspensorium; the suspensorium are the bones from which the lower jaw is suspended.

tandem articulation – two bones, one behind the other, that articulate with each other.