

## REVIEW OF THE GOBIID FISH GENERA *EUGNATHOGOBIUS* AND *PSEUDOGOBIOPSIS* (GOBIOIDEI: GOBIIIDAE: GOBIONELLINAE), WITH DESCRIPTIONS OF THREE NEW SPECIES

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**ABSTRACT.** – The gobiid fish genera *Eugnathogobius* and *Pseudogobiopsis* are reviewed and redescribed. Species of these genera are known from shallow estuarine and freshwater habitats in east Africa, the Indo-Malay Archipelago, northern Australia, southern China and Taiwan. Two new species of *Eugnathogobius* are described, one from Mozambique, Kenya and Seychelles, and one from northern Australia. *Mugilogobius polylepis* Wu & Ni is placed in *Eugnathogobius* and redescribed. *Pseudogobiopsis* includes four species, most of which had previously been placed in several other genera. One new species is described, from Malaysian Borneo, and *Gobius tigrellus* Nichols is placed in *Pseudogobiopsis* and redescribed.

**KEYWORDS.** – Gobioidei, Gobiidae, Gobionellinae, *Eugnathogobius*, *Calamiana*, *Pseudogobiopsis*, new species.

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### INTRODUCTION

The species usually assigned to the gobiid genera *Calamiana*, *Eugnathogobius* and *Pseudogobiopsis* have been of interest to me for some time, as I attempted to discover if they formed one or more monophyletic groups, and if so, how many species were included. Many of the species known are represented by few specimens from a range of Indo-west Pacific and Southeast Asian localities, making identification difficult. This paper presents some answers plus some more questions, and I recognise that these may not be the final answers for this group of fishes.

Hugh Smith began it all originally by describing a new genus and species of goby, *Eugnathogobius microps*, from a single specimen from the lower Bangpakong River, Thailand (Smith, 1931). He characterized the genus by its enormous mouth with elongate maxillary, but did not compare it with any known genus. Koumans (1940) considered that *Eugnathogobius microps* was “Probably a good genus and species”.

Koumans (1935) created the genus *Pseudogobiopsis*, to include *Gobiopsis oligactis* Bleeker, and *Gobius römeri* Weber. He stated that *Pseudogobiopsis* “... in general appearance is close to *Stigmatogobius*, but differs in having the maxillary prolonged posteriorly” (Koumans, 1935). Koumans (1953) later placed *Pseudogobiopsis oligactis* in the genus *Stigmatogobius* Bleeker, along with other species now referred to *Hemigobius*, *Redigobius*, *Pseudogobius* and *Stigmatogobius*. Koumans did not discuss

the reason for synonymising his genus *Pseudogobiopsis* with *Stigmatogobius*.

Herre (1945) created *Calamiana* for a new species (*Calamiana magnoris*) that he considered to possess vomerine teeth, mistaking the curved vomer itself for a pair of canine-like vomerine teeth. His species *C. magnoris* also possessed an enlarged mouth and “physiognomy peculiar”.

Smith (1945) considered that *Eugnathogobius* was related to his genus *Gnathogobius* (a junior synonym of *Calamiana*), *Mahidolia*, *Pseudogobiopsis* and *Waitea* (the last a synonym of *Oligolepis*), due to their greatly enlarged jaws. *Mahidolia* is a gobiine, while the others are gobionellines (Birdsong et al. 1988; Larson 2001).

The placement of *Mugilogobius polylepis* Wu & Ni, 1985, was uncertain for many years due to insufficient material. This species was described from three specimens: the 34 mm SL holotype (Shanghai Fisheries College S-0001) and two paratypes 22–23 mm SL (Shanghai Fisheries College S-0002, S-0003). The paratypes now appear to be lost in the postal system (Wu Han-Lin, pers. comm.). The holotype was made available for study by I-S. Chen (National Taiwan Ocean University) and was found to agree with *Calamiana*.

Birdsong et al. (1988) placed *Calamiana* and *Pseudogobiopsis* in their Gobionellus Group (they also included *Gnatholepis*, *Mugilogobius*, *Oligolepis*, *Oxyurichthys*, *Pseudogobiopsis*, *Stenogobius* and *Tamanka*). These genera share the characters

of two epurals, 25–26 vertebrae, dorsal pterygiophore formula of 3-12210, and having two or three anal pterygiophores before the first haemal spine. Pezold (1993) assigned *Calamiana* and *Pseudogobiopsis* to the Gobionellinae, but did not mention *Eugnathogobius*.

Larson (1999) described a new species of *Calamiana* and allocated *Apocryptes variegatus* Peters, and *Vaimosa mindora* Herre, to the genus. She retained *Calamiana* as separate from *Eugnathogobius*, pending further research.

Larson (2001) revised *Mugilogobius* and 13 genera related to it, and concluded that *Pseudogobiopsis* (referred to as *Eugnathogobius*), as it currently stood, was para- or polyphyletic. Larson (1999) considered that *Calamiana* shared some similarity with *Eugnathogobius microps* Smith, 1931, in having headpores absent; sensory papillae in cheek rows *c* and *cp* being large and widely spaced, with papillae in rows *b* and *d* small and close-set; papilla row *p* composed of widely spaced papillae, and fine villi absent from the dorsal surface of the head. *Calamiana* was then considered to be different from *Eugnathogobius* in that it had 16 segmented caudal rays (vs. 17), had jaws enlarged in males in one species only (*C. kabilia*) (vs. jaws are greatly enlarged in all males), had a low to moderate metapterygoid (vs. a broad metapterygoid) with a process or bridge overlapping the quadrate (vs. no process reaching the quadrate). The similarity of the type species of *Eugnathogobius* and *Calamiana*, plus the discovery of new species which had features which agreed with those characteristic of one or more of these genera as presently understood, prompted this review.

## MATERIALS AND METHODS

Measurements were taken using electronic callipers and dissecting microscope. Counts and methods generally follow Hubbs & Lagler (1970), except as indicated below. Papillae pattern terminology is based on that of Sanzo (1911), due to its use in previous literature on this group of gobionellines by Aurich (1938) and Miller (1987, 1989). Pterygiophore formula follows Birdsong et al. (1988). Transverse scale counts are taken by counting the number of scale rows from the anal fin origin diagonally upward and back toward the second dorsal fin base. The circumpeduncular scale count is taken beginning at the first scale on top of the caudal peduncle immediately in front of the caudal fin, and following the scale rows down and forward to the ventral edge of the peduncle, then around and back to the original scale. Head length is taken to the upper attachment of the opercular membrane. Interorbital width is the least fleshy width (not least bony width). Although both left and right pectoral fin ray numbers were recorded, the right pectoral fin count is that used in descriptions and tables, unless otherwise indicated (in cases of damage). The segmented or branched caudal fin ray pattern (e.g. 9/8 or 9/7) is the number of segmented caudal fin rays attaching to the upper and lower hypural plates respectively. In the descriptions, an asterisk indicates counts of the holotype (or lectotype). Numbers in parentheses after counts indicate the number of

specimens with that count, or the range of counts. Vertebral counts and other osteological information were obtained by radiography and clearing and double-staining.

Cladistic analyses were made using PAUP\* v.40b, using both branch and bound and bootstrap methods (branch-and-bound option) (Swofford 2002). Data was acquired from 12 of the 13 nominal species of *Calamiana*, *Eugnathogobius* and *Pseudogobiopsis*. The matrix used is a subset of that in Larson (2001), with the addition of data for *Pseudogobiopsis tigrellus* for which much osteological information was lacking but its placement was uncertain (Table 1) and there was insufficient data for an undescribed *Calamiana* from the Indian Ocean (so it was not included in the analyses). The 41 characters used are the 40 detailed in Larson (2001: 15–31), with the addition of character 41 (“broken row *b*”, Fig. 21) possessed by *P. festivus*, new species and *P. paludosus* (papilla row *b* is broken behind the eye into two short sections, with a wide gap between each section; in all of the other species, this papilla row *b* is continuous); all characters were run unordered and unweighted. Nominal species of *Calamiana* (*C. illota*, *C. kabilia*, *C. mindora*, *C. polylepis*, *C. stictos*, new species, and *C. variegata*), *Eugnathogobius* (*E. microps*) and *Pseudogobiopsis* (*P. oligactis*, *P. paludosus*, *P. siamensis*, *P. tigrellus* (this species initially thought to be *Redigobius*) and *P. festivus*, new species), were compared with three species of *Pseudogobius* (*P. javanicus*, *P. melanostictus* and *P. olorum*) and three species of *Redigobius* (*R. balteatus*, *R. dispar* and *R. macrostoma*) [both these genera are closely related to *Calamiana*, *Eugnathogobius* and *Pseudogobiopsis* and share some common characters (Larson 2001)]. Two odontobutids (*Micropercops borealis* and *Sineleotris chalmersi*) were used as outgroups.

Abbreviations for institutions referred to are: AMS, The Australian Museum, Sydney; BMNH, The Natural History Museum, London; CAS, California Academy of Sciences, San Francisco; CMK, Collection Maurice Kottelat, Cornol, Switzerland; FMNH, Field Museum of Natural History, Chicago; KEW, collection of Dr K. E. Witte, previously of University of Constance, Konstanz; KUMF, Kasetsart University Museum of Fisheries, Bangkok; MNHN, Museum National d’Histoire Naturelle, Paris; NIFI, National Inland Fisheries Institute, Bangkok; NTM, Museum and Art Gallery of the Northern Territory (previously Northern Territory Museum), Darwin; QM, Queensland Museum, Brisbane; PMBC, Phuket Marine Biological Laboratory, Thailand; RMNH, Nationaal Natuurhistorisches Museum, Leiden; ROM, Royal Ontario Museum, Toronto; RUSI, now SAIAB, South African Institute for Aquatic Biodiversity, Grahamstown; SFC, Shanghai Fisheries College, Shanghai; SMF, Senckenberg Museum, Frankfurt; URM, University of the Ryukyus, Naha; USNM, National Museum of Natural History, Washington; WAM, Western Australian Museum, Perth; ZMB, Zoologische Museum, Berlin; ZRC – Raffles Museum of Biodiversity Research, National University of Singapore; ZSM, Zoologische Staatssammlung, München.

Other abbreviations used: HL, head length; SL; standard length; HD, head depth at rear preopercular margin; HW,

head width at rear preopercular margin; BDA, body depth at anus; BWA, body width above anus; CPL, caudal peduncle length; CPD, caudal peduncle depth; CL, caudal length.

Details of preserved specimens examined are given with each species account (descriptions), except for cleared and stained and x-rayed specimens, which are listed below (C = cleared and stained specimen, X = radiograph):

ODONTOBUTIDAE. *Micropercops borealis*: ex AMNH 10441, C, 3(31-33.5). *Sineleotris chalmersi*: holotype of *Philypnus chalmersi*, AMNH 8384, 1(100); ex AMNH 10456, C, 3(31.5-40.5). GOBIIDAE, GOBIONELLINAE. *Eugnathogobius illotus*: holotype of *Calamiana illota*, ZRC 39268, X, 1(37); paratypes, NTM S.14235-002, X, 7(22.5-34); NTM ex S.14235-002, C, 1(30); ZRC 39269, X, 3(37-45). *Eugnathogobius kabilia*: holotype of *Vaimosa kabilia*, CAS 32978, X, 1(36.5); paratypes of *Vaimosa rambaia*, USNM 119647, X, 2(27-29); NTM S.16415-001, C, 1(47); CMK 4789, X, 1(45); NIFI unregistered, X, 3(26-34); NTM S.14302-001, X, 3(21-23); NTM ex S.14302-001, C, 2(22.5-28). *Eugnathogobius microps*: holotype, USNM 90316, X, 1(26); paratype, USNM 11951, X, 1(26); paratypes, USNM 119593, X, 3(20-26.5); KUMF unregistered, X, 2(17.5-17.5); NTM S.13953-013, X, 6(18-25.5); ex NTM S.13953-013, C, 1(24). *Eugnathogobius mindora*, ex ROM 53371, C, 1(24.5); ROM 53371, X, 8 of 20(14-25); CMK 5366, X, 6(19.5-26). *Eugnathogobius polylepis*: ex AMS I.25523-003, C, 3(17-20.5); QM I.13347, X, 3(18-21). *Eugnathogobius siamensis*: holotype of *Vaimosa mawaia*, CAS 29080, X, 1(24); holotype of *Vaimosa jurongensis*, CAS 32982, X, 1(36); paratypes of *V. jurongensis*, CAS 32983, X, 11(19.5-34); ex USNM 119637, C, 3(26.5-32.5); ANSP 63126, X, 2(27.5-28); ANSP 87453, X, 13(23-32.5); CMK 8485, X, 6(22-31). *Eugnathogobius stictos*, new species: ex AMS I.32051-032, C, 1(21). *Eugnathogobius variegatus*: holotype of *Tamanka ubinensis*, CAS 30964, X, 1(30); ex URM P.13341, C, 1(32); URM P.13341, X, 2(29-31.5); ZRC 39270, X, 1(33); URM P.13842, X, 1(33). *Pseudogobiopsis festivus*, new species, paratypes, NTM S.16412-001, C, 1(25); paratypes, ex CMK 8401, X, 26(11-27); ZRC 26026-7, X, 2(14.5-19.5). *Pseudogobiopsis oligactis*: holotype of *Vaimosa perakensis*, CAS 32975, X, 1(25.5); paratypes of *V. perakensis*, CAS 32977, X, 6(13.5-28.5); NTM S.14239-001, X, 3(31.5-36); CMK 5385, X, 7(21-36); ex CMK 7422, C, 1(30); NTM S.16413-001, C, 2(28.5-29). *Pseudogobiopsis paludosus*: holotype of *Ctenogobius paludosus*, CAS 32998, X, 1(30.5); NTM S.16416-001, C, 2(18-25); CMK 7384, X, 10(12.5-29); ZRC 8411, X, 1(30); CMK 9009, X, 2(13-21); ZRC 14011, X, 1(22). *Pseudogobiopsis tigrellus*: holotype and paratypes of *Gobius tigrellus*, AMNH 18574, X, 10(15-21). *Pseudogobius javanicus*: WAM P.30806-003, X, 10(21-35); ex NTM S.11125-029, C, 2(30-31). *Pseudogobius melanostictus*: ZMH 19312, X, 3(30.5-36); CMK 6286, X, 3(31.5-35.5); USNM 241842, X, 1(35.5); SMF 18199, X, 1(40); ZRC 3521, X, 9(24-38); ex USNM 268186, C, 2(27.5-33). *Pseudogobius olorum*: ex AMS I.20158-001, C, 2(32.5-33); ex AMS I.18478-003, C, 2(38-39); NTM unregistered, X, 7(37-53); SAMA F.5123, X, 7(27-45). *Redigobius balteatus*: CMK 7184, X, 7(26.5-

36); ex AMS I.22055-020, C, 3(17-27). *Redigobius dispar*: syntypes, ZMB 6705, X, 5(31-33.5); syntypes, ZMB 6700, X, 6(40-41); syntypes, ZMB 6703, X, 2(30-36); syntypes, ZMB 6702, X, 4(38-42); ex USNM 263330, C, 2(21.5-25.5). *Redigobius macrostoma*: AMS I.16954-018, X, 9(19-30); ex AMS I.19341-002, C, 3(28-35.5).

## SYSTEMATICS

**Results of analyses.** – The branch-and-bound analysis resulted in 10 trees, with the best being 78 steps in length, with consistency and homoplasy indices of 0.50 (consensus tree in Fig. 1). A bootstrap 50% majority-rule consensus tree was the same but for the taxa from *Calamiana illota* to *Pseudogobiopsis siamensis* forming an unresolved group (*Pseudogobius* remained as in Fig. 1). Both analyses indicated that the six nominal species of *Calamiana* and *Eugnathogobius microps* form a monophyletic grouping. *Pseudogobiopsis siamensis* aligned with this clade in eight of the trees and with the *Pseudogobius* clade in two trees by a reversal (character 1: rear portion of oculoscapular canal over opercle absent). These eight taxa (*E. illotus*, *E. kabilia*, *E. microps*, *E. mindora*, *E. polylepis*, *E. siamensis*, *E. stictos*, new species, and *E. variegatus*) are placed together here as the genus *Eugnathogobius* Smith, 1931, which has priority over *Calamiana* Herre, 1945. The species of *Eugnathogobius* all share the derived condition of character 19 (papilla row e), which is variably developed in each species.

However, species assigned to *Pseudogobiopsis* do not all fall out quite so neatly. In the branch-and-bound analyses, *Pseudogobiopsis siamensis*, *P. paludosus* and *P. festivus*, new species, are unresolved in the consensus. *Pseudogobiopsis siamensis* is best placed with *Eugnathogobius* (as above). *Pseudogobiopsis paludosus* and *P. festivus*, new species, formed a species-pair in six of the 10 trees, but in four trees they are split (due to headpore characters), *P. festivus*, new species, grouping with the *Pseudogobius* clade and *P. paludosus* grouping with the *Eugnathogobius-Pseudogobius* clade. In two trees they appear next to *Pseudogobiopsis oligactis* and *P. tigrellus*. *Pseudogobiopsis oligactis* and *P. tigrellus* always appear closer in the 10 trees to *Redigobius* than to any other taxon and form a species-pair in four trees. One tree (Fig. 2) is used as the basis for the classification herein. The name *Pseudogobiopsis* is here retained for four species (*P. festivus*, new species, *P. oligactis*, *P. paludosus* and *P. tigrellus*), based on four characters (4, pectoral girdle lobes; 12, preanal pterygiophores; 21, unossified scapula; 32, preopercular bone morphology). *Pseudogobiopsis* shows some similarity to *Redigobius* (its 44 putative species are presently under revision).

Several species of *Eugnathogobius* and *Pseudogobiopsis* have been described a number of times (e.g. males as one species, females as another) (Table 2). Several museum lots of specimens exist which may represent an additional one or more species, but this cannot be confirmed until more specimens are obtained. Further work may help clarify the relationships of all these taxa. DNA analyses of some

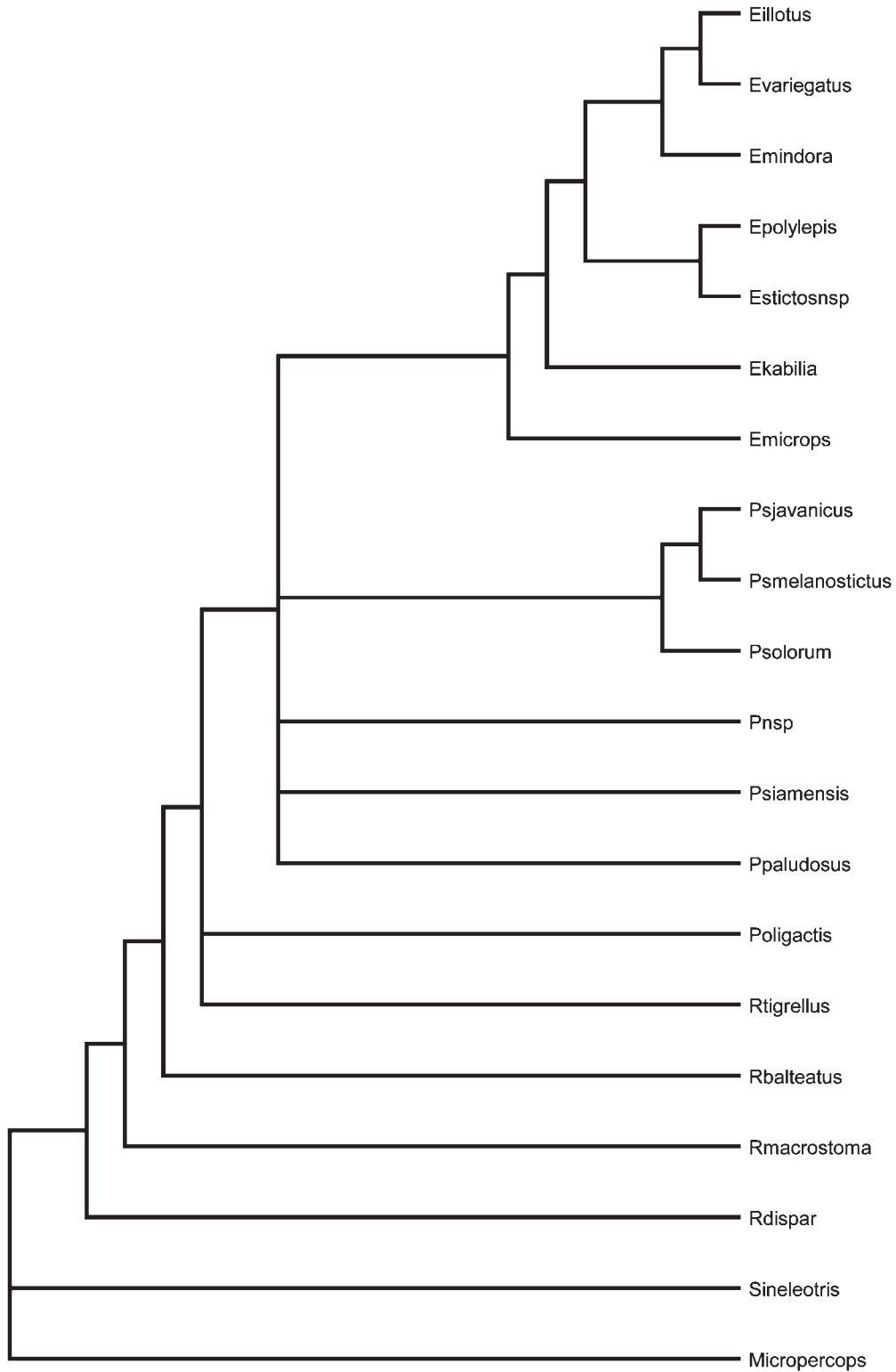


Fig. 1. Consensus of 10 equally parsimonious trees, resulting from PAUP branch-and-bound search, of *Calamiana*, *Eugnathogobius*, *Pseudogobiopsis*, *Pseudogobius* and *Redigobius* (*Micropercops* and *Sineleotris* are outgroup).

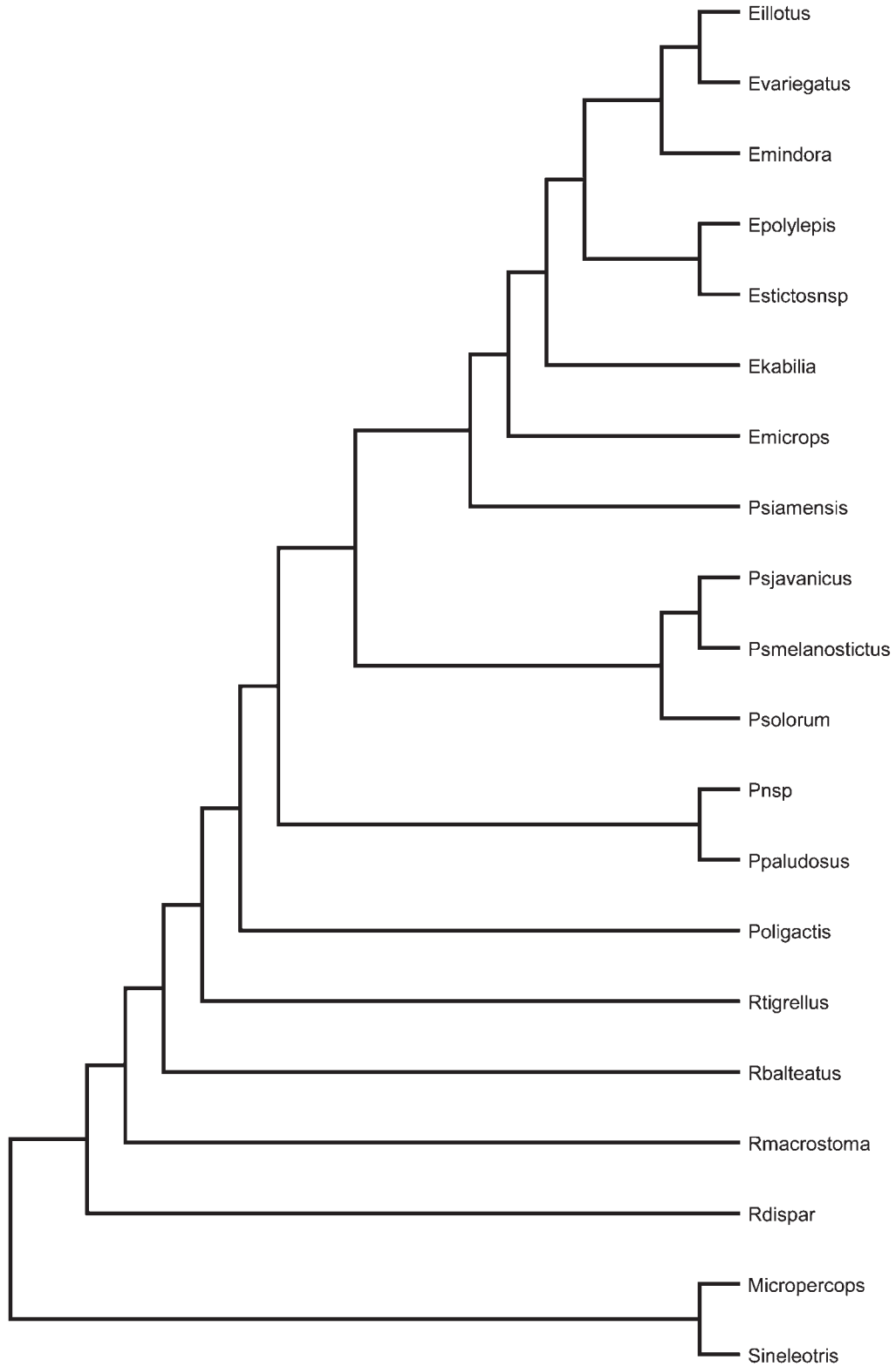


Fig. 2. One of the 10 trees from PAUP analyses; preferred tree on which classification is based (CI = 0.4935, RI = 0.6929).

species of these genera and their relatives are underway (Jaafar, in prep.; McMahon & Larson, in prep.), but genetic samples are not yet available for all the species presently under discussion.

As Larson (1999) previously described and illustrated three *Eugnathogobius* species (as *Calamiana*: *E. illotus*, *E. mindora* and *E. variegatus*), these three are not redescribed below, but they do appear in the dichotomous key to species.

### KEY TO GOBIONELLINE GENERA USED IN ANALYSES

- 1 16-segmented caudal fin rays in most species, if 17 fin rays present then papilla row *e* turns upward onto the cheek well in advance of the preopercular margin; preopercular pores and posterior portion of oculoscapular canal (over preopercle) always absent ..... 2
- 17-segmented caudal fin rays; papilla row *e* follows preopercular margin; preopercular pores and posterior portion oculoscapular canal usually present (absent in two species) ..... 3
- 2 Mouth terminal, lower jaw tip anteriormost; gut short, “S-bend” shape; headpores absent in three species .... *Eugnathogobius*
- Mouth subterminal, upper jaw tip anteriormost, with round snout overhanging mouth; gut long, spirally coiled about its longitudinal axis; headpores always present ... *Pseudogobius*
- 3 Second dorsal fin modally with one more ray than in anal fin; vertebral pattern 11+15 to 12+14; scapula usually ossified at tip or around foramen; three to four anal pterygiophores before first caudal vertebra; most species stocky, head and body somewhat compressed; widespread in estuarine to freshwaters across the Indo-Pacific ..... *Redigobius*
- Second dorsal and anal fins with equal numbers of rays; vertebral pattern 10+15-17 (usually 16); scapula usually cartilaginous, tip above foramen sometimes ossified; two to three anal pterygiophores before first caudal vertebra; head usually depressed; restricted to freshwaters of South-east Asian region ..... *Pseudogobiopsis*

### *Eugnathogobius* Smith, 1931

*Eugnathogobius* Smith 1931 (*Eugnathogobius microps* Smith, 1931: 37, Fig. 18, lower Bangpakong River, central Siam, by original designation and monotypy).

*Eugnathogobius* Koumans, 1931: 69 (error for *Eugnathogobius*).

*Calamiana* Herre, 1945 (*Calamiana magnoris* Herre, 1945: 80, Calamianes, the Philippines, by original designation and monotypy).

*Gnathogobius* Smith, 1945 (*Gnathogobius alicae* Smith, 1945: 523, Fig. 104, Bangkok, Thailand, by original designation and monotypy).

**Diagnosis.** – Distinguished by following combination of characters. Second dorsal fin rays I,6-9; anal fin rays I,5-9; unpaired fin rays modally equal in number; first dorsal spine may be elongate; pectoral fin rays 14-20; 16 or 17 segmented caudal fin rays in 9/7 or 9/8 pattern; predorsal scales variable, absent or 2-25; 23-63 scales in lateral series; TRB 7-22; 12-25 circumpeduncular scales; headpores present in three species, absent in five; headpores, if present, reduced (no rear part of oculoscapular canal, no preopercular pores, no

nasal pores); preopercular pores absent; sensory papillae in longitudinal pattern; papillae rows *a* and *c* consisting of large, widely spaced papillae, as does row *p* if present (otherwise replaced by headpores), rows *b* and *d* always consisting of small close-set papillae, row *f* of one or two papillae only, two or three *s* rows on snout of one papilla each; modally two but up to three *s* papillae rows on snout; papillae rows *p*, *a* and *c* composed of few large widely spaced papillae, other papillae small and close-set; papilla row *c* broken under eye, rear portion consisting of one papilla, papilla row *e* curves upward onto the cheek in advance of the preopercular margin (variably developed); gill opening restricted to pectoral fin base or extending past pectoral base to under opercle; smooth bony or fleshy flange or ridge on pectoral girdle, with no fleshy knobs and flaps; jaws terminal with lower jaw tip usually anteriormost, jaws may be enlarged in males (may be greatly enlarged in some species); inner edges of lips smooth, without fimbriae; anterior nostril tubular, placed at or just behind preorbital edge; genital papilla flattened and usually elongate in males, rounded and bulbous in females; gut simple, S-bend shape.

Pterygiophore formula 3-12210; 26 vertebrae, modally 10+16; two epurals; two or three (rarely one) anal fin pterygiophores present before first caudal haemal spine; anterior end of preopercular bone blunt, rounded or slightly pointed; neural spines of first few vertebrae slender, pointed; neural spines on first few vertebrae slender, tips not broadened (except in some specimens of *E. kabilia*); metapterygoid short, relatively small, may be broadened dorsally or with short dorsal process, but not contacting or forming bridge to quadrate in three species, metapterygoid forming distinct low bridge to quadrate in six species; palatine and pterygoid slender and nearly equal in length; palatine reaching quadrate; quadrate broad, may be somewhat forked; fifth ceratobranchial stout, triangular, with high flange fifth ceratobranchial narrow and triangular, with distinct flange on back (extra crest on back in one species); four to nine ossified gill-rakers; scapula usually unossified but tip above foramen may be ossified.

### KEY TO SPECIES OF *EUGNATHOGOBIUS*

- 1 Segmented caudal fin rays 16 ..... 3
- Segmented caudal fin rays 17 ..... 2
- 2 Caudal fin pale, conspicuously barred with dark pigment, five elongate black or brown blotches along midside of body; headpores present; lateral scales 22-24 ..... *E. siamensis* (Fowler, 1934) (Thailand, Malaysia, Singapore, Borneo)
- Caudal fin plain greyish to translucent, darker at base, side of body without brown blotches or bars; no distinct elongate dark blotches along midside of body; headpores absent; lateral scales 24-27 ..... *E. microps* Smith, 1931 (Thailand)
- 3 Upper jaw teeth in single row, teeth compressed and even in height, with tips pointed, indented and bent to one side, lower jaw teeth conical, pointed ..... *E. variegatus* (Peters, 1869) (Thailand, Singapore, Indonesia, Papua New Guinea)
- Upper jaw teeth in at least two rows, all teeth conical and pointed ..... 4

- 4 Lateral scales 27–39; headpores present or absent; first dorsal fin spines always VI; all fins well-developed ..... 6
- Lateral scales 48–63; headpores always absent; first dorsal fin spines VI, V or less; fish small and slender with very low fins ..... 5
- 5 Back and upper sides with small distinct black spots in both sexes, no distinct black spot on upper base of caudal fin; nape always naked; first dorsal fin spines V or fewer .....  
 ..... *E. stictos*, new species (Northern Territory, Australia)
- Body indistinctly mottled, males with black spot on upper base of caudal fin; predorsal scales modally absent, may be 2–16 present; first dorsal fin spines VI, rarely V .....  
 ..... *E. polylepis* (Wu & Ni, 1985) (China, Taiwan, Malaysia, Singapore, northern Australia)
- 6 Headpores always absent; jaws greatly enlarged in males; head with at least two dark stripes, each body scale with fine brown bar or spot ..... *E. kabilia* (Herre, 1940) (Thailand, Malaysia, the Philippines)
- Headpores present or absent; jaw length not greatly dissimilar between males and females; body with small but distinct brown or blackish spots and mottling ..... 7
- 7 All nape scales small and equal in size, reaching forward as far as over preopercular margin, but not reaching to behind eyes; headpores always absent; about 10 narrow bars or saddles across dorsum, side of body with dark stripe along midline; no distinctive bars or stripes on face .....  
 ..... *E. indicus* new species (Kenya, Mozambique, Aldabra)
- Nape scales reaching forward to close behind eyes, anteriormost scale often enlarged; headpores present or absent; dark stripes or broad dusky bars present on snout and/or side of head ..... 8
- 8 First three dorsal spines often elongate in males; four to five oblique dark brown lines cross side of head; headpores modally absent; anteriormost nape scale enlarged, occasionally all nape scales small, equal in size ..... *E. mindora* (Herre, 1945) (Fiji, Queensland, the Philippines, Thailand)
- No dorsal spines elongate in males, second or third spine longest; two or three broad irregular dusky bands cross snout and cheek; headpores modally present; anteriormost nape scale often enlarged ..... *E. illotus* Larson 1999 (Thailand, Singapore, Brunei, the Philippines)

***Eugnathogobius indicus* new species**

(Figs 3, 4; Tables 3–7)

**Material examined.** – HOLOTYPE – AMS I.23623-001, 27 mm SL female, Bazaruto Island, off Inhossoro, Mozambique, 4 May 1972. PARATYPES – NTM S. 16251-001, 1(25.0), pools at end of mangrove creek, Gazi Bay, Kenya, H. Coehne, Jul.-Aug.1993; USNM 316139, 6(13.5–15.5), in well at trail marker 37, Grand Terre, Aldabra Atoll, Seychelles, J. Louton, 3 Jun.1990; RUSI 5461, 8(13.5–33.0), Bazaruto, Mozambique, 4 May 1972; AMS I.23623-002, 1(23), same data as holotype.

**Diagnosis.** – Small, slender-bodied *Eugnathogobius*; first dorsal fin VI; second dorsal rays I,7–8, modally I,7; anal rays I,6–8, modally I,7; pectoral rays 15–17, modally 16; longitudinal scales 32–41; TRB 10–13; headpores absent; predorsal scales 14–20; scales on body small, mostly ctenoid; gill opening restricted to just under opercle; colour pale yellowish with dark scale margins in network pattern and variably distinct dark stripe along mid-side of body; known only from Kenya, Mozambique and Seychelles, in estuarine and freshwater habitats.

**Description.** – Based on 16 specimens, 15–33 mm SL. Counts of female holotype (Fig. 3) indicated by asterisk.

First dorsal VI; second dorsal I,7–8 (mean I,7\*); anal I,6–8 (mean I,7\*), pectoral rays 15–17 (mean 16\*), segmented caudal rays 15–17 (mean 16\*); caudal ray pattern modally 9/7\*; branched caudal rays 12–16 (mean 14, 15 in holotype); unsegmented (procurrent) caudal rays 6/5 (in 1), 6/6 (in holotype), 7/7 (in 2); longitudinal scale count 32–41 (mean 35\*); TRB 10\*–13 (mean 11); predorsal scale count 14–20 (mean 11, 16 in holotype); circumpeduncular scales 12–14\* (mean 13). Gill rakers on outer face of first arch 2+7 (in 1), 3+5 (in 1), 3+7 (in 2), 3+8 (in 2), 4+6 (in 1). Pterygiophore formula 3-12210\* (in six). Vertebrae 10+16\* (in 8). Neural spine of first few vertebrae narrow, pointed. Two\* (in 8) epurals. Two\* (in 7) or three (in 1) anal pterygiophores before haemal spine of first caudal vertebra.

Body very slender and compressed, less so anteriorly; head broad and somewhat depressed. Body depth at anal fin origin 14.4–18.7% (mean 16.5%) in SL. Head rounded, always wider than deep, HL 26.4–31.1% (mean 28.7%) of SL. Depth at posterior preopercular margin 53.6–61.9% (mean 57.0%) of HL. Width at posterior preopercular margin 68.1–81.0% (mean 74.6%) of HL. Mouth terminal, slightly oblique, forming angle of about 15° with body axis; jaws not greatly enlarged in males, reaching to just below anterior half of eye in large adults or to just below anterior margin of eye in male specimens less than 25 mm SL. Lips smooth, with fine fleshy fimbriae present on inner edges of lips; lower lip free at sides, fused across front. Upper jaw 32.6–47.0% (mean 37.2% in males, 35.1% in females) of HL. Eyes relatively small, dorsolateral, high on head, top forming part of dorsal profile, 21.7–30.3% (mean 25.3%) of HL. Snout short, flattened, rounded in dorsal view, 22.7–30.0% (mean 26%) of HL. Interorbital moderate to fairly wide, usually flat, 14.5–25.0% (mean 20.5%) of HL. Caudal peduncle quite compressed, length 21.9–28.9% (mean 26.7%) of SL. Caudal peduncle depth 11.3–12.9% (mean 12.1%) of SL.

First dorsal fin low, third spine nearly always longest; spines slightly longer in males than females; tips of spines just reaching past first and second fin element of second dorsal fin (in 33 mm SL specimen); in most specimens, first dorsal fin spines falling short of second dorsal fin, or just reach second dorsal fin spine base. Third dorsal spine length 11.5–19.7% (mean 13.8%) of SL. Second dorsal and anal fins low, short-based, posteriormost rays longest, in most specimens, fin rays falling short of caudal fin base when depressed (as in holotype); in 33 mm SL male, rays reaching to caudal fin procurrent rays. Pectoral fin moderately broad to slightly pointed (tips variably damaged in many specimens), central rays longest, 20.3–25.5% (mean 22.4%) of SL; rays usually all branched. Pelvic fins rounded to somewhat oval, often cup-like, nearly reaching anus, 18.4–22.2% (mean 20.3%) of SL. Caudal fin short, rounded to truncate, 24.6–30.3% (mean 27.3%) of SL.

No mental fraenum or fold, chin smooth. Anterior nostril tubular, placed at edge of upper lip, tube short, oriented

down and forward, preorbital usually curved to accommodate nostril. Posterior nostril small and rounded, placed very close to upper front margin of eye. Gill opening usually extending forward to just under opercle. Inner edge of pectoral girdle smooth with very low, bony ridge on anterior face of cleithrum, usually forming distinct thin flange of bone, with two to three small fleshy knobs. Gill rakers on outer face of first arch greatly reduced, very short fleshy knobs, largest raker by angle of arch; rakers on inner face of first arch also short and stubby; inner rakers on other arches slightly longer and more slender than first arch inner rakers. Tongue reduced to nearly absent, tip blunt. Outer teeth across front of upper jaw sharp and curved, larger (but not greatly so) than inner row teeth; behind this row, two to three rows of very small, pointed teeth; one or two rows of small pointed teeth at side of jaw (outer row teeth not enlarged in males). Lower jaw with three or four rows of small curved sharp teeth across front, inner rows all pointing inward; usually one or two rows of teeth at side of jaw.

Predorsal scales very small and cycloid, reaching to, or just anterior to, posterior preopercular margin. Operculum with

patch of small cycloid scales on upper third to half; sometimes entire operculum scaled. Cheek always naked. Pectoral base naked. Prepelvic area naked. Belly with cycloid scales; ctenoid scales may be present anteriorly, close by pelvic fin base or up to anterior third of belly with ctenoid scales. Scales on body small, those on caudal peduncle tending to be larger. Ctenoid scales on side of body extending anteriorly to up behind pectoral fin; small specimens from Aldabra with only few scales anteriorly.

Genital papilla in male slender and flattened, with pointed tip; genital papilla in female short and cylindrical to rounded and bulbous.

Head pores absent.

Sensory papillae pattern longitudinal. Two *s* rows present on snout, of one papilla each. Cheek rows *b* and *d* composed of small closely spaced papillae; rows *a*, *c* and *cp* of few large widely spaced papillae. Mental *f* rows consisting of two pairs of papillae.



Fig. 3. *Eugnathogobius indicus*, new species, holotype, 27 mm SL female, AMS I.23623-001, Bazaruto Island, Mozambique.



Fig. 4. *Eugnathogobius indicus*, new species, paratype, 14 mm SL, male, USNM 316139, Grande Terre, Aldabra Atoll, Seychelles.



**Colouration of fresh material.** – No information available.

**Colouration of preserved material.** – Based on holotype and two largest paratypes (Figs. 3, 4); most specimens faded. Head and body light yellowish, with scale margins on most of body, especially upper half, narrowly outlined with light brown, side of body with small cross-hatched brownish blotches, short bars and X-shaped marks, forming lateral stripe or series of blotches linked by dusky midlateral line; blotch at caudal base may be darkest. Holotype most heavily pigmented specimen, with about seven indistinct brownish saddles crossing dorsum, blending with dark scale margins (Kenya specimen has remnants of these saddles).

Head and nape speckled with pale brown dorsally, pigment evenly distributed or forming faint spots or diffuse blotches. Side of head with several pale brownish irregular blotches, opercle with one or two darker brown horizontal bars or blotches, indistinct brownish bars from eye to snout tip and lower jaw visible on Kenyan specimen. Lips plain, pale whitish yellow. Underside of head pale (diffuse brownish band crossing isthmus behind chin in Kenyan specimen). Breast pale yellowish-white. Pectoral base pale with short brown horizontal bar or spot across upper half. Belly whitish.

First dorsal fin transparent to light brown, outer half dusky to brown; or with lower third of fin translucent and outer portion light to dark brown. Second dorsal fin translucent with scattered pale brown pigment, which may form row of dark blotches. Anal fin transparent to translucent yellowish. Caudal fin translucent yellowish, faintly spotted with brown; narrow brown vertical bar along hypural crease; just behind vertical bar, a pair of faint brownish spots. Pectoral fins translucent, sometimes with light brown fin rays. Pelvic fins plain, translucent.

**Comparisons.** – This species resembles the two other dwarf slender species (*E. polylepis* and *E. stictos*, new species) in its general morphology but differs in usually having second

dorsal and anal fin ray counts of I,7 (vs. usually I,8) and its lower lateral scale counts (32–41 vs. 48–63).

**Distribution.** – Restricted to the Indian Ocean, to coasts of Mozambique and Kenya, and Aldabra Atoll in the Seychelles.

**Etymology.** – From the Latin *indicus*, referring to India; in this case the Indian Ocean, where this species occurs.

**Ecology.** – Limited information is available; the species appears to be marine to estuarine in habitat. The specimens from the freshwater well on Aldabra are intriguing in their isolation.

***Eugnathogobius kabilia* (Herre, 1940)**

(Figs. 5–10; Plate 1A; Tables 3–6, 8)

?*Glossogobius mas* Hora, 1923: 742–743, Fig. 23 (Chilka Lake: off Samal Island, Rambha Bay, off Barkul).

*Vaimosa kabilia* Herre, 1940: 19, Pl. 14 (Kabili River, north Borneo). – Koumans 1953: 388.

*Calamiana magnoris* Herre, 1945: 80 (Calamianes, the Philippines). – Herre 1953: 732; Roberts 1989: 168.

*Gnathogobius alicae* Smith, 1945: 523–524, Fig. 104 (Bangkok). – Suvatti 1981: 203; Kottelat 1989: 19.

*Vaimosa rambai* (in part) Smith, 1945: 538–540 (Bangkok).

*Calamiana kabilia* – Roberts, 1989: 168; Kottelat et al. 1993: 146; Larson 2001: 59–60.

*Mugilogobius kabilia* – Kottelat et al. 1993: 146.

*Calamiana alicae* – Watson & Horsthemke 1995: 91–92.

**Material examined.** – MALAYSIA: Holotype of *Vaimosa kabilia*, CAS 32978, 1(36.5), Kabili River, British North Borneo, Sabah, A. W. Herre, 1936–1937 Oriental Expedition, Jan.1937. FMNH 51667, 1(15), East Coast Residency, Sungai Gana, tributary of Little Kretam River, just above *Nypa* belt, Kinabatangan, North Borneo, Sabah, R. F. Inger, 12 May 1950; NTM S.14302-001, 5(20.5–28.0), Kampong Panggang Kuap, Sarawak, B. L. Lim, 1 Jan.1969. THAILAND: Holotype of *Gnathogobius alicae*, USNM 119604, 1(38), central canal, Bangkok, Thailand, H. M. Smith, 2 May 1931. Paratype of *Gnathogobius alicae*, USNM



Fig. 5. *Eugnathogobius kabilia*. Holotype of *Vaimosa kabilia* Herre, 36.5 mm SL female, CAS 32978, Kabili River, North Borneo [Sabah].

119605, 1(31), same data as preceding. Paratypes of *Vaimosa rambaiae*, ex USNM 119647, 2 (27–29), from shallow slough behind Department of Fisheries, Bangkok, N. Pongse on 28 May 1931, preserved 2 Dec.1931. CMK 4789, 2(45–47), aquarium specimens exported by K. Derwanz, 1985; NIFI uncatalogued, 6(26–34), Bangpakong River, Nongnuch. THE PHILIPPINES: Holotype of *Calamiana magnoris*, CAS 39881, 1(31), Busuanga, Palawan Province, the Philippines, A. W. Herre, 1 Jul.1940. SRI LANKA: SMF 30305, 3(26–33), freshwater, A. Heymer, Dec.1987. NO DEFINITE LOCALITY: AMS I.35823-001, 1(36), Singapore: probable aquarium specimen, I. Benoit, Sorbonne.

**Diagnosis.** – A relatively large *Eugnathogobius* with second dorsal rays I,6–8; anal rays I,5–8; pectoral rays 15–18; 15–17 segmented caudal rays (modally 16); longitudinal scales 25–34; TRB 8–12; predorsal scales 10–19; shoulder girdle with smooth low ridge or flange, rarely with fleshy lobes; mouth terminal, large, greatly enlarged in mature males (maxillary sometimes extending past rear edge of preoperculum); each scale on side of body with short dusky bar, two distinct brown stripes extending back from rear of eye and two from eye to snout tip, fins dark, dorsal fins usually distinctly spotted with brown; known from estuarine to fresh waters of Sri Lanka, Thailand, Malaysian Borneo and the Philippines.

**Description.** – Based on 23 specimens, 15–47 mm SL. An asterisk indicates counts of holotype of *Vaimosa kabilia* (Fig. 5).

First dorsal VI\* (in 21), VII (in one); second dorsal I,6–8 (mean I,7\*); anal I,5–8 (mean I,7\*); pectoral rays 15–18\* (mean 17); segmented caudal rays 15–17 (mean 16\*); caudal ray pattern 9/6 to 10/7 (modally 9/7\*); branched caudal rays 13–15 (modally 15\*); unsegmented (procurrent) caudal rays 7/7 to 7/8 (modally 7/7); longitudinal scale count 25–34 (mean 30, 27 in holotype); TRB 8–12 (mean 10, 9 in holotype); predorsal scales 10–19 (mean 14, 11 in holotype); circumpeduncular scales 12\*. Gill rakers on outer

face of first arch 1+6 to 3+8 (no mode, mean of seven total rakers). Pterygiophore formula 3-12210\* (in 11), 3-2311 (in one). Vertebrae 10+16\* (in nine); 10+15 (in four). Neural spines of first few vertebra relatively straight, pointed (in five); tips of first three spines somewhat expanded at tips (in four). Two epurals (in eight)\*, one in one specimen. Two (in 12\*) or three (in one) anal pterygiophores before haemal spine of first caudal vertebra. Anterior tip of preoperculum blunt in males, pointed in females. Metapterygoid broad, forming bridge to quadrate; greatly expanded dorsally and overlapping quadrate in adult males (see Larson 2001: Fig. 61) but separate in females (Fig. 6).

Body relatively slender, somewhat cylindrical anteriorly, compressed posteriorly. Body depth at anal fin origin 16.4–21.5% (mean 18.9%) of SL. Head depressed anteriorly, especially in males, always wider than deep, HL 28.1–33.8% (mean 30.8%) of SL. Depth at posterior preopercular margin 44.2–67.1% (mean 57.5%) of HL. Width at posterior preopercular margin 63.2–81.0% (mean 73.6%) of HL, preopercular area tending to be inflated and muscular in males. Mouth large, terminal, slightly oblique, forming angle of about 35–40° with body axis; jaws reaching well past eye to preopercular edge in males and to below mid-eye in females (jaw in large males often reaching past preopercular margin). Lips fleshy, smooth and without fimbriae; lower lip mostly free, fused near tip of jaw. Upper jaw 31.8–86.6% (mean 39.6% in females, 73.9% in males) of HL. Eyes placed dorsolaterally, protruding above dorsal profile in large specimens, eye width 19.4–31.8% (mean 23.9%) of HL. Snout broad, blunt and flattened, 23.2–33.6% (mean 29.1%) of HL; one large male with snout almost square, another with snout almost rectangular (dorsal view). Interorbital broad, flat, 17.9–39.5% (mean 26.6%) of HL; wider in males than females. Caudal peduncle compressed, length 24.2–30.4% (mean 27.1%) of SL. Caudal peduncle depth 11.2–14.4% (mean 12.9%) of SL.

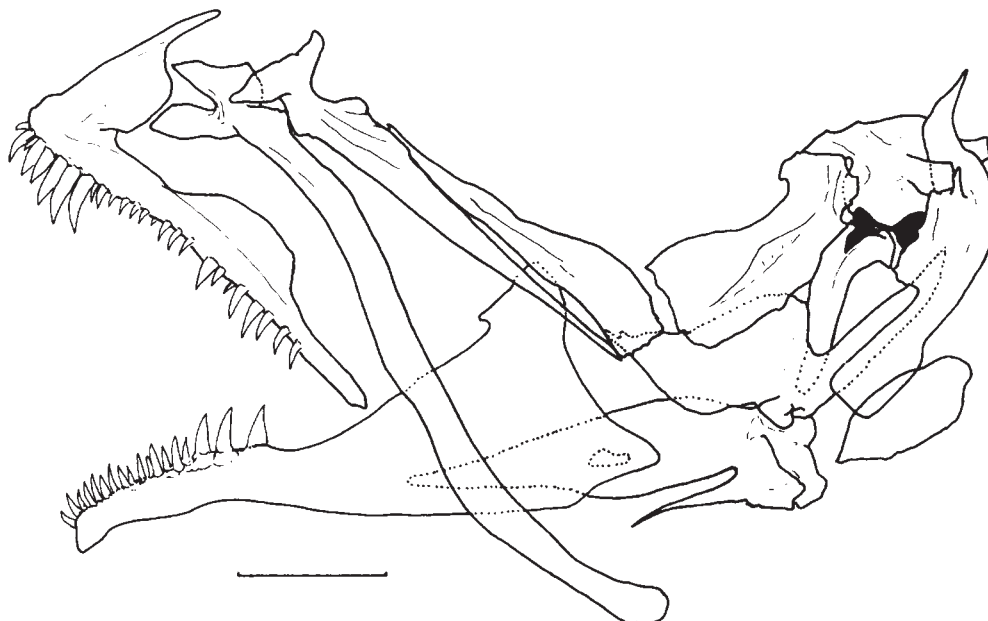


Fig. 6. Jaws and suspensorium of *Eugnathogobius kabilia*, female, ex NTM S.14302-001, Sarawak.

First dorsal fin rounded, rather low, usually third (or second) spine longest; fin not always reaching second dorsal fin origin when depressed, otherwise reaching back to base of first element of second dorsal fin. First dorsal spine always shorter than next two. Second dorsal spine sometimes longest (in males only), spine length 11.1–13.9% (mean 12.7%) of SL. Third dorsal spine length 12.5–15.9% (mean 14.1%) of SL. Second dorsal fin may be taller than first dorsal, especially anteriorly; posteriormost rays barely longer than anteriormost; fin not reaching caudal base when depressed. Anal fin low, posteriormost rays longest, rays falling short of caudal fin base when depressed. Pectoral fin oval, central rays longest, 18.1–26.8% (mean 23.2%) of SL; all rays usually branched. Pelvic fins oval, rays not reaching anus, 14.5–22.2% (mean 19.2%) of SL. Caudal fin moderate in size, oval, rounded posteriorly, 24.5–33.3% (mean 29.6%) of SL.

Chin smooth, without mental fraenum. Anterior nostril in short tube, oriented down and forward over upper lip, preorbital slightly curved to accommodate nostril. Posterior nostril rounded, sometimes with slightly raised rim, placed close to front of eye. Gill opening extending forward to under opercle. Inner edge of pectoral girdle smooth with no ridge or flange (in nine), with low fleshy flange (in eight), or knobs and flaps (in two, including holotype). Gill rakers on outer face of first and second arch short and unspined, rakers longer and more slender near angle of arch; rakers on inner face of first and second arch stubby and with fine spines at tip; inner and outer rakers on other two arches stubby, spiny at tip and equal in size to the first arch inner rakers. Tongue large, broad, concave to rounded at tip. Outer teeth in upper jaw largest, relatively small but sharp and curved, two to three rows of very small sharp teeth behind this row; innermost row of few inward-pointing large teeth may be present. In males, teeth present on anterior half or

two-thirds of upper jaw; in females, teeth present either on all or anterior three-quarters of jaw. Lower jaw with teeth mostly across front, with outer row of small pointed curved teeth and two or three inner rows of slightly smaller sharp teeth (inner and outer rows not differing much in size in some specimens); only outermost row of teeth present at side of jaw. Males with teeth restricted to front of lower jaw.

Predorsal scales cycloid, mostly evenly sized, reaching forward to behind eyes; often only one scale anteriormost, in centre of nape close to interorbital space (sometimes this scale and one or two scales near it somewhat enlarged). Operculum with small cycloid scales on upper half to upper third only. Cheek always naked. Pectoral base usually covered with cycloid scales, naked in one specimen. Prepelvic area covered with small cycloid scales. Belly scales cycloid, with area of ctenoid scales anteriorly, close to base of pelvics (ctenoid scales sometimes extending halfway down belly). On side of body, ctenoid scales extending forward in wedge to close behind pectoral base or at least to below first dorsal fin.

Genital papilla in males small and slender, tip slightly expanded (pigmented so that it appears bilobed). Genital papilla in females short, bulbous and round, without lobes at tip.

Head pores absent.

Sensory papillae pattern longitudinal, as in Fig. 7. Papillae rows *g*, *x*, *z*, *b*, *d*, *e* and opercular series consisting of small, closely spaced papillae. Papillae rows *s*, *p*, *a*, *c*, *cp* and *i* consisting of widely spaced, relatively large papillae. Three *s* rows present, each of one papilla. Row *e* well separated from preopercular margin, running almost vertically, or

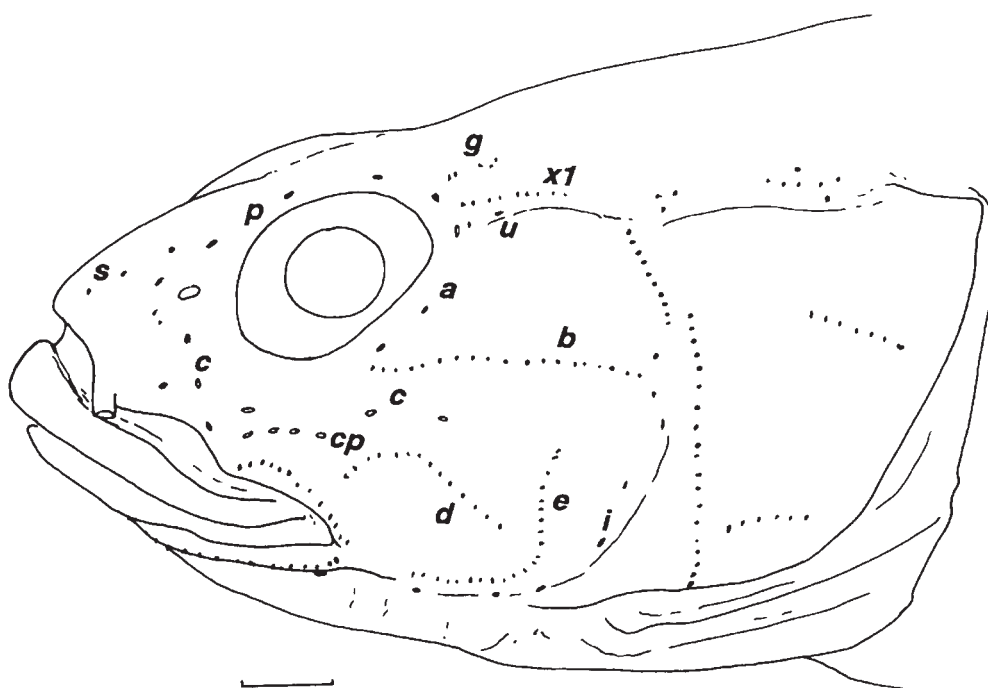


Fig. 7. *Eugnathogobius kabilia* papillae pattern. Holotype of *Vaimosa kabilia* Herre (CAS 32978). Scale bar = 1 mm.

curving anteriorly or posteriorly. Row *d* forming curved arch, posteriormost end always pointing downward (not rearward). Two longitudinally oriented *f* rows, of two papillae each.

**Colouration of fresh material.** – Herre (1945) gave an account of the freshly preserved holotype of *Calamiana magnoris*: “...very pale tan, each scale stippled with minute brown dots; a brown stripe runs from the lower margin of the eye across the preopercle and opercle; the dorsals have a few dark spots basally, then a white longitudinal bar, the balance reddish brown; the other fins are all more or less reddish brown”.

Smith (1945) indicated that his type specimens of *Gnathogobius alicae* were pale yellow with dull brown to yellowish brown markings; the first dorsal fin was blackish with a white margin, and the second dorsal had reddish-brown spots.

Hans Horsthemke provided several images of captive adults (for example, Plate 1A), from which the following description is taken. Head and body light pearly grey, paler ventrally, with grey-brown edges to scale margins mostly developed on dorsal half of body. Head mostly plain, with scattered brownish blotches over nape, diffuse dark grey streak from front of eye running below nostrils to upper lip, and a narrow irregular dark grey horizontal line just ventral to eye, ending near rear preopercular margin. Iris golden with brown speckling. First dorsal fin fawn with dark grey to blackish mottling, a indistinct black spot in centre of fin; outer third of fin reddish to reddish-orange. Second dorsal fin similar in colour to first, fawn with grey to brownish or blackish mottling, with narrow blue-white outer margin and broad submarginal red band. Anal fin whitish to pale grey, becoming darker toward outer margin and with narrow bright white edge. Pectoral fin whitish to translucent on distal half, basally yellow to pale brownish. Pelvic fins translucent bluish grey. Caudal fin base with grey somewhat square blotches; fin greyish to brownish, rays reddish to brown, darkening toward fin margin, edge of fin narrowly white.

**Colouration of preserved material.** – Head and body background colour variable, pale fawn to light brown (Figs. 5, 8, 9). Top and side of head, back and side of body plain brown or finely speckled with brown; on lower half of side brown spots may be enlarged. Distinct vertical brown line or spot close to margin of each scale on side of body, giving fish a finely reticulate appearance. On upper half of body and nape, irregular brown mottling and blotches present (not always visible). Brown shoulder bar usually present (distinct on holotype); bar beginning above pectoral base and sloping obliquely backward to midline of body behind pectoral fin. At caudal base, three indistinct brown spots forming vague Y-shape.

Dark brown streak running almost horizontally from lower rear edge of eye, across cheek to opercle; opercle brown to blackish (rounded blotches sometimes present), especially on rear half, where blackish pigment usually present. Shorter and less distinct brown streak extending from upper rear

edge of eye and running along top of preopercle and opercle, then becoming indistinct. Two short brown streaks extending from front of eye: upper streak from middle of eye curving around top of posterior nostril and running straight to upper lip; lower streak running from front lower edge of eye to just below anterior nostril. Tips of sensory papillae blackish in large male specimen (Fig. 8); only a few papillae blackish-tipped in other specimens. Lips, underside of head and breast plain dusky (lips and folds of branchial membranes may be edged with blackish); dusky underside of head may include pale areas. Belly pale.

Some sexual dichromatism in fin colour present. In males, first dorsal fin plain dusky, with broad translucent whitish margin. In females, first dorsal fin translucent with about three rows of dusky rounded spots over rays and membrane; broad translucent margin also present. Second dorsal fin dusky with broad translucent margin (fin darker in males) and about five irregular rows of dusky spots and streaks (becoming more irregular toward rear of fin) in females, in males only about three rows of spots on lower half of fin visible. Anal fin plain dusky with broad whitish membrane in both sexes. Caudal fin plain dusky grey with very narrow whitish margin in males; fin whitish to translucent in females, with irregular rows of small rounded brownish spots. Pectorals and pelvics light dusky in both sexes; pelvic fraenum whitish.

**Distribution.** – Specimens are known only from Malaysian Borneo (Sabah and Sarawak), the Philippines, Thailand and Sri Lanka. The species is rarely collected. The specimen from Singapore is in poor condition, and shows every sign of having died in an aquarium, scales standing out, ulcerations, clumps of fungus), and was very likely purchased from an aquarium dealer and not collected from the wild. The species has never been recorded from Singapore (Larson & Lim 2005).

**Ecology.** – Apparently restricted to fresh water. Little ecological information is available. One specimen (FMNH 51667) probably came from slightly brackish water: “just above *Nypa* belt” according to the label (*Nypa* grows at upper tidal limits, usually where freshwater inflow is constant). Smith (1945) kept *E. kabilia* and *Mugilogobius rambaiae* alive in a small tank for seven months, fed on mosquito larvae and “entomostracans”.

This species first appeared in the German aquarium trade in the late seventies but most of the specimens were males (Horsthemke, in litt.). Werner (1981) described and illustrated captive behaviour and breeding of this species. He described the fish as strictly benthic and quite secretive; the males constructed nests under flat stones, shovelling sand with their large mouths while pieces of gravel (up to 12 mm diameter) carried out one by one. Males display to each other with mouths wide open, and may push against each other jaw to jaw (Plate 1A); if disturbed by an observer they often switched to locking jaws (as if biting). About 1,000 eggs per batch were laid in the spawning burrow; eggs were elongate (1.5 × 0.5 mm) and hatched after 44–95 hours at 25°C. Larvae were 2.4 mm long and floated up near the

water surface until yolk absorbed after 124 hours; they then moved down into the water column. Werner was not able to provide suitable food.

Watson & Horsthemke (1995) compare the behaviour of this species (as *Calamiana alicae*) with that of *Awaous flavus* Valenciennes (adult males of this species have an enlarged mouth which is gaped extremely widely during territorial displays). They also report that the fish use the

mouth "... as a shovel in nest construction ...". Horsthemke (in litt.) states that males can open the jaws to an almost vertical gape, with the ends of the maxillaries flared out at a considerable angle to the body axis; the males then push against each other with jaws agape.

**Remarks.** – *Glossogobius mas* Hora, 1923, is possibly this species. Hora's syntypes were deposited at ZSI, but were reported as lost according to the ZSI type register (Barman



Fig. 8. *Eugnathogobius kabilia* male, 45 mm SL, CMK 4789, Thailand.



Fig. 9. *Eugnathogobius kabilia*. Holotype of *Calamiana magnoris* Herre, 31 mm SL, CAS 39881, Calamianes, the Philippines.



Fig. 10. *Eugnathogobius kabilia*. Holotype of *Gnathogobius alicae* Smith, 38 mm SL, USNM 119604, Bangkok.

*in litt.*, 19 Aug.1991). Hora's description was based on six specimens, four female and two male, about 21–25 mm SL. From the description and drawing, *Glossogobius mas* could be *Eugnathogobius microps*, *Pseudogobiopsis oligactis*, *E. kabilia* or a valid species. Lateral scale counts are given as 24–26, which is within the range for *E. kabilia* and *E. microps*. Freshly collected specimens from Chilka Lake (the type locality) are required to ascertain what Hora may have had.

*Calamiana magnoris* Herre, 1945, the type species of the genus *Calamiana* (Fig. 9), has priority over *Gnathogobius aliciae* Smith, 1945, type species of the genus *Gnathogobius* (Fig. 10). The former name was published on the 3 Jun and the latter on the 13 Nov. Herre (1945d) thought that this species had two vomerine teeth, placed one behind the other. The enlarged, posteriorly directed teeth in the innermost row of the upper jaw (four present in holotype of *Calamiana magnoris*) may have been mistaken for vomerine teeth. Herre also noticed the "...3 small fleshy flaps on the inner margin of the shoulder girdle".

Roberts (1989) compared scalation and colour pattern of *Calamiana magnoris* and *C. kabilia* (he had examined the type specimen of *C. magnoris* but not *V. kabilia*) and also with specimens he had collected from the Kapuas River and identified as *Calamiana* (these specimens were *Eugnathogobius paludosus*).

The Thai name for this species is given by Smith (1945) as "pla bu", a generic name for nearly all small gobies.

***Eugnathogobius microps* Smith, 1931**

(Figs. 11–13; Tables 3–6, 9)

?*Glossogobius mas* Hora, 1923: 742–743, Fig. 23 (Chilka Lake: off Samal Island, Rambha Bay, off Barkul).

*Eugnathogobius microps* Smith, 1931: 37, Fig. 18 (Bangpakong River, Siam). – Koumans 1931: 68–69; Koumans 1940: 129, 200; Smith 1945: 520; Suvatti 1950: 421 (not seen); Suvatti 1981: 202; Kottelat 1989: 19; Eschmeyer & Bailey 1990: 145; Larson 2001: 68.

*Eugnathogobius macrops* – Herre 1940: 24 (*lapsus*).

**Material examined.** – THAILAND: Holotype of *Eugnathogobius microps*, USNM 90316, 1(26), lower Bangpakong River, central Thailand, H. M. Smith, 1 Jul.1923. USNM 119591, 1(26), same data as holotype; USNM 119593, 3(20.0–26.5), near Pitrieu, Bangpakong River, H. M. Smith, 4 Jun.1928; KUMF uncatalogued, 2(17.5–17.5) Bang Nara River, Narathiwat Province, D. Tanwilai, 23 Dec.1983; NTM S.13953-013, 7(18.0–25.5), small mangrove creek, Klong Bang Sai, Phuket Island, H. K. Larson, D. F. Hoese & PMBC staff, 8 Dec.1993.

**Other material examined (but not used in description).** Two specimens, KUMF 1853, near Pitrin, Bangpakong River, H. M. Smith, 4 Jun.1928 (fish very fragile, heads separated from bodies).

**Diagnosis.** – Small, stocky *Eugnathogobius* with slightly depressed head; second dorsal and anal rays I,6; pectoral rays 16–20; longitudinal scales 23–27; TRB 8–9; predorsal scales absent in specimens from central Thailand, 10–12 predorsal scales present in southern (peninsular) specimens; pectoral girdle smooth or with low fleshy flange; eyes small,

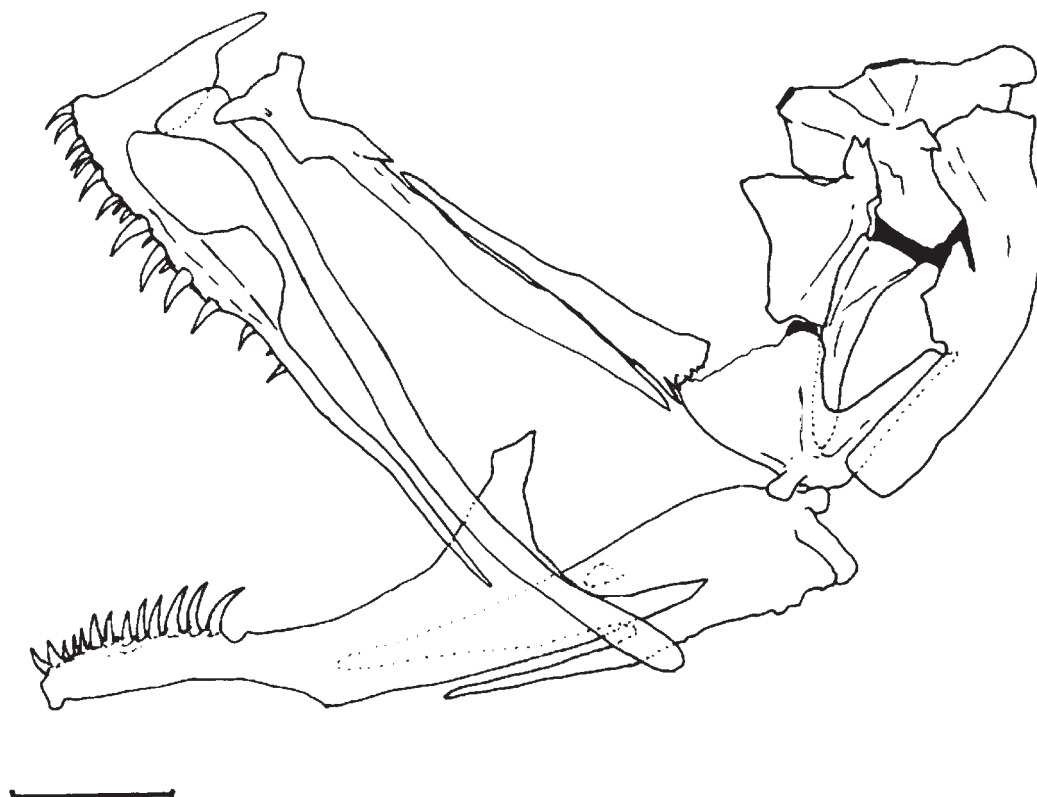


Fig. 11. Jaws and suspensoria of *Eugnathogobius microps*, male, ex NTM S.13953-013, Phuket, Thailand. Scale bar = 1 mm.

mostly dorsal and close to snout tip; mouth terminal, large, may be greatly enlarged in males; tongue deeply bilobed; plain grey in colour, with blackish markings along bases of dorsal, anal, caudal and pectoral fins; known only from estuarine to fresh waters of Thailand.

**Description.** – Based on 13 specimens, 17.5–26.5 mm SL. An asterisk indicates counts of male holotype (illustrated in Larson 2001: Fig. 60).

First dorsal VI\* (in 12), V (in one); second dorsal I,5–6\* (mean I,6); anal always I,6\*; pectoral rays 16–20 (mean 19, 18 in holotype); segmented caudal rays 17\*; caudal ray pattern 9/8 (11)\*; branched caudal rays 8/7\* to 9/7 (modally 8/7); unsegmented (procurrent) caudal rays 7/7 or 8/7 (modally 8/7); longitudinal scale count 23–27\* (mean 24); TRB 8\*–9 (mean 9); predorsal naked in central Thailand specimens, 10–12 in peninsular Thailand specimens (mean 11); circumpeduncular scales 12\*. Gill rakers on outer face of first arch 2+9 (in one), 3+9 (in one), 3+10 (in one). Pterygiophore formula 3-12210\* (in eight). Vertebrae usually 10+16\* (in 11); 10+15 (in one), 11+16 (in one). Neural spines of first few vertebra straight, pointed (in seven). Two\* epurals (in nine). Two\* anal pterygiophores before haemal spine of first caudal vertebra (in nine), three in one specimen. Anterior tip of preoperculum blunt (Fig. 11).

Body stout, somewhat depressed anteriorly, compressed posteriorly. Body depth at anal fin origin 18.5–23.1% (mean 21.3%) of SL. Head depressed anteriorly, always wider than deep, HL 31.3–35.4% (mean 33.9%) of SL; cheeks often considerably inflated. Depth at posterior preopercular margin 53.3–63.2% (mean 59.3%) of HL. Width at posterior preopercular margin 63.9–86.4% (mean 76.4%) of HL. Mouth large, terminal, slightly oblique, forming angle of about 30° with body axis; jaws reaching well past rear of

eye in some males and to below rear half of eye in females (nearly to preopercular angle in male holotype). Lips smooth and without fimbriae, not very fleshy; lower lip mostly free, fused at tip of jaw. Upper jaw 45.2–69.6% (mean 48.4% in females, 63.0% in males) of HL. Eyes small, mostly dorsally oriented and close to snout tip and nostrils, 12.0–21.0% (mean 17.5%) of HL. Snout broad, blunt and flattened, 22.4–26.6% (mean 25.2%) of HL. Interorbital broad, flat, 23.9–31.6% (mean 27.8%) of HL. Caudal peduncle compressed, length 23.5–28.6% (mean 25.9%) of SL. Caudal peduncle depth 12.6–14.6% (mean 13.8%) of SL.

First dorsal fin low, first to fourth spines longest or subequal; spines usually not reaching second dorsal fin origin when depressed (rays of USNM specimens, including holotype, flabby and mostly wrinkled); spine tips in some specimens reaching front part of fin. First and second dorsal spine length 14.3% of SL (in 1). Third dorsal spine length 10.0–13.7% (mean 12.7%) of SL. Fourth dorsal spine length 10.0–12.2% (in 2) of SL. Second dorsal and anal fins low, posteriormost rays longest, rays falling well short of caudal fin base when depressed. Pectoral fin oval, central rays longest, 21.3–26.7% (mean 24.1%) of SL; rays usually all branched (upper and lowermost rays sometimes unbranched). Pelvic fins oval, central rays usually reaching anus, 24.2–27.2% (mean 25.6%) of SL. Caudal fin short, round, 22.5–29.1% (mean 25.7%) of SL.

Chin with very low bilobed mental fraenum (distinguishable in fresh specimens, but not in types). Nostrils very close together, just in front of eye. Anterior nostril with short tube, oriented down and forward over upper lip, preorbital slightly inflated to accommodate nostril. Posterior nostril oval, without raised rim, placed halfway between eye and anterior nostril. Gill opening usually extending forward to under opercle. Inner edge of shoulder girdle smooth with no

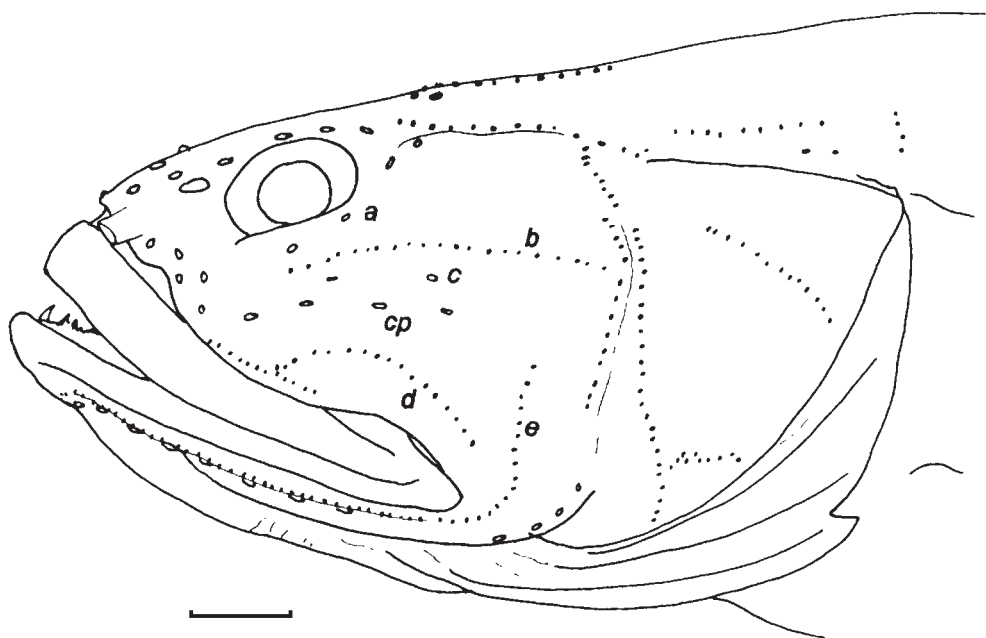


Fig. 12. *Eugnathogobius microps* papillae pattern. NTM S.13953-013, Klong Bang Sai, Phuket, Thailand. Scale bar = 1 mm.

ridge or flange (in six) or with low fleshy flange on upper half of girdle (in seven). Gill rakers on outer face of first arch very short and unspined, longest rakers near angle of arch; rakers on inner face of first arch also stubby, but slightly bigger than outer rakers; inner and outer rakers on other arches smooth, stubby, equal in size to the first arch inner rakers. Tongue large, deeply bilobed. Outer teeth in upper jaw larger than others, relatively small but sharp and curved; behind outer row, two to three rows of very small sharp teeth present; inner rows ending at anterior third of jaw. In males, teeth present on anterior half or two-thirds of upper jaw; in females, teeth present on anterior two-thirds to three-quarters of jaw. Lower jaw with teeth mostly across front only, with outer row of small pointed curved teeth and two to four inner rows of very small sharp teeth; only outermost row of teeth present at side of jaw. Both males and females with teeth restricted to front of lower jaw; outer row extending halfway along side in females and along one third of jaw length in males.

Predorsal scales, if present, small, mostly evenly sized, usually reaching forward to behind eyes; often only single scale anteriormost, in centre of nape close to interorbital space (this scale and its immediate neighbours may be somewhat enlarged). Specimens from the Bangpakong River with scales extending only partly over operculum, but predorsal naked. Operculum with small cycloid scales in peninsular Thailand specimens, naked in Bangpakong specimens. Cheek always naked. Pectoral base covered with cycloid scales (peninsular) or naked (Bangpakong). Prepelvic area covered with small cycloid scales (peninsular) or naked (Bangpakong). Belly scales cycloid (peninsular) or naked (Bangpakong). Ctenoid scales on side of body in wedge, close up to behind or just above pectoral base.

Genital papilla in male slender flattened and pointed, with one to several tiny lobes at tip; in female, papilla bulbous, rounded to slightly pointed.

Head pores absent.

Sensory papillae pattern longitudinal, as in Fig. 12. Papillae rows *g*, *x*, *z*, *b*, *d*, *e* and opercular series consisting of

small, closely spaced papillae. Papillae rows *s*, *p*, *a*, *c*, *cp* and *i* include widely spaced, relatively large papillae. Three *s* rows present, each consisting of one papilla. Row *e* well separated from preopercular margin, running almost vertically or turning anteriorly. Row *d* forming curved arch, posteriormost end always pointing downward (not rearward). Row *f* consisting of two papillae only, crowded behind mental fraenum.

**Colouration of fresh material.** – Fresh specimens collected from Phuket in 1993 were noted as being “plain dark greyish brown”; unfortunately they were not photographed.

Three months after preservation, the fish looked very similar to their remembered live colour, other than the pale underside appears to have become accentuated.

Head and body dark greyish-brown, with belly and underside of head paler (varying among individuals). Thin, very dark brown edge on scales on sides of body (especially rear half of body) and tiny dense brown spot often present at base of each scale. Cheeks paler than interorbital, front of head and preorbital region, which are usually darker brown than rest of head. Papillae rows dark brown; sometimes distinctly contrasting with rest of head colour. Isthmus whitish to white.

Fins translucent. Dorsals, anal, pectorals and caudal with band of dense dark brown pigment along bases, extending short distance onto fin rays and membranes. Pectoral sometimes with greyish brown patch on base of fraenum, sometimes narrow brownish edge to fraenum. Iris dark gold with dark brown mottling mostly obscuring gold colour. Genital papilla and area around anus white (usually streak of grey-brown on each side of male papilla).

**Colouration of preserved material.** – Available preserved specimens have generally lost all markings (other than the specimens from Phuket, described above) (Fig. 13). The two uncatalogued KUMF specimens from the Bang Nara River have dusky heads, a small spot at the base of each body scale and some scattered melanophores on the underside of the head and breast.



Fig. 13. *Eugnathogobius microps*, 25.5 mm SL, NTM S.13953-013, Klong Bang Sai, Phuket, Thailand.



**Distribution.** – Specimens are known only from central and peninsular Thailand. However, three specimens were obtained in October 2008 by Koichi Shibukawa (in litt.) from near the mouth of Tien River, Mekong drainage system, in southern Vietnam.

**Ecology.** – The holotype was collected by a *pong pang* (= tidal bag-net) net from “...the swift, tidal [estuarine] part of the Bangpakong River, where small gobies abound in both species and individuals” (Smith, 1931). Later Smith collected specimens from Petrieu (= Paetriu; also spelled Pitrieu on one label), a town on the Bangpakong River about 39 miles (62.4 km) east by south of Bangkok where the water was quite fresh (this river enters the Gulf of Thailand at the NE “corner”) (Smith, 1945).

The only recently collected specimens known have all come from peninsular Thailand and south Vietnam. The KUMF specimens came from the Bang Nara River, not far north of the border with Malaysia (unfortunately no habitat information was available). The Phuket specimens came from a small (0.1–1.5 m wide) muddy creek draining through tall mangrove forest into Klong Bang Sai (on the other side of which was an abandoned tin mining area). The substrate was sandy-mud to fine mud, with leaf litter, sticks and tiny burrows visible, and the creek was occupied by about 20 species of gobioids.

**Remarks.** – According to the original description, Smith (1931) had only one specimen, the holotype, which was eventually sent to the USNM (USNM 90316). However, Smith (1945) mentions that other specimens had since been collected from other parts of the Bangpakong River and he lists what he states are paratypes held at USNM (USNM 119593, which currently consists of three specimens, and USNM 119591, one specimen). The latter two lots of specimens cannot be paratypes, as Smith (1931) clearly stated that he was describing his new species and genus “... from a single specimen...”.

This species is the type of the genus *Eugnathogobius*. Smith (1945) considered that *Eugnathogobius* was related to *Gnathogobius* (a junior synonym), *Mahidolia*, *Pseudogobopsis* and *Waitea* (the last a synonym of

*Oligolepis*), due to their greatly enlarged jaws. *Mahidolia* is a gobiine, while the others are gobiionellines (Birdsong *et al.* 1988; this paper). Koumans (1940) considered that *E. microps* was “Probably a good genus and species”.

*Glossogobius mas* Hora is possibly this species (type lost; see under **Remarks** for *E. kabilia*). Hora (1923) states that his species has small eyes and a “deeply notched” tongue, but he does not indicate if there are scales on the nape. If material from the type locality is shown to be identical to *E. microps*, Hora’s name then has priority.

#### ***Eugnathogobius polylepis* (Wu & Ni, 1985)**

(Figs 14-16; Plate 1B,C; Tables 3-6, 10)

*Mugilogobius polylepis* Wu & Ni, 1985: 95–98 (Zhonggang, Fengxian, Shanghai).

*Calamiana polylepis* – Larson, in Randall & Lim, 2000: 636; Larson *et al.*, 2008: 141.

?*Calamiana polylepis* – Larson 2001: 57.

*Calamiana* sp. nov. 2 – Larson 2001: 61–62.

**Material examined.** – CHINA: Holotype of *Mugilogobius polylepis*, SFC S-0001, 31.5 mm SL male, Zhonggang, Fengxian, Shanghai. NSMT P.54851, 1(22), mangrove area, Wenchang, east coast of Hainan Island, K. Matsuura, 10 Mar.1997. TAIWAN: NMMBP-460, 3(22.5–27.0), Tongshu, Charyi County, I-S. Chen, 5 March 1996. VIETNAM: NTM S.16373-001, 2(21.5–24.5), vicinity of Haiphong, North Vietnam, Pham Dinh Trong, Mar.2000. THAILAND: ZRC 50377, 1(19), Laem Phrao, Changwat Trat, Z. Jaafar *et al.*, Feb.2006. SINGAPORE: ZRC 47532, 1(21), Pulau Tekong, N. Sivasothi, 1 Nov.2001; ZRC 50569, 2(20–21), Pasir Ris mangrove, R. Ng *et al.*, 23 Jun.2006. AUSTRALIA, QUEENSLAND: QM I.23883, 2(22.5–24.0), in subsurface mangrove mud, Serpentine Creek, Moreton Bay, 5 Aug.1972; QM I.13374, 3(17.5–21.0), Serpentine Creek, Moreton Bay, CSIRO prawn survey, 7 Nov.1972; AMS I.19580-002, 4(18–26), Serpentine Creek, Moreton Bay, CSIRO prawn survey, 7 Nov.1972; WAM P.28816-001, 3(18–22), Moreton Bay, V. Wadley & P. Young, 7 Nov.1972; WAM P.28814-002, 9(17–23), Moreton Bay, V. Wadley & P. Young, 1972; AMS I.23262-004, 1(20), The Esplanade, Cairns, D. Hoese & D. Rennis, 2 Oct.1982. AUSTRALIA, NORTHERN TERRITORY: NTM S.14236-001, 19.5 mm SL male, among mud and mangrove roots on bank of tidal creek, Reichardt Creek, Darwin Harbour, Northern Territory, R. Hanley, 9 February 1993; NTM S.11933-001, 1(19.5), mud surface, mouth of Adelaide River, R. Hanley, 23 May 1985;



Fig. 14. *Eugnathogobius polylepis*. Holotype of *Mugilogobius polylepis* Wu & Ni, 1985, 31.5 mm SL male, Shanghai Fisheries College S-0001, Zhonggang, Fengxian, Shanghai, China. Photograph by Heok Hui Tan. Specimen has tiny bubbles on dorsal surface.

NTM S.10419-007, 2(14–19), tiny puddle on mud, East Arm of Darwin Harbour, near Elizabeth River mouth, H. Larson, 29 Mar.1982; NTM S.14075-001, 1(17), on mud surface, Nayarnpi Creek, Roper River, R. Hanley & L. Banks, 7 Sep.1994; NTM S.14074-001, 1(21.5), on mud surface, Nayarnpi Creek, Roper River, R. Hanley & L. Banks, 8 September 1994; NTM S.14080-001, 1(20), on mud surface, Roper River, R. Hanley & L. Banks, 10 Sep.1994; NTM S.11936-001, 2(18–21), in mud, *Rhizophora*-lined channel, Little Lucky Creek, McArthur River, R. Hanley, 5 Aug.1985. WESTERN AUSTRALIA: AMS I.25521-007, 1(22.5), Crab Creek, Broome, 0–2 m, D. Hoese & D. Rennis, 20 Sep.1985; AMS I.25523-003, 25(13.5–23.0), King Sound, NE of Derby, 0–1 m, D. Hoese & D. Rennis, 22 Sep.1985.

**Other material examined (but not used in description).**

QUEENSLAND: QM I.13347, 3, Moreton Bay; WAM P.28805-004, 1, Moreton Bay; AMS I.19580-001, 4, Moreton Bay. NORTHERN TERRITORY: NTM S.14072-001, 1, Roper River; NTM S.14073-001, 1, Roper River; NTM S.14076-001, 1, Roper River; NTM S.14077-001, 1, Roper River; NTM unregistered, 1, Rosie Creek.

**Diagnosis.** – Small, slender-bodied *Eugnathogobius*; first dorsal fin IV–VI, modally V; second dorsal rays I,6–8; anal rays I,7–9; pectoral rays 16–18; longitudinal scales 37–63; TRB 12–22; headpores absent; predorsal scales modally absent, 2–20 small scales may be present on midline before first dorsal fin origin; scales on body small, mostly cycloid, ctenoid scales on caudal peduncle and in small patch under pectoral fin; gill opening restricted to just under opercle; colour pale yellowish with black speckling, black spot on upper caudal fin base in males; known from China, Taiwan, Vietnam, Singapore and northern Australia, in estuarine and mangrove habitats.

**Description.** – Based on 45 specimens, 14.0–31.5 mm SL. Counts of holotype (Fig. 14) indicated by asterisk.

First dorsal IV–VI (mean V\*); second dorsal I,6–8\* (mean I,8); anal I,7–9 (mean I,8\*), pectoral rays 16–18\* (mean 17), segmented caudal rays 15–17 (mean 16\*); caudal ray pattern modally 9/7; branched caudal rays 12–16 (mean

14, 13 in holotype); unsegmented (procurrent) caudal rays 7/6 to 7/8; longitudinal scale count 37–63 (mean 52, 49 in holotype); TRB 12–22 (mean 17, 15 in holotype); predorsal scale count 0–20 (mode 0\*, mean 3.8); circumpeduncular scales 13–23 (mean 17, 19 in holotype). Gill rakers on outer face of first arch 2+6 to 4+7 (modally 3+6). Pterygiophore formula 3-12210 in two), 3-112100 (in one), 3-12200 (in one); in first two arrangements, no fin ray attached to last pterygiophore. Vertebrae 10+16 (in six). Neural spine of first few vertebrae narrow, pointed (in five). Two epurals (in five). Two (in four) or one (in one) anal pterygiophores before haemal spine of first caudal vertebra. Metapterygoid broad, with wide bridge overlapping quadrate; palatine slender; pterygoid relatively short.

Body very slender and compressed, less so anteriorly; head relatively broad. Body depth at anal fin origin 12.4–17.1% (mean 14.7%) of SL. Head rounded, always wider than deep, HL 24.5–28.6% (mean 26.4%) of SL. Depth at posterior preopercular margin 49.1–61.0% (mean 54.8%) of HL. Width at posterior preopercular margin 63.9–87.5% (mean 72.1%) of HL. Mouth terminal, slightly oblique, forming angle of about 20° with body axis; jaws not greatly enlarged in mature males, reaching to below anterior half of eye in large adults or to just past anterior margin of eye in specimens less than 20 mm SL. Lips smooth, without fleshy fimbriae present on inner edges of lips; lower lip free at sides, fused across front. Upper jaw 32.7–43.8% (mean 39.1 in males, 36.4% in females) of HL. Eyes relatively small, dorsolateral, high on head, top usually forming part of dorsal profile, 21.7–31.0% (mean 26.1%) of HL. Snout short, flattened, 21.3–31.3% (mean 26.2%) of HL. Interorbital moderate to narrow, flat to slightly convex, 14.0–31.3% (mean 23.4%) of HL. Caudal peduncle very compressed, length 23.5–27.9% (mean 25.9%) of SL. Caudal peduncle depth 10.7–13.6% (mean 12.1%) of SL.

First dorsal fin reduced, low, second or third spines longest or subequal; spines slightly longer in males than females; fin widely separated from second dorsal fin origin. Second dorsal

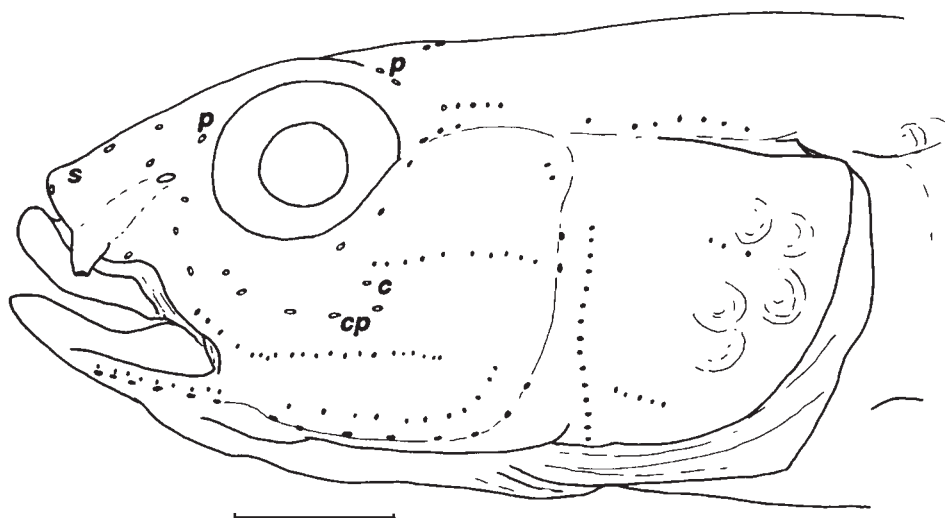


Fig. 15. *Eugnathogobius polylepis*, sensory papillae. NTM S.10419-007, Elizabeth River, Northern Territory, Australia. Scale bar = 1 mm.

spine length 6.1–11.0% (mean 8.5%) of SL. Third dorsal spine length 6.5–11.0% (mean 8.8%) of SL. Second dorsal and anal fins low, short-based, posteriormost rays longest, rays falling well short of caudal fin base when depressed, only reaching about half length of caudal peduncle. Pectoral fin broad, round, central rays longest, 17.0–22.8% (mean 19.6%) of SL; rays usually all branched (uppermost ray may be unbranched). Pelvic fins short, often cup-like, oval, reaching about one-third to half distance to anus, 12.5–16.3% (mean 14.5%) of SL. Caudal fin short, rounded to truncate, 19.1–25.2% (mean 22.0%) of SL.

No mental fraenum or fold, chin smooth. Anterior nostril tubular, placed at edge of upper lip, tube short, oriented down and forward, preorbital curved to accommodate nostril. Posterior nostril small, rounded to oval, placed very close to upper front margin of eye. Gill opening usually extending forward to just under opercle. Inner edge of pectoral girdle smooth with very low, bony ridge on anterior face of cleithrum, usually forming distinct thin flange of bone, bent laterally. Gill rakers on outer face of first arch very short and unspined, longest rakers near angle of arch; rakers on inner face of first arch stubby with tiny pointed papillae resembling spines; inner rakers on other arches similar in form and length to first arch inner rakers. Tongue tip blunt, occasionally slightly concave. Outer teeth across front of upper jaw largest, sharp and curved; behind this row, two to three rows of very small, pointed teeth; one or two rows of small pointed teeth at side of jaw (teeth similar in males and females). Lower jaw with three or four rows of small pointed teeth across front, outermost row teeth oriented nearly upright, inner rows all pointing inward; usually one or two rows of teeth at side of jaw.

Predorsal scales usually absent, if present, very small, cycloid, mostly along midline just before first dorsal fin, occasionally an additional isolated patch of a few scales or a single row along midline nearly to behind eyes. Operculum naked or with patch of small cycloid scales on upper third to half; sometimes only few scales present. Cheek always naked. Pectoral base naked. Prepelvic area naked. Belly naked, or with midline naked and remaining scales cycloid, or naked

anteriorly at least under pelvic fins and with cycloid scales posteriorly. Scales on body small, those on caudal peduncle larger. Most of body scales cycloid; ctenoid scales on side of body usually limited to posterior part of caudal peduncle and small patch behind pectoral fin; ctenii relatively stout, especially on caudal peduncle scales.

Genital papilla in male short, slender and flattened, with pointed tip; genital papilla in female short, rounded and bulbous.

Head pores absent.

Sensory papillae pattern longitudinal, as in Fig. 15. Two or three *s* rows present on snout, of one papilla each. Cheek rows *b* and *d* composed of small closely spaced papillae; rows *a*, *c* and *cp* of few large widely spaced papillae. Mental *f* rows of two pairs of papillae.

No swim bladder. Gut simple “S-bend”, with one loop; intestine looping to left rather than right, tucked behind rest of gut as in *E. variegatus*.

**Colouration of fresh material.** – Freshly collected specimens from the Northern Territory were noted in field log by the author as being similar to preserved specimens in colour. Colour photographs of live male and female specimens from Singapore and Taiwan were made available by H. H. Tan and I-S. Chen respectively (Plate 1B, C).

Head and body translucent yellowish grey, with scale margins on upper half of body narrowly outlined with light brown, upper half of body with brown to red-brown small spots, cross-hatched blotches, short bars and X-shaped marks; markings may extend below mid-side of body on caudal peduncle; most conspicuous mark in males being dark brown to black, round spot on upper caudal fin base (Fig. 4, Plate 1B); in females, spot smaller (Fig. 16). Adult male from Singapore (Plate 1B) almost plain yellowish grey in colour, slightly darker dorsally, with almost no red-brown spots or bars visible; very fine brown cross-hatched



Fig. 16. *Eugnathogobius polylepis*, 21 mm SL female, NTM S.14074-001, Nayarnpi Creek, Roper River region, Northern Territory, Australia.

markings visible; bright yellow stripe along lower part of body extending from yellow pectoral fin base to just above rear insertion of anal fin.

Head and nape speckled with red-brown to grey-brown dorsally. Side of head with short brown oblique streak extending diagonally from lower rear edge of eye, ending anterior to preopercular edge; short blotchy brown to blackish slightly oblique streak just ventral to eye and ending below posterior margin of eye; a narrow dark brown to red-brown narrow stripe commencing just above rictus and running horizontally along side of head to mid-opercle, extending horizontally onto opercle and ending as indistinct brown blotch; lowermost brown line on head narrow and less distinct than others, beginning below rictus and running just above lower preopercular margin. Upper lip concolourous with snout or bright yellow (in live male from Singapore); lower lip outlined by distinct orange-red to dark pink line ending at rictus. Pectoral fin base with short brown horizontal bar crossing dorsal half, ending on lower pectoral fin ray bases; male with yellow bar across bases of fin rays.

First dorsal fin transparent with lower third of fin dusky to translucent brownish; broad yellow margin to fin in male. Second dorsal fin transparent to translucent yellowish. Anal fin transparent to yellowish brown with diffuse brownish submarginal band in male.

Caudal fin in female transparent, spotted with brown, especially toward base of fin; in male, caudal fin translucent yellow with broad dusky brown submarginal edging, transparent yellowish margin around entire fin, distinct blackish rounded spot on upper base of fin. Pectoral fins transparent, rays silvery-whitish ventrally.

A photograph by Gianluca Polgar of a captive specimen from Sulawesi shows the typical male caudal fin colour but there are no stripes on the head as in other specimens of this species (but this is possibly an artefact of captivity).

**Colouration of preserved material.** – Head and body light yellow to yellowish grey, with scale margins on upper half of body narrowly outlined with light brown; side of body with small spots, cross-hatched blotches, short bars and X-shaped marks; most conspicuous mark in males being dark brown to black, round spot on upper caudal fin base; in females, spot smaller, light brown and not always distinguishable from other body markings.

Head and nape speckled with pale brown dorsally, pigment evenly distributed or forming pairs of faint spots or two to three narrow bands crossing nape. Side of head with four short brown streaks, central two often diffused into single dark patch: uppermost (first) forming line extending diagonally from lower rear edge of eye and ending before preopercular edge; second streak short, blotchy, extending diagonally from ventral edge of eye to centre of cheek and intersecting mid-point of third streak; third beginning just above rictus, extending horizontally onto opercle and ending as indistinct brown blotch; fourth (lowermost) streak

narrow, beginning below rictus and running just above lower preopercular margin. Lips pale whitish yellow, may be light brown (extension of third cheek streak). Underside of head pale with diffuse brownish band crossing isthmus behind chin, band joining anterior ends of lowermost cheek streak. Side of body with two rows of 11–13 short, staggered, cross-hatched brownish blotches or bars; lower third of body mostly pale. Breast brown, distinctly darker than rest of underside. Pectoral base pale with short brown horizontal bar across upper half. Belly whitish, even in heavily pigmented males. Peritoneum brown dorsally, fading on sides toward pale belly.

First dorsal fin transparent to light brown, lower half dusky to brown; or with outer third of fin translucent, central light brown stripe, and lower third of fin translucent whitish. Second dorsal fin light brownish with transparent outer margin, or with scattered pale brown pigment, some forming blotches. Anal fin translucent yellowish brown to brownish, with transparent margin. Caudal fin in females and juveniles translucent yellowish, faintly spotted with brown; in males, caudal fin dusky brown with broad transparent margin around entire fin, dark brown edge separating transparent margin from dusky centre, and distinct dark brown to blackish round spot on upper base of fin, just touching hypural crease. Pectoral fins with light brown fin rays, darkest in males. Pelvic fins light to dark brown, darkest in males.

**Comparisons.** – This species is close to *E. stictos*, new species; as stated above, these two grouped together in cladistic analyses (Figs. 1, 2) and they do not resemble the other *Eugnathogobius* species. They are small, slender fish characterised by a reduction in dorsal fin spines (usually having four or five spines) and a high number of lateral scales (37 to 63). They appear to be more similar to *E. indicus* than to other species of *Eugnathogobius*.

**Distribution.** – Specimens are known from China, Taiwan, Vietnam, Singapore and northern Australia (from Broome in Western Australia to Moreton Bay in Queensland); possibly also from West Malaysia (see **Remarks**) and Sulawesi (see **Colouration of fresh material**).

**Ecology.** – *Eugnathogobius polylepis* is usually found in mangroves, at sites not far from the sea. Much of the Queensland material was collected during beam trawl sampling in shallow water. In the Northern Territory, many of the specimens were collected by hand at low tide on mangrove mud-banks, in tiny puddles, on the exposed mud surface or partly buried in the mud. A specimen from Rosie Creek in the Gulf of Carpentaria, was found alive among the bases of dead mangroves *Bruguiera exaristata* on quite dry, firm mud.

**Remarks.** – *Mugilogobius polylepis* Wu & Ni, 1985, was described from three specimens: the 34 mm SL holotype (SFC S-0001), and two paratypes 22–23 mm SL (SFC S-0002, SFC S-0003). The paratypes now appear to be lost in the postal system (Wu Han-Ling, pers. comm.). My initial impression from Wu & Ni's illustration (which shows predorsal scales) and the English abstract given in the



Plate 1.

A. *Eugnathogobius kabilia*. Captive males exhibiting agonistic behaviour. Photograph by Hans Horsthemke.

B. *Eugnathogobius polylepis*, captive male, ZRC 50569, 21 mm SL, Pasir Ris, Singapore. Photograph by Heok Hui Tan.

C. *Eugnathogobius polylepis*, freshly dead female specimen, NMMBP-460, Tongshu, Taiwan. Photograph by I-Shiung Chen.

original description, was that *Mugilogobius polylepis* greatly resembled in colour pattern specimens originally identified as *Calamiana* (Larson 2001; and originally considered to be a new species: *Calamiana* sp. nov. 2 of Larson (2001)) from northern Australia, but *M. polylepis* had VI first dorsal spines (vs. IV–VI, modally V) and more predorsal scales (25–34 vs. 0–16). However, after being able to examine the holotype of *Mugilogobius polylepis* (brought to Taiwan by Wu), it was found to be a *Eugnathogobius* almost identical to the northern Australian specimens, but it possessed VI first dorsal fin spines. Specimens from Taiwan and China (Hainan Island) agreed with the holotype of *E. polylepis* in having the nape naked, and in having VI first dorsal fin spines. However, two specimens from North Vietnam have first dorsal IV–V and 4–5 predorsal scales. Material from Singapore and Thailand have V–VI first dorsal fin spines and 9–20 predorsal scales. All Australian specimens have IV–VI first dorsal fin spines (strongly modally V) and 0–16 predorsal scales (strongly modally 0). No consistent colour pattern or other difference could be discerned (for example, the Singapore and Taiwan populations both have the distinctive orange-red lower lip margin). It is difficult to make meaningful comparisons of the differences in predorsal scale counts and number of first dorsal fin spines (e.g. to determine if there is clinal variation or actually several species involved), as there are 54 northern Australian specimens available, but only 11 from all the South-east Asian localities. So I have retained them all together under *E. polylepis*, pending further material becoming available.

However, there may be undescribed species related to *E. polylepis*. For example, several specimens (held at NTM) from mangroves at Sementa, Klang, on the west coast of Peninsular Malaysia, resemble this species but males do not have the dark caudal fin spot. Further collections in appropriate habitat should provide additional specimens which will help clarify their status.

### *Eugnathogobius siamensis* (Fowler, 1934)

(Figs. 17–20; Tables 3–6, 11)

- Vaimosa siamensis* Fowler, 1934: 157, Fig. 125 (Silom Canal, Bangkok, Thailand). – Fowler, 1935: 161; Smith 1945: 538, 540–541.
- Vaimosa mawaia* Herre, 1936: 9, Pl. 6 (Mawai district, Johore, north of Singapore). – Herre & Myers, 1937: 40; Fowler, 1938: 267; Koumans 1940: 152.
- Vaimosa jurongensis* Herre, 1940: 18, Pl. 13 (Jurong, Singapore). – Koumans, 1953: 386–387.
- Vaimosa oratai* Herre, 1940: 20, Pl. 15 (Brook at Tawau, north Borneo). – Koumans, 1953: 389.
- Pseudogobiopsis oligactis* – Koumans, 1940: 135.
- Vaimosa singapurensis* – Tweedie, 1940: 75.
- Stigmatogobius oligactis* – Koumans, 1953: 116–117; Suvatti, 1981: 204.
- Stigmatogobius poicilosoma* (in part) – Alfred, 1966: 47.
- Calamiana siamensis* – Hoesé, in Böhlke, 1984: 110.
- Pseudogobiopsis jurongensis* – Roberts, 1989: 169–170.
- Mugilogobius jurongensis* – Kottelat, 1989: 19.
- Mugilogobius mawaia* – Kottelat, 1989: 19.
- Pseudogobiopsis siamensis* – Kottelat, 1989: 19; Tan & Tan, 1994: 357; Lim & Larson, 1994: 260; Kottelat & Lim, 1995: 247;

- Ng & Tan, 1999: 364; Larson & Lim, 2005: 144; Larson et al., 2008: 143.
- Pseudogobiopsis campbellianus* – Kottelat et al., 1993: 150, Pl. 70 (in part).
- Pseudogobiopsis oratai* – Kottelat et al., 1993: 150, Fig. 306.
- Pseudogobiopsis wuhanlini* Zhong & Chen, 1997: 79–81 (Min River, Fujian Province, China).
- Eugnathogobius siamensis* – Larson, 2001: 71.

**Material examined.** – THAILAND: Holotype of *Vaimosa siamensis*, ANSP 60025, 1(31.5), Silom Canal, Bangkok, R.M. de Schauensee, 18 Dec.1932. ANSP 87453, 13(23.0–32.5), Bangkok, R. de Schauensee, 1936; ANSP 63126, 2(27.5–28.0), Bangkok, R. de Schauensee, May 1934. PENINSULAR MALAYSIA: Holotype of *Vaimosa mawaia*, CAS 29080, 1(24), Mawai district, Johore, A. W. Herre, 22 Mar.1934. CMK 8485, 11(19.0–30.5), blackwater stream, 70 km on road to Kuantan-Pekan-Mersing, Pahang, M. Kottelat et al., 24 Jul.1992; ZRC 19323-19324, 2(33.5–34.5), stream by Desaru Road, Kota Tinggi, Johor, P. Ng & M. Kottelat, 14 Aug.1991; ZRC 17051-6, 6(23.5–31.0), freshwater stream on Mawai-Tanjung Sedili Road, Johore, P. Ng & M. Kottelat, 14 Aug.1991. MALAYSIA, SABAH: Holotype of *Vaimosa oratai*, CAS 32988, 1(18), Tawau, British North Borneo, A. W. Herre, 17 Jan.1937. SINGAPORE: Holotype of *Vaimosa jurongensis*, CAS 32982, 1(36), Jurong, A.W. Herre, 8 May 1937. Paratypes of *Vaimosa jurongensis*, CAS 32983, 22(19.5-34), same data as holotype; BMNH 1938.12.1.215-7, 3(24.5–28.5), same data as previous. BRUNEI: NTM S.14244-001, 8(23.0–28.5), small stream near Kampong Lempong, Temburong Baru, S. Choy, 9 Jan.1992. INDONESIA: CMK 7304, 24(11.5–21.0), tributary of Sungei Siak, Riau Province, Sumatra, M. Kottelat, 13 Feb.1991.

**Other material examined (but not used in description).** – CHINA: ZRC 45961, 1, Lai Chi Wu, New Territories, Hong Kong. THAILAND: USNM 119638, 37, Bangpakong River; USNM 119637, 23, Bangpakong River; USNM 119648, 29, Bangkok; USNM 119650, 14, Bangpakong River; USNM 263426, 11, Tale Sap. CAS 53249, 2, Goh Chang Island, 12°04'30"N 102°22'12"E. PENINSULAR MALAYSIA: CAS 33865, 38, Kota Tinggi; CMK 8538, 38, Johore; CMK 7841, 28, Johore; USNM 258941, 15, Johore; USNM 257131, 53, Muar River; CAS 33169, 4, Mawai, Johore; CAS 39485, 8, Kota Tinggi; USNM 263418, 5, Muar River. MALAYSIA: FMNH 51776, 2, Sandakan; FMNH 44932, 1, Sandakan, Sabah; CMK 5683, 1, Sungei Sebutut; NTM S.14240-002, 8, south of Kuching, Sarawak; NTM S.14351-002, 4, near Kuching, Sarawak; ZSM/KEW 495, 3, Sungei Stunggang Sarawak. BRUNEI: NTM S.13051-001, 1, Bukit Patoi; NTM S.14298-001, 5, Temburong. INDONESIA: CMK 7312, 4, Sungei Siak, Sumatra; CMK 9527, 27, Sungei Sebuku, Kalimantan Timur, Borneo.

**Diagnosis.** – A robustly built *Eugnathogobius* with second dorsal and anal rays always I,6; pectoral rays 16–19; longitudinal scales 22–24; TRB 7-9; predorsal scales 6–8, large, reaching close up to behind eyes; preopercular pores absent, posterior portion of oculoscapular canal absent; scales on body mostly ctenoid; third spine of dorsal fin usually longest, but not elongate; head and body pale with margins of scales outlined in brown, row of brown midlateral blotches, three diagonal dark streaks on head and vertically barred caudal fin; known from China, Thailand and Indo-Malayan Archipelago.

**Description.** – Based on 36 specimens, 17–36 mm SL. An asterisk indicates counts of holotype of *Vaimosa siamensis*.

First dorsal VI\*; second dorsal rays I,6\*; anal rays I,6\*, pectoral rays 16–19 (mean 17, 18 in holotype), segmented caudal rays 17\*; caudal ray pattern 9/8; branched caudal rays 6/6 to 8/7 (modally 7/7, 8/7 in holotype); unsegmented (procurent) caudal rays 8/7 to 8/8; longitudinal scale count 22–24\* (mean 23); TRB 7–9 (mean 8\*); predorsal scale count 5–8 (mean 7\*); circumpeduncular scales 12\*. Gill rakers on outer face of first arch 2+5 to 3+8 (modally 3+7). Pterygiophore formula 3-12210 (in 21). Vertebrae 10+15 (in three), 10+16 (in 29), 10+17 (in one). Neural spines of first few vertebrae slender, pointed (in 11). Two epurals (in 31). Two (in 16) or three (in 15) anal pterygiophores before haemal spine of first caudal vertebra. Scapula unossified. Metapterygoid broad, approximately triangular (apex dorsal), without process extending toward quadrate (Fig. 17).

Body stout, compressed, less so anteriorly. Body relatively stocky, depth at anal fin origin 18.8–23.4% (mean 21.2%) of SL. Head approximately triangular to rounded, depth modally greater than width (or subequal), HL 30.8–34.8% (mean 32.9%) of SL; cheeks may somewhat inflated. Depth at posterior preopercular margin 55.9–69.3% (mean 61.6%) of HL. Width at posterior preopercular margin 58.0–86.0% (mean 70.8%) of HL. Mouth terminal, oblique, forming angle of about 20–25° with body axis; jaws generally reaching to below rear of eye at least in mature males and to below front half of eye in females. Lips usually smooth,

fleshy fimbriae may be present on inner edges of upper lip and front of lower lip; lower lip free at sides, narrowly fused across front. Upper jaw 34.2–67.9% (mean 39.0% in females, 54.2% in males) of HL. Eyes dorsolateral, high on head, top forming part of dorsal profile, 21.6–32.7% (mean 27.6%) of HL. Snout slightly pointed, 21.3–35.0% (mean 27.3%) of HL. Interorbital moderate to rather narrow, slightly concave, 10.9–31.6% (mean 16.2%) in HL. Caudal peduncle compressed, length 25.3–31.0% (mean 29.2%) of SL. Caudal peduncle depth 11.4–14.9% (mean 13.1%) of SL.

First dorsal fin low, rounded, second to fourth spines longest or subequal, third spine modally longest; spines longer in males than females; spines barely reaching second dorsal fin origin when depressed in males, spines usually falling well short in females. First dorsal spine always shorter than next three. Second dorsal spine length 13.9–16.9% (mean 16.0%) of SL. Third dorsal spine length 14.0–18.3% (mean 15.6%) of SL. Fourth dorsal spine sometimes longest, in males only, length 14.5–16.1% (mean 15.3%) of SL. Second dorsal and anal fins short-based, posteriormost rays not much longer than anterior rays, rays usually falling well short of caudal fin base when depressed (just reaching in some large males). Pectoral fin slender, pointed, central rays longest, 20.3–29.6% (mean 26.0%) of SL; rays all branched but for uppermost. Pelvic fins long, rounded to oval, reaching to anus, and to anal fin origin in large specimens, 20.7–29.8% (mean 26.0%) of SL.



Fig. 17. Jaws and suspensorium of *Eugnathogobius siamensis*, male, ex USNM 119637, Bangpakong River, Thailand. Scale bar = 1 mm.

Caudal fin approximately rectangular, rounded posteriorly, 25.0–35.8% (mean 30.0%) of SL.

No mental fraenum, chin usually smooth, sometimes slightly inflated anterior to *f* papillae row. Anterior nostril in short tube, placed at or just behind preorbital edge, tube oriented down and forward, preorbital sometimes slightly curved to accommodate nostril. Posterior nostril oval, placed halfway between anterior margin of eye and anterior nostril. Gill opening usually extending forward to just under opercle. Inner edge of pectoral girdle smooth with no ridge or flange (in eight); with low bony ridge or flange, sometimes angled outward (in 12); or with low irregular fleshy ridge or knob (in 11). Gill rakers on outer face of first arch very stubby, without spines, longest rakers near angle of arch; rakers on inner face of first arch also short, about equal to longest raker on outer face; outer and inner rakers on other arches same length as inner rakers on first arch. Tongue blunt to concave, occasionally reduced or absent. Outer teeth in upper jaw largest, stout and curved, largest teeth across front of jaw; behind outer row, about three rows of small, curved, sharp teeth; one row of sharp teeth along side of jaw, teeth often absent from rear quarter of jaw in males; teeth slightly smaller in females; tips of teeth may be tinted translucent brownish orange. Lower jaw with about four rows of small curved teeth across front, outermost row oriented upright, inner rows all pointing posteriorly; in males, innermost teeth toward side of jaw large and stout, sometimes three or four teeth strongly curved; teeth absent from posterior half of jaw in males, only one row of teeth at side of jaw in females; tips of teeth may be tinted translucent brownish orange.

Predorsal scales large, evenly sized, reaching forward to behind eyes, anteriormost scale just behind posterior interorbital pore. Operculum with three to five cycloid scales on upper half. Cheek always naked. Pectoral base covered with relatively large cycloid scales. Prepelvic area with small cycloid scales. Belly usually covered with ctenoid scales; some specimens with isolated patch of ctenoid scales under pelvics, rest of scales cycloid; occasionally scales along midline of belly cycloid. Side of body with ctenoid scales extending at least up to behind pectoral base, sometimes extending over top of pectoral base. Anterior scales on sides of body larger than those posteriorly.

Genital papilla in male elongate and flattened, narrowing toward tip; in female, short, rounded and bulbous.

Head pores present. Pair of nasal pores present, pair of anterior interorbital pores (single anterior median pore in one specimen), median posterior interorbital pore, and postorbital pore and infraorbital pore behind each eye. Rear portion of oculoscapular canal absent; preopercular pores absent. Pores often at end of short vertical tubes.

Sensory papillae pattern longitudinal, as in Fig. 18. Papillae usually quite tall and conspicuous. Cheek rows *a*, *c* and *cp* composed of few large, widely spaced papillae; rows *b* and *d* of small, closely spaced papillae. Three *s* rows on snout, of one papilla each, anteriormost *s* papilla just behind upper lip, other papillae close together by posterior nostril. Mandibular papillae widely spaced, with mental *f* row consisting of one papilla on each side of symphysis.

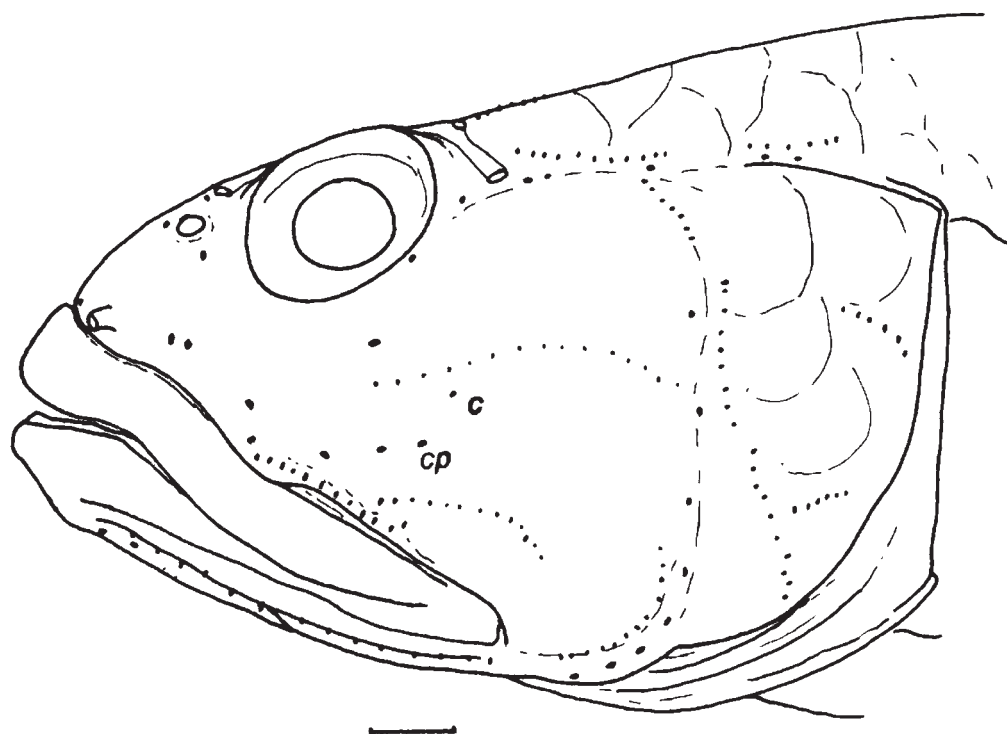


Fig. 18. *Eugnathogobius siamensis*, papillae pattern. Paratype, *Vaimosa jurongensis*, CAS 32983, 33.5 mm SL male, Jurong, Singapore. Scale bar = 1 mm.



**Colouration of fresh material.** – From colour slides by Maurice Kottelat. Freshly dead specimens very similar to preserved material. Background colour whitish to greyish-white with greyish-brown markings on head and body and dark grey to black markings on fins. In some slides, three to five evenly-spaced subcutaneous blackish bars just visible through body wall along lower half of caudal peduncle (three bars) and anal fin base (two bars); usually only three bars along caudal peduncle visible.

Larson & Lim (2005: 144) show a live specimen from Johor, Malaysia, which is generally translucent golden with dusky

grey internal blocks of pigment along the lower half of the caudal peduncle and diffuse brown saddles and blotches on the head and body (see description of preserved material). The caudal and dorsal fins are translucent pale yellow, becoming transparent distally, with diffuse grey bands and a blackish spot at the rear of the first dorsal fin. The eyeball is red-brown with pale gold iris.

**Colouration of preserved material.** – Head and body whitish yellow to pale brownish (depending upon preservation), whitish to pale brown on ventral half, with five narrow brown blotches (resembling short, broad horizontal lines)



Fig. 19. *Eugnathogobius siamensis*. CMK 7864, 24 and 33 mm SL, Johor, Malaysia. From colour slide by Maurice Kottelat.



Fig. 20. *Eugnathogobius siamensis*. Holotype of *Vaimosa jurongensis* Herre, 34.5 mm SL, CAS 32982, Jurong, Malaysia.

along midside of body; scale margins on most of body (not ventrally) narrowly outlined with brown, more diffusely outlined on lower half of body; upper half of body duskier than lower half (Figs 19, 20). Five diffuse brown saddles sometimes visible, crossing back and reaching down to midside of body toward midlateral blotches. Posteriormost midlateral blotch extending onto caudal fin base and meeting vertical brownish to blackish bar at fin base. Ventral midline of caudal peduncle and along anal fin base with thin black line and (usually) three evenly spaced blackish blotches. Nape plain brownish to whitish-yellow, scale margins broadly outlined with brown, often with indistinct brownish mottling.

Head with three brown markings: first, usually diffuse and indistinct broad bar from front of eye to upper lip (but not extending onto lip); second, broad diffuse streak or patch from lower edge of eye to end of jaw; and third, distinct broad diagonal bar from rear of eye extending backward and ending on middle of cheek, bar often expanded posteriorly; third bar always darkest. Opercle plain brownish or with diffuse brown blotches, usually darker brown irregular marking in centre. Lips and chin plain dusky to brown. Chin and anterior portion of underside of head with scattered dusky spots or plain brownish. Pectoral base with blackish to brown spot or blotch across bases of uppermost few rays. Breast and belly pale to dusky, breast usually darker than belly.

First dorsal fin translucent with two narrow blackish horizontal lines crossing middle of fin, lower line intensified posteriorly as black spot or blotch; broad dusky brown fin margin. Second dorsal fin with four to six rows of brownish to blackish spots, usually coalescing on posterior third of fin at least, forming wavy rows. Anal fin plain dusky to dark greyish brown. Caudal fin translucent to dusky with four to seven vertically oriented, slightly wavy, brownish to blackish lines; anteriormost vertical line thickest and darkest, coalescing with posteriormost midlateral blotch in centre of fin. Pectoral fins with light dusky fin rays, membranes translucent. Pelvic fins plain dusky to brownish, including fraenum.

**Comparisons.** – This species is most like *Pseudogobiopsis oligactis*; see under **Comparisons** for that species.

**Distribution.** – Specimens are known from China, Thailand, Malaysia, Singapore, Brunei and Indonesia. It is probably extinct in Bangkok. Ng & Tan (1999) reported the species for the first time from the Endau River system in southern Peninsular Malaysia. This species was thought to be extinct in Singapore until three specimens (ZRC 50271, from MacRitchie Reservoir) were collected in 2005 (Larson et al. 2008). *Eugnathogobius siamensis* was not known from China until Zhong & Chen's (1997) description of *Pseudogobiopsis wuhanlini*, in which they described material from the Kwangton and Fujian Provinces (Pearl and Min Rivers); and in 1999 ZRC acquired a specimen from the New Territories of Hong Kong.

**Ecology.** – This species is known only from freshwater

habitats, including blackwater streams. It has been found syntopically with *P. oligactis*.

Adult females are about 10 mm smaller than males. Roberts (1989) briefly discussed maximum size at maturity of this species, comparing specimens from the Kapuas River with the type specimens of *Vaimosa jurongensis* (from Singapore). He noted that a female from the Kapuas was gravid at 20 mm SL, with "... numerous eggs about 0.20 mm diameter ...", while three gravid Singapore females were 22.9–24.3 mm SL and had noticeably smaller eggs (0.15 mm diameter) (Roberts 1989).

**Remarks.** – *Vaimosa oratai* Herre, 1940, was based on two specimens, a large female (holotype at CAS) and a smaller male paratype (13 mm long). The latter has not been examined and its whereabouts are uncertain.

Koumans (1940: 135) considered that *Vaimosa siamensis* was a synonym of *Pseudogobiopsis oligactis*, and also observed that *Vaimosa mawaia* was probably a *Pseudogobiopsis* (Koumans 1940: 152).

Tweedie's (1940) record of *Vaimosa singaporensis* from Singapore does not refer to *Stigmatogobius borneensis* (of which *Stigmatogobius singaporensis* Bleeker is a junior synonym), but to *P. siamensis*, as he refers to paratypes from Jurong in the Raffles Museum (which Herre took to CAS/SU). It is possible that *V. singaporensis* may have been a manuscript name used initially for *Vaimosa jurongensis* by Herre.

Smith (1945) first noticed the black line and spots along the ventral edge of the caudal peduncle, which are present in this species and *P. oligactis*, as well as in *Pseudogobius* and *Redigobius*. This feature is being investigated further.

Kottelat et al. (1993) combined *P. oligactis* and *P. siamensis* under their account of *Pseudogobiopsis campbellianus*. The specimens in their Fig. 70 are *E. siamensis* and show the deeper head and barred caudal fin pattern clearly. Upon examination of their preserved material (deposited at CMK), it was found that the specimen lot from which the fish came included both species.

Material of *Pseudogobiopsis wuhanlini* Zhong & Chen, 1997, was not available for examination. However, it is clear from the description and illustrations that this is a synonym of *E. siamensis*. The differences cited by Zhong & Chen fall within the definition of *E. siamensis*; they compared it against both *P. oligactis* and *E. siamensis*. The statements of "shorter jaw length in adult male, extending only to the vertical line from posterior margin of orbit" (jaws reaching to below rear edge of eye at least in *E. siamensis*, not to the lower corner of the preopercle in both *E. siamensis* and *P. oligactis* as stated by Zhong & Chen); "without the head pore (ρ)" (characteristic of *E. siamensis*); and "predorsal scales always 7" (predorsal scales 5–8, mean 7, in *E. siamensis*) all agree with *E. siamensis*. A ZRC specimen from Hong Kong seems to be a typical specimen of *E. siamensis*.

***Eugnathogobius stictos* new species**

(Fig. 21; Tables 3–6, 12)

*Calamiana* sp. nov. 3 – Larson 2001: 62.

**Type Material.** – HOLOTYPE – NTM S.14287-001, 22 mm SL male, mouth of East Alligator River, Northern Territory, Australia, beam trawl, T. Davis, Apr. 1979. PARATYPES – AMS I.32051-032, 12(12.5–22), same data as holotype; NTM S.14287-002, 2(20–20.5), same data as holotype.

**Diagnosis.** – Small (to 22 mm SL), slender-bodied *Eugnathogobius*; first dorsal fin always V; second dorsal rays I,8–9; anal rays I,7–8; pectoral rays 14–18; longitudinal scales 48–61; TRB 15–22; predorsal scales absent; headpores absent; scales on body mostly cycloid, weak, ctenoid scales present on caudal peduncle; gill opening restricted to pectoral base; colour pale yellowish with small brown to blackish spots and flecks along upper sides of body and caudal fin dusky with vertical bars; known only from the East Alligator River estuary, Northern Territory.

**Description.** – Based on 14 specimens, 16.5–22 mm SL. Counts of holotype (Fig. 21) indicated by asterisk.

First dorsal V\* (13), VI (1); second dorsal I,8–9 (mean I,8\*); anal I,7–8 (mean I,8\*), pectoral rays 14–18 (mean 16, holotype with 18 on right, 17 on left), segmented caudal rays 13–16 (mean 16\*); caudal ray pattern modally 9/7\*; branched caudal rays 13–16 (mean 15\*); unsegmented (procurrent) caudal rays 8/7 (in one); longitudinal scale count 48–61 (mean 54, 59 in holotype); TRB 15–22 (mean 18\*); predorsal scales absent; circumpeduncular scales 18–25 (mean 22, 21 in holotype). Gill rakers on outer face of first arch 2+6 to 3+7 (modally 3+7). Pterygiophore formula 3-12210 (in one). Vertebrae 10+16 (in one). Neural spine of second vertebra blunted at tip, other spines narrow, pointed (in one). Two epurals (in one). Two (in one) anal pterygiophores before haemal spine of first caudal vertebra. Metapterygoid broad, with wide bridge overlapping quadrate; palatine slender; pterygoid short and stout. Upper ceratobranchial broad,

pierced by relatively large holes, teeth long and robust. Scapula unossified. Four ossified gill rakers.

Body compressed, less so anteriorly; ripe females almost cylindrical anteriorly. Body depth at anal fin origin 15.3–18.0% (mean 16.5%) of SL. Head rounded, somewhat depressed, wider than deep, but not greatly so, HL 25.9–27.3% (mean 26.6%) of SL. Depth at posterior preopercular margin 53.3–68.8% (mean 61.4%) of HL. Width at posterior preopercular margin 64.4–77.1% (mean 73.4%) of HL. Mouth terminal, oblique, forming angle of about 25–35° with body axis; jaws reaching to below middle of eye in mature males and to below front half of eye in females and small males (to below mid-eye in holotype). Lips smooth, without fleshy fimbriae present on inner edges of lips; lower lip free at sides, fused across chin. Upper jaw 37.8–47.2% (mean 35.0% in females, 42.2% in males) of HL. Eyes relatively small, dorsolateral, high on head, forming part of dorsal profile, 22.9–29.1% (mean 25.5%) of HL. Snout flattened to rounded, blunt when viewed from above, 24.4–30.2% (mean 26.5%) of HL. Interorbital moderate to narrow, flat, 13.3–23.5% (mean 21.9% in females, 18.0% in males) of HL. Caudal peduncle compressed, length 23.5–26.5% (mean 24.5%) of SL. Caudal peduncle depth 10.8–13.7% (mean 12.1%) of SL.

First dorsal fin very low, rounded, tips of spines free, second or third spines longest or subequal; spines falling short of second dorsal fin origin when depressed. First dorsal spine length 10.0% of SL in one specimen. Second dorsal spine length 7.0–11.4% (mean 9.2%) of SL. Third dorsal spine length 7.0–11.4% (mean 8.5%) of SL. Second dorsal and anal fins low, pointed posteriorly, posteriormost rays longer than anterior rays, rays not reaching caudal fin base when depressed. Pectoral fin broad, rounded, central rays longest, 18.2–21.2% (mean 19.8%) of SL; rays all branched but for uppermost ray (usually unbranched). Pelvic fins short, oval, sometimes cup-like, reaching half or less the distance to anus, 14.1–17.5% (mean 15.1%) of SL. Caudal fin relatively long, rounded posteriorly, 24.1–29.1% (mean 26.7%) of SL.



Fig. 21. *Eugnathogobius stictos*, new species, holotype, male, 22 mm SL, NTM S.14287-001, East Alligator River, Northern Territory, Australia.

No mental fraenum, chin smooth, flat. Anterior nostril in short tube, at edge of upper lip, tube oriented down and forward, preorbital curved forward to accommodate nostril. Posterior nostril oval, placed close to front centre margin of eye. Gill opening restricted to pectoral base, occasionally extending forward to just under opercle. Inner edge of pectoral girdle smooth with thick fleshy ridge on anterior edge of cleithrum, ridge occasionally bumpy, usually smooth. Gill rakers on outer face of first arch very short and unspined, most rakers similar in length; rakers on inner face of first arch also stubby; inner rakers on other arches slightly longer than first arch inner rakers. Tongue tip blunt to bluntly rounded; absent in two specimens. Outer teeth in upper jaw largest, stout and curved, one or two rows of small sharp teeth behind this row (outer row teeth slightly larger in males); one row of small teeth at side of jaw. Lower jaw with two or three rows of small, curved, pointed teeth across front; usually only one row of teeth at side of jaw.

Predorsal scales absent in all specimens. Body scales mostly cycloid, thin, difficult to see, extending anteriorly to over pectoral base. Small patch of weakly ctenoid scales behind pectoral fin in seven specimens, remainder with all cycloid scales; patch of distinctly ctenoid scales at base of caudal fin, covering approximately posteriormost third (or less) of caudal peduncle. Operculum with few small cycloid scales on upper half; scales often obscured by mucous coat. Cheek always naked. Pectoral base, breast and belly naked.

Genital papilla in male elongate, slender and flattened, with pointed tip; genital papilla in female short, rounded and bulbous.

Head pores absent.

Sensory papillae pattern longitudinal, almost identical to *E. polylepis* (Fig. 15). Two *s* rows present on snout, of one papilla each; rows *p*, *c* and *cp* reduced, papillae few and widely spaced. Mental *f* row of two pairs of papillae.

**Colouration of fresh material.** – No information available.

**Colouration of preserved material.** – Head and body pale yellowish, paler ventrally, with light brownish fine speckling; cheek with darker speckling (Fig. 21). Underside of head and branchiostegal membranes brown in males; in females, brown branchiostegal membranes contrasting with pale underside of head. Most conspicuous markings are dark brown to blackish small spots, flecks and short streaks scattered over upper half of body, in some specimens, spots roughly forming two rows; markings sometimes forming about 12 indistinct blackish bars or blotches crossing dorsal midline.

In males, both dorsal fins plain dusky brownish with brown streak at base of first few fin rays; females with dorsal fins translucent with brownish speckling and short streaks. Anal fin dusky brownish with translucent to whitish margin. Caudal fin dusky to light brown with translucent margin on rear edge of fin and four to seven short, vertically oriented rows of

brown spots and short streaks. Pectoral fins pale, rays outlined in light brown. Pelvic fins, including fraenum, pale to light brown. Males more intensely coloured than females; can be quickly distinguished by dark dorsal and anal fins.

**Comparisons.** – This species is most similar to *E. polylepis* (see **Comparisons** for that species).

**Distribution.** – Specimens are known so far only from one locality, the East Alligator River estuary, Northern Territory. Recent beam trawl surveys in the area have not obtained additional specimens, but it is likely the exact identical habitat was not sampled (Larson, 1999a, b, 2000, 2002).

**Ecology.** – Specimens were obtained by 1 mm mesh beam-trawl, from muddy substrate.

**Etymology.** – From the Greek *stiktos*, meaning spotted or dappled, in reference to the fine black spots on the body.

### *Pseudogobiopsis* Koumans, 1935

*Pseudogobiopsis* Koumans, 1935 (*Gobiopsis oligactis* Bleeker, 1875: 113, Amboina, by original designation).

**Diagnosis.** – Distinguished by following combination of characters. Second dorsal fin rays I,6–10; anal fin rays I,5–8; first dorsal spine often longest and may be elongate; pectoral rays 14–20; usually 17 segmented caudal rays in 9/7 or 9/8 pattern; predorsal scales variable, 2–13; 22–27 scales in lateral series; TRB 6–9; 12–13 circumpeduncular scales; headpores present in three species (Fig. 25), absent in one, headpores reduced with no nasal pores, and rear part of oculoscapular canal absent in three species, preopercular pores present in two species; sensory papillae in longitudinal pattern; papillae rows *a* and *c* consisting of large, widely spaced papillae, as does row *p* if present (otherwise replaced by headpores), rows *b* and *d* always consisting of small close-set papillae, two or three *s* rows on snout of one papilla each; modally two but up to three *s* papillae rows on snout; papillae rows *p*, *a* and *c* composed of few large widely spaced papillae, other papillae small and close-set; papilla row *c* broken under eye, rear portion consisting of one papilla; dorsal surface of head without fine villi; gill opening extending past pectoral base to under opercle; bony or fleshy flange present on pectoral girdle, forming fleshy knobs in some species; jaws terminal, jaws enlarged in males, reaching posteriorly to behind eye; anterior nostril tubular, placed at or just behind preorbital edge; genital papilla flattened and usually elongate in males, rounded and bulbous in females.

Pterygiophore formula 3-12210; 25-27 vertebrae, strongly modally 10+16; two epurals; two or three (usually two) anal fin pterygiophores present before first caudal haemal spine; anterior end of preopercular bone blunt, rounded or pointed; ridge and/or posteriorly facing groove present along rear edge of preopercle; neural spines of first few vertebrae slender, pointed; metapterygoid short, relatively short and broadened dorsally, may have short dorsal process, may

contact or slightly overlap quadrate or widely separated from quadrate; palatine and pterygoid not particularly slender, usually nearly equal in length, palatine falling short of quadrate; fifth ceratobranchial stout, triangular, with distinct triangular to blunt high flange on back; two to 10 ossified gill-rakers; scapula usually unossified but tip above foramen may be partly ossified.

**Remarks.** – There are four valid species of *Pseudogobiopsis* recognised here, one of which is described as new below. Several species of this genus have been described a number of times (e.g. males as one species, females as another). Several museum lots of specimens exist which may represent an additional one or more species, but this cannot be confirmed until more specimens are obtained.

#### Key to species of *Pseudogobiopsis*

- 1 Preopercular pores absent, pores on top of head present or absent ..... 3
- Preopercular pores present, pores on top of head always present ..... 2
- 2 Dorsal rays I,7, and anal rays I,6–7; 15–16 pectoral rays; body with 12–13 narrow vertical blackish lines; no elongate first dorsal fin spines ..... *P. tigrellus* (Nichols, 1951) (freshwater, Papua New Guinea)
- Dorsal and anal rays modally I,6; 16–19 pectoral rays; body with five narrow dark blotches along midside, several short dark bars radiate from lower edge of eye; first dorsal fin spine usually greatly elongate, especially in males ..... *P. oligactis* (Bleeker, 1875) (freshwater; Thailand, Malaysia, Singapore, Borneo, Indonesia)
- 3 Headpores present; pectoral rays 17–19; cheeks, preorbital and upper lip crossed with rows of irregular, oblique, distinct black lines ..... *P. festivus*, new species (freshwater; Sarawak)
- Head pores absent; pectoral rays 13–16; side of head with dark spots and blotches, forming two broad bars, one across preorbital and one to end of jaws ..... *P. paludosus* (Herre, 1940) (freshwater; Kalimantan, Malaysia, Sumatra)

#### *Pseudogobiopsis festivus* new species (Figs. 22–24; Plate 2A; Tables 13–17)

*Calamiana* sp. nov. – Kottelat & Lim, 1995: 247.

*Eugnathogobius* sp. nov. – Larson, 2001: 66–68.

**Material examined.** – HOLOTYPE - ZRC 40279, 34.5 mm SL male, 8.6 km after turnoff to Sungei Cina Matang after entrance to Matang Reserve, near Kuching, Sarawak, Malaysia, THH 9554, H. H. Tan & D. C. J. Yeo, 4 Sep.1995. PARATYPES - MALAYSIA, SARAWAK: ZRC 40280, 6(20.5–27.0), same data as holotype; NTM S.14299-001, 7(19.5–29.5), same data as holotype; ZRC 27842-3, 2(14.5–24.4), 7 km on Kuching-Batu-Kawa Road, M. Kottelat & K. Lim, 3 Jul.1992; ZRC 29082-3, 2(19.0–20.5), 7 km on Kuching-Batu-Kawa Road, M. Kottelat & K. Lim, 3 Jul.1992; ZRC 50715, 9(18–33), stream 1, Ulu Assam, Bako National Park, Kuching, K. Lim, 30 Jun.1994; ZSM\KEW 538, 5(16–24), NW of Bau, Batang Kayan River basin, Sungai Stunggang, C. Kettner, K.-E. Witte & R. Krümenacher, 24 Mar.1988; CMK 8401 (12 will go to ZRC), 26(11–27), Sungei Bejit, road from Balai Ringin to Simunjan, M. Kottelat, K. Lim & P. Ng, 2 Jul.1992.

**Other material examined (but not used in description).** SARAWAK: ZRC 40281, 3, Sungei Stok Muda, Lundu; ZRC 26026-27, 2, drain off road to Simundjan; ZRC 40282, 4, about 10 km from Kuching; NTM S.14301-001, 3, Sungei Stok Muda, Lundu; NTM S.14300-001, 3, Sungei Cina Matang, Matang; ZSM/KEW 1031, 1, field label lost.

**Diagnosis.** – A moderately slender *Pseudogobiopsis* with second dorsal rays I,7; anal rays modally I,7; pectoral rays 17–19; longitudinal scales 28–32; TRB 8–9; predorsal scales 8–13, reaching up to behind eyes; jaws enlarged in mature males; some headpores present, preopercular pores and posterior portion of oculoscapular canal absent; first spine of dorsal fin longest, occasionally filamentous in males; light sandy yellow with brown saddles and mottling, fins red in life, dorsal fins and caudal fins with rows of black or dark brown spots; known only from fresh waters in Sarawak.

**Description.** – Based on 33 specimens, 14.5–34.5 mm SL. An asterisk indicates counts of holotype (Fig. 22).

First dorsal VI\*; second dorsal rays always I,7\*; anal rays I,7\*–8 (strongly modally I,7); pectoral rays 17\*–19 (mean 18), segmented caudal rays 16–18 (mean 17\*); caudal ray pattern 6/6 to 9/6 (modally 7/7\*); branched caudal rays 12–16 (mean 14\*); unsegmented (procurrent) caudal rays 9/9 (in one); longitudinal scale count 24–26 (mean 25\*); TRB 8–9 (mean 8\*); predorsal scale count 8–13 (mean 10\*); circumpeduncular scales always 12\*. Gill rakers on outer face of first arch 2+5 to 3+7 (modally 2+7). Pterygiophore formula 3-12210 (in three). Vertebrae 10+16 (in seven). Neural spine of second vertebra blunt or broadened at tip (in one), or slender and pointed (in one). One (in two) or two (in four) epurals. Two (in seven) anal pterygiophores before haemal spine of first caudal vertebra. Palatine not reaching quadrate. Metapterygoid relatively low, well separated from quadrate. Quadrate shallowly forked. Dentary short. Anterior margin of preopercle pointed. Scapula unossified. Six ossified gill rakers.

Body slender, somewhat compressed posteriorly, less so anteriorly. Body depth at anal fin origin 15.6–19.2% (mean 16.9%) of SL. Head rounded, almost cylindrical, wider than deep, but not greatly so, HL 25.3–30.3% (mean 28.4%) of SL; cheeks may be somewhat inflated in large males. Depth at posterior preopercular margin 50.0–62.1% (mean 55.1%) of HL. Width at posterior preopercular margin 56.8–75.5% (mean 65.7%) of HL. Mouth terminal, slightly oblique, forming angle of about 20° with body axis; jaws reaching past rear preopercular margin in large males (such as holotype) and to below mid-eye in females. Lips smooth, without fleshy fimbriae on edges; lower lip narrowly free at sides, fused across front. Upper jaw 31.8–66.0% (mean 35.8% in females, 46.2% in males) of HL. Eyes dorsolateral, high on head, forming part of dorsal profile, 21.6–34.6% (mean 28.3%) of HL. Snout short, flattened, 19.6–27.3% (mean 22.9%) of HL. Interorbital moderately broad to narrow, 9.8–29.4% (mean 16.9%) of HL. Caudal peduncle compressed, length 28.2–33.8% (mean 30.3%) of SL. Caudal peduncle depth 11.7–13.5% (mean 12.4%) of SL.

First dorsal fin triangular, first or second spines longest or subequal, occasionally filamentous, first spine modally longest; spines slightly longer in males than females; spines falling short of second dorsal fin origin when depressed, even in large males (unless spines filamentous). First dorsal spine length 14.4–24.8% (mean 19.3% in males, 17.3% in females) of SL. Second dorsal spine length 14.4–22.7% (mean 17.5% in males, 16.1% in females) of SL. Second dorsal and anal fins short-based, lower than first dorsal fin, posteriormost rays longest, rays falling well short of caudal fin base when depressed. Pectoral fin slender, pointed, central rays longest, 23.7–29.7% (mean 25.7%) of SL; rays usually all branched. Pelvic fins long, oval, usually reaching to anus, 21.1–24.8% (mean 22.8%) of SL. Caudal fin slender, pointed to slightly rounded, 27.0–31.9% (mean 29.3%) of SL.

No mental fraenum, chin smooth to slightly bulbous. Anterior nostril tubular, placed at preorbital edge, tube oriented down and forward, preorbital often slightly curved to accommodate nostril. Posterior nostril round to oval, placed close to front centre margin of eye. Gill opening extending forward to under opercle. Inner edge of pectoral girdle smooth (in nine) or with knobby ridge or bony flange, which may support flaps (in 21), two specimens with distinct fleshy knobs. Gill rakers on outer face of first arch very short and unspined, longest rakers near angle of arch; rakers on inner face of first arch not much longer than those on outer face; inner and outer rakers on other arches similar to rakers on first arch. Tongue long, tip usually blunt to slightly concave; occasionally folded longitudinally. Outer teeth across front of upper jaw largest, sharp and curved, largest teeth toward side of jaw (considerably larger in males); behind this row, two or three rows of small sharp teeth; only one or two rows at side of jaw; teeth may be absent from posterior half of jaw; tips of teeth (mostly outer row) often tinted translucent orange to brown. Lower jaw with four or five rows of small sharp teeth across front; teeth toward sides largest and stoutest (enlarged and curved in males); usually only one row of teeth along side of jaw; tips of teeth often tinted translucent orange or brown.

Predorsal scales moderate, evenly sized, reaching forward to behind eyes or at least halfway between rear preopercular margin and eyes. Operculum with two to four cycloid scales on upper half. Cheek always naked. Pectoral base covered with cycloid scales. Prepelvic area covered with cycloid scales. Belly with cycloid scales, occasionally naked anteriorly, underneath pelvics. Ctenoid scales on side of body extending up to pectoral base.

Gut simple, S-bend shape.

Genital papilla in male relatively short, flattened, tip blunt to rounded, with one or two fine lobes present; in female, short, rounded and indented at tip.

Headpores present, with pair of anterior interorbital scales, single posterior interorbital pore, and infraorbital and postorbital pores behind each eye. Rear portion of oculoscapular canal absent. No preopercular pores.

Sensory papillae pattern longitudinal, as in Fig. 23. Papilla row *b* broken well behind eyes, rear portion with two to four papillae. Three *s* rows, of one papilla each. Mental *f* row consisting of one papilla on each side of symphysis.

**Colouration of fresh material.** – From colour slides by Peter Ng and Heok Hui Tan of fresh specimens. Colouring very similar to preserved specimens, but upper part of head and body with scattered orange-red spots, dorsal and anal fins with orange-red to red wash over black and dark brown spots and streaks; pectoral and caudal fins reddish, not as bright as dorsal fins (Plate 2A).

**Colouration of preserved material.** – Head and body yellowish-white to pale yellowish-brown, with scattered dark brown to blackish spots, some scale margins partly outlined with dark brown, especially on lower half of body, and five oblique to nearly vertical dark brown bars crossing back and sides, evenly spaced from just before first dorsal fin origin to just before upper procurrent rays of caudal fin; occasionally brown blotch on centre of nape (Fig. 24, Plate 2A). Oblique bars becoming diffuse and ending on midside of body; indistinct midlateral brown streak, formed by two to three rows of pale scales with brown spots on or near their centres, sometimes present. Brown spots on body of variable intensity, usually very fine and partly outlining scale margins, especially on lower half of body. At midbase of caudal fin, oblique elongate blackish blotch present, extending down and back onto lower segmented caudal rays. Pectoral base dusky with short dark brown bar extending obliquely from upper third of base onto upper ray bases. Ventral midline of caudal peduncle with thin black line sometimes visible; midventral line of body with five narrow black blotches, evenly spaced, from anus to just before lower procurrent rays of caudal fin; anteriormost black blotch (at anus) sometimes obscure.

Side of head with many dark brown to blackish oblique lines, often vermiculate or broken into rows of short streaks or spots; opercle usually with rows of spots. Anteriormost two lines darkest, extending from margin of eye across preorbital to front of jaws, crossing jaws to meet counterparts on lower lip and chin. Upper lip pale, barred with dark brown (continuation of oblique stripes on head); lower lip pale to dusky, often with few brown bars or spots anteriorly. Rear of opercle and branchiostegal membranes dusky with small brown blackish spots in males; pale with short brown to blackish oblique lines in females. Nape and interorbital with small brown blotches and small spots. Underside of head and belly plain pale whitish to dusky brownish; scales with margins outlined in dark brown forming dark patch on breast just anterior to pelvic fins in males.

First dorsal fin translucent to dusky, with broad dark grey to blackish streak across centre of fin, diffuse black spot within streak toward rear sometimes present; brownish narrow stripes or dusky streaks along fin above and below central broad dark streak; tips of several dorsal spines with dense black spot, usually on first, third and fourth; first dorsal spine always pale with two to three small dark brown to black spots on membrane just behind spine. Second dorsal

fin whitish to translucent, with five to seven rows of small dark brown to black round to oval spots; unsegmented spine always pale with two black spots, fin margin plain dusky. Anal fin plain dusky to brownish. Pectoral fins translucent dusky to pale brownish, rays becoming darker toward tips; fins distinctly darker in males. Pelvic fins plain dusky grey to brownish. Caudal fin translucent whitish to pale dusky with many rows of vertically oriented, dark brown to black small spots or short lines, spots becoming smaller distally; short lines closest to fin base sometimes joining to form one or two oblique to vertical dark lines on lower half of fin; lowermost edge of caudal with broad plain dusky to greyish margin; one to three black spots along upper edge of fin, crossing dorsal procurrent rays.

Males distinguished from females in being darker, on pectoral fins especially, and in having darker and more complex vermiculate oblique lines on head (Figs. 23, 24, Plate 2A).

Sensory papillae often orange-tipped. Peritoneum pale with broad brown dorsal saddle and scattered brown spots (as in colour pattern of surrounding skin).

**Comparisons.** – Most similar to *P. paludosus*; most easily distinguished by the presence of headpores and in the oblique dark lines on the side of the head (vs. headpores absent and brown blotches on side of head).

**Distribution.** – Specimens are only known so far from rainforest freshwater streams of Sarawak, Malaysia.

**Ecology.** – One specimen lot was recorded as being from a slightly turbid blackwater stream, with leaf litter and aquatic vegetation present.

**Etymology.** – From the Latin, *festivus*, meaning cheerful, delightful or humorous, all words which relate to the elongate smiling jaws of mature males.

**Remarks.** – This species and *P. paludosus* share a synapomorphy: cheek papilla row *b* is broken into two sections, with a wide gap behind the eyes.

***Pseudogobiopsis oligactis* (Bleeker, 1875)**

(Figs. 22, 26; Plate 2B; Tables 13–16, 18)

- Gobiopsis oligactis* Bleeker, 1875: 113-114 (Amboina, Indonesia).  
 – Koumans, 1931: 67; Bleeker, 1983: Pl. 433, Fig. 4.  
*Glossogobius campbellianus* Jordan & Seale, 1908: 542, Fig. 2 (Buytenzorg, Java).  
 ?*Glossogobius mas* Hora, 1923: 742-743, Fig. 23 (Chilka Lake: off Samal Island, Rambha Bay, off Barkul).  
*Pseudogobius neglectus* Koumans, 1931: 102 (*nomen nudum*; Bleeker museum name). – Bleeker, 1983: Pl. 438, Fig. 13.  
*Stigmatogobius neglectus* Koumans, 1932: 3, 5 (western Java).  
*Pseudogobiopsis oligactis* – Koumans, 1935: 131-132, Fig. 4; Fowler, 1937: 251; Koumans, 1940: 126; Smith, 1945: 521-522; Kottelat, 1989: 19; Kottelat et al., 1993: 150, Pl.70; Lim & Larson, 1994: 260; Kottelat & Lim, 1995: 247; Ng & Tan, 1999: 364; Larson & Lim, 2005: 143; Larson et al., 2008: 143.  
*Vaimosa perakensis* Herre, 1940: 21, Pl. 16 (Lake above Chenderoh Dam, Perak, Malay Peninsula).  
*Stigmatogobius oligactis* – Koumans 1953: 110, 116-117, Fig. 27; Chatterjee, 1980: 229, 230.  
*Stigmatogobius poecilosoma* (in part) – Alfred, 1966: 47.  
*Stigmatogobius isognathus* - Mohsin & Ambak, 1983: 187, Fig. 141.  
*Mugilogobius perakensis* – Kottelat, 1989: 19.  
 ?Genus and species undet. – Roberts, 1993: 44, Fig. 51.  
*Pseudogobiopsis campbellianus* – Kottelat et al., 1993: 150, Pl. 70 (in part).  
*Pseudogobiopsis neglectus* – Kottelat et al., 1993: 150, Pl. 70.  
*Eugnathogobius oligactis* – Larson, 2001: 6970.

**Material Examined.** – INDIA: CAS 61960, 3(15.0-20.5), sandy beach at Hampi, Tungabhadra River, Bellary District, Karnataka State, Mysore, T. Roberts, 3 Feb.1985. THAILAND: CMK 5385, 22(17-36), stream on road from Ranong to Kra Buri, Ranong Province, M. Kottelat, 24 Apr.1985; KUMF uncatalogued, 3(37.5-41.0), Tha Lad Waterfall, Samui, Surathani Province, C. Vidthayanon, 22 Jul.1983; NIFI 1230, 3(33.5-41.0), Chiew Larn Dam, Klong Saeng, Surat Thani Province, J. Karnasutra, 20 Mar.1983. CAMBODIA: CMK 4806, 1(35), Stung Tong Hong, 77 km on road from Phnom Penh to Sihanoukville, d'Aubenton, 13 Jan.1963. MALAYSIA: Holotype of *Vaimosa perakensis*, CAS 32975, 1(25.5), Chanderoh Dam, Perak, A.W. Herre, 9 Mar.1937. Paratypes of *Vaimosa perakensis*, CAS 32977, 17(13.5-28.5), 2 miles N of Sauk, Perak, A.W. Herre, 18 Apr.1937; ZRC 255, 47(12-24.8), lake above Chanderoh Dam, Perak, A. W. Herre & M. F. Tweedie, 19 Mar.1937. CMK 7422, 4(24-31), NE foothills

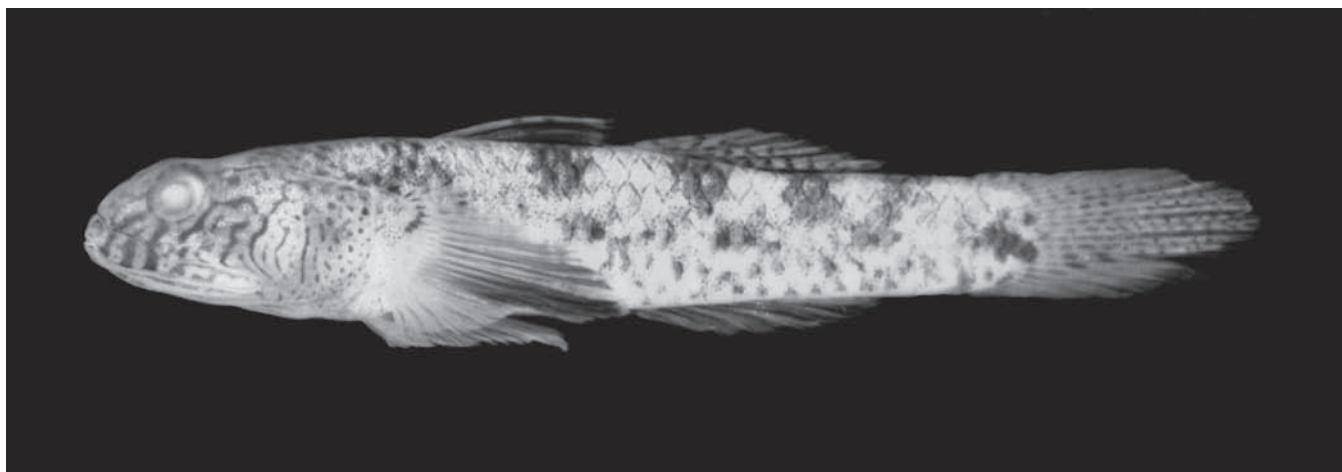


Fig. 22. *Pseudogobiopsis festivus*, new species, holotype, 34.5 mm SL, male, ZRC 40279, near Kuching, Sarawak, Malaysia.

of Gunung Panti, N of Kota Tinggi, Johore, M. Kottelat et al., 1991; NTM S.16374-001, 1(30.5), cleared and stained, same data as preceding; ZRC 19323-19325, 1 of 3(34), Desaru Road, Kota Tinggi, Johor, P. Ng & M. Kottelat, 14 Aug.1991; ZRC 20457-61, 5(25.5-37.5), Rembia, Malacca, D. S. Johnson, 26 Feb.1958; ZRC 1651i-iii, 3(32.0-40.5), Sungei Telok Bahang at 14.5 miles (23.2 km) on Telok Bahang Road, Penang, E. R. Alfred, 21 Oct.1961; FMNH 68465, 3(27.5-29.0), Sungai Tawan, Sungai Tibas Camp,

Kalabakan, Tawau, Sabah, R. Inger, 8 Jun.1956; NTM S.14240-001, 4(23-26), 7 miles (11.2 km) south of Kuching, Kampong Pangkalan Kuap, Sarawak, B. L. Lim, 1 Jan.1969. BRUNEI: NTM S.14239-001, 3(32-36), Sungai Belalong, KBSFC, S. Choy, 27 Jul.1992. SINGAPORE: ZRC 1049i-iv, 4(24-28), MacRitchie Reservoir, S. H. Chung, 4 Nov.1959. INDONESIA: Holotype of *Glossogobius oligactis*, RMNH 4459, 1(25.5), Java. Holotype of *Glossogobius campbellianus*, USNM 61051, 1(26.5), Buitenzorg

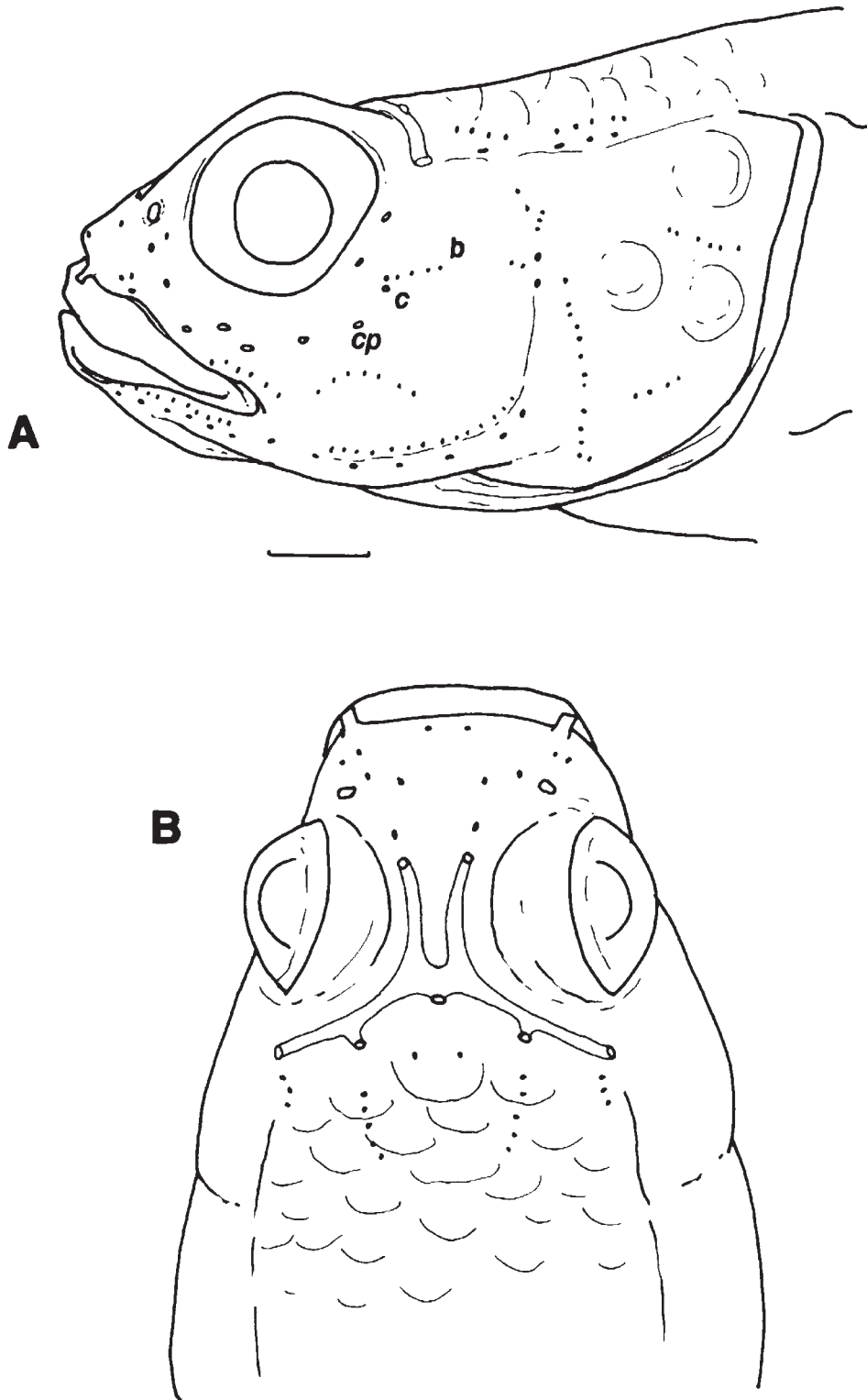


Fig. 23. *Pseudogobiopsis festivus*, new species, papillae pattern. 26 mm SL female, CMK 8401, Sungei Bejit, Sarawak: A, lateral view; B, dorsal view. Scale bar = 1 mm.



(= Bogor Botanical Gardens), Java, D. H. Campbell. Paratype of *Glossogobius campbellianus*, CAS 22498, (23), same data as holotype. CMK 9621, 6(15–32), clear stream east of Mentok on road from Pangkalpinang, Banka, Sumatra, M. Kottelat et al., 4 Mar.1993.

**Other material examined (but not used in description).**

THAILAND: KUMF uncatalogued, 8, Thasaeh Reservoir, Chumporn; USNM 263432, 14, Ban Pong; CMK 9765, 2, Koh Chang Island; CMK 5350, 5, Phang Nga; CAS 44347, 4, Goh Chang Island; CAS 53248, 1, Goh Chang Island; CAS 53254, 1, Goh Chang Island; CAS 51608, 1, Goh Chang Island; NTM S.14350-042, 2, Bangpakong River; CMK 10713, 22, Trat Province; SMF 13346, 4, Lam Pi River, Phuket; USNM 316197, 1, Pungah; NTM S.14241-001, 13, Borapet Swamp, Nakonsawan. CAMBODIA: MNHN 1985.988, 2, Kampot River; MNHN 1985.996, 1, Stung Hong Kong. THE PHILIPPINES: CMK 9978, 2, Basey River, Samar. MALAYSIA: CAS 32976, 187, paratypes of *Vaimosa perakensis*, Chanderoh Dam, Perak; ex CAS 39485, 10, Kota Tinggi, Johore; ex USNM 258941, 1, Sungei Sedili Besar, Johore; ZRC 32013–26, 14, Penang; ZRC 35262–89, 28, Perak; CMK 20510, 6, near Kota Tinggi; ZRC 27562–5 (in part), 1, Selangor; FMNH 63039, 1, Sungei Saoh Sarawak; FMNH 68468, 1, Tawau, Sabah; FMNH 68469, 3, Tawau, Sabah; FMNH 68470, 1, Tawau, Sabah; FMNH 68464, 5, Tawau, Sabah; ZSM/KEW 268, 1, on Kota Kinabalu/Sandakan road, Sabah. BRUNEI: NTM S.14237-001, 1, Belalong; NTM S.14238-001, 1, east of Temburong. INDONESIA: CMK 9527, 1, Sungei Tulit, Kalimantan Timur, Borneo; BMNH 1975.8.15.387-389, 3, Ranu Klumdungah E, Java; CMK 6098, 8, Lake Sawangan, Java; CMK 10816, 2, Rawa Pening, Java; CMK 6104, 1, Maros, Sulawesi; RMNH 17118, 1, Sinaloa (possibly = Sinalud, S of Singaraja, Bali; not Sinaloa, Mexico). NO LOCALITY: RMNH 23266, 7; RMNH 23017, 1; RMNH 14050, 5.

**Diagnosis.** – A moderately slender *Pseudogobiopsis* with second dorsal rays I,6–8 (modally I,6); anal rays I,5–7 (modally I,6); pectoral rays 16–19; longitudinal scales 22–25; TRB 6–8; predorsal scales 6–10, large, reaching up to close behind eyes; head flattened and jaws greatly enlarged in male; preopercular pores present, posterior portion of oculoscapular canal present, including TLCP pore; scales on body mostly ctenoid; first spine of dorsal fin longest and usually filamentous in males, second or third spine longest in females, but not elongate; upper half of body with scale margins narrowly outlined with dark pigment, five elongate

dark blotches along midside of body with fine dark spots below and three dark streaks on face; known from fresh waters of Indo-Malay Archipelago.

**Description.** – Based on 56 specimens, 18.5–46 mm SL. An asterisk indicates counts of holotype of *Glossogobius oligactis*.

First dorsal VI\*; second dorsal I,6–7 (mean I,6\*); anal I,5–7 (mean I,6\*), pectoral rays 16–19 (mean 18, holotype with 19 on right, 18 on left), segmented caudal rays always 17\*; caudal ray pattern 9/8; branched caudal rays 12–15 (mean 14, modally 7/7, fin ray tips broken in holotype); unsegmented (procurrent) caudal rays 7/7 to 10/10 (modally 9/9); longitudinal scale count 22–25\* (mean 23); TRB 6–8 (mean 8, 7 in holotype); predorsal scale count 6\*–10 (mean 7); circumpeduncular scales 12–13 (13 only in one specimen). Gill rakers on outer face of first arch 1+7 to 4+8 (modally 3+6). Pterygiophore formula 3-12210 (in 19). Vertebrae 10+15 (in two), 10+16 (in 17), 10+17 (in two). Neural spine of second and third vertebra narrow and pointed (in nine) or stout and pointed (in two). Two epurals (in 16). Two (in nine) or three (in seven) anal pterygiophores before haemal spine of first caudal vertebra. Upper rear corner of scapula ossified or not. Palatine not in contact with quadrate. Pterygoid slender, may be equal to palatine in length. Quadrate forked. Metapterygoid small, with short dorsally oriented projection, no process reaching toward or contacting quadrate (illustrated in Larson, 2001: Fig. 64).

Body compressed posteriorly, rounded to somewhat depressed anteriorly. Body depth at anal fin origin 14.0–21.6% (mean 18.4%) of SL. Head wider than deep, especially in mature males; HL 28.6–35.8% (mean 32.1%) of SL; head in mature females appearing oval in cross-section, males with head distinctly depressed. Depth at posterior preopercular margin 43.4–63.0% (mean 53.1%) of HL. Width at posterior preopercular margin 60.2–84.3% (mean 69.0%) of HL; cheeks may be inflated. Mouth terminal, slightly oblique, forming angle of 15–20° with body axis; jaws greatly enlarged in mature males, reaching well back past eye and nearly reaching angle of preopercle; immature males with jaws reaching to



Fig. 24. *Pseudogobiopsis festivus*, new species, female paratype, 29.5 mm SL, ZRC 40280, Kuching, Sarawak, Malaysia.

below rear half of eye; mature females with jaws reaching to below front half of eye or just behind eye (in holotype of *Glossogobius oligactis*, end of jaws protruding past preopercular edge). Lips usually smooth, fleshy fimbriae may be present anteriorly on inner edge of upper lip (fimbriae sometimes very close to outer edge); lower lip free at sides, fused across front, fleshy symphysis slightly raised. Upper jaw 36.6–81.5% (mean 40.7% in females, 59.5% in males) of HL. Eyes dorsolateral, forming part of dorsal profile, 20.4–30.2% (mean 27.4% in females, 24.4% in males) of HL. Snout flattened, rounded, 24.2–35.9% (mean 28.4%) of HL. Interorbital narrow, 11.1–19.1% (mean 13.8%) of HL. Caudal peduncle long, compressed, length 24.7–31.3% (mean 28.5%) of SL. Caudal peduncle depth 10.3–14.1% (mean 12.3%) of SL.

First dorsal fin rounded, tips of spines free, first spine nearly always longest in males (rarely second or third spine longest), spine elongate and filamentous, reaching back nearly to rear of second dorsal fin when depressed; females with no elongate first dorsal fin spines, second or third spines longest; spines barely reaching second dorsal fin origin when depressed. First dorsal spine 15.1–15.3% (mean 15.2%) in females, 14.1–41.0% (mean 25.4%) in males, of SL. Second dorsal spine length 13.2–16.8% (mean 15.0%) of SL. Third dorsal spine length 11.9–15.0% (mean 13.9%) of SL. Second dorsal and anal fins short-based, posteriormost rays longest, rays falling well short of caudal fin base when depressed. Pectoral fin slender, pointed, central rays longest, 20.4–27.9% (mean 25.0%) of SL; rays usually branched but for uppermost. Pelvic fins slender to oval, reaching to anus, 20.2–26.6% (mean 23.2%) of SL. Caudal fin relatively short, rounded posteriorly, 23.8–28.9% (mean 26.4%) of SL.

No distinct mental fraenum, chin smooth, sometimes with fleshy pad behind symphysis (usually discernible in freshly preserved material). Anterior nostril placed just above preorbital edge, in short tube oriented forward. Posterior nostril rounded to oval, placed very close to front centre margin of eye. Gill opening wide, extending forward to under opercle or just under preopercle. Inner edge of pectoral

girdle smooth with no ridge or flange; only two specimens observed with single small fleshy knob. Gill rakers very short and unspined, longest rakers near angle of arch; rakers on inner face of first arch about twice height of outer rakers, as are outer and inner rakers on other arches. Tongue large, tip deeply bilobed (rarely concave); occasionally tongue blunt and reduced in size. Teeth small; teeth in outermost row of upper jaw largest, curved and pointed, placed at front of jaws; two rows of smaller pointed teeth behind this row; one or two rows of small pointed teeth at side of jaw (very little difference in size of teeth between males and females). Lower jaw with three or four rows of small pointed teeth across front, teeth in inner rows tending to point posteriorly; teeth in innermost row on side of jaw largest and stoutest (posteriormost few teeth largest); usually one or two rows of teeth at side of jaw in females; in males, only anterior half of lower jaw with teeth, posteriormost tooth largest.

Predorsal scales moderately large, evenly sized, reaching to close behind eyes; anteriormost scale broader than those behind it. Operculum with large cycloid scales, lower quarter sometimes unscaled. Cheek always naked. Pectoral base covered with few large cycloid scales. Prepelvic area covered with cycloid scales. Belly midline naked, remainder covered with cycloid or ctenoid scales, or with patch of ctenoid scales close to pelvic fin base and rest of scales cycloid. Ctenoid scales on side of body extending forward to pectoral base, sometimes extending dorsally over base. Anteriormost scales on body larger than those posteriorly.

Genital papilla in male elongate and flattened, narrowing toward tip, one or several tiny lobes at tip; in female, papilla short, rounded and bulbous, indented at tip.

Head pores present (Fig. 25). Pair of nasal pores, pair of anterior interorbital pores, a median posterior interorbital pore, postorbital and infraorbital pore behind each eye, oculoscapular canal and pore over preoperculum and three preopercular pores. One specimen from Cambodia (MNHN 1985.996) with extra pore on each oculoscapular canal, close to infraorbital pore.

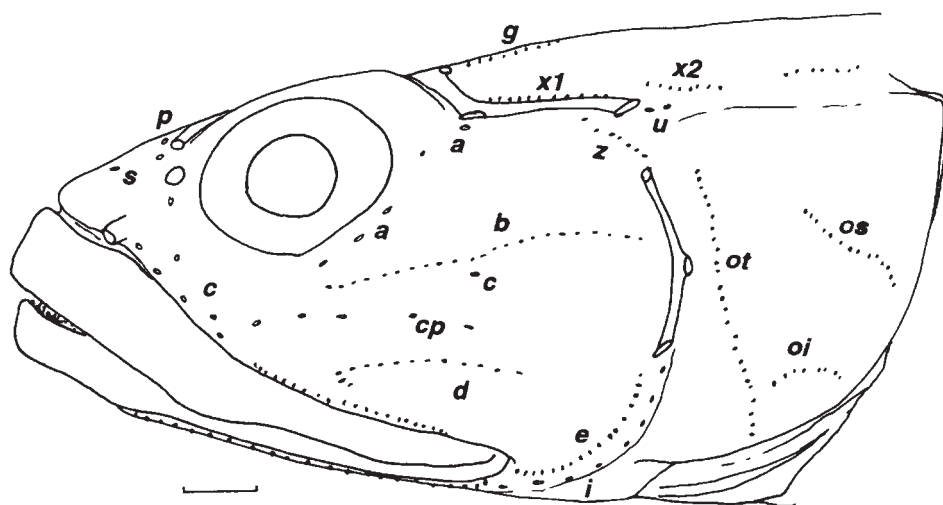


Fig. 25. *Pseudogobiopsis oligactis*, papillae pattern. 36 mm SL male, CMK 5385, Ranong, Thailand. Scale bar = 1 mm.

Sensory papillae pattern longitudinal, as in Fig. 25. Cheek rows *a*, *c* and *cp* composed of large, widely spaced papillae, and rows *b* and *d* of very small, closely spaced papillae. Two to three *s* rows on snout, of one papilla each; middle row papilla absent or reduced in size. Mandibular *f* row of two papillae, one on each side of symphysis.

**Colouration of fresh material.** – Gerhard Ott made available photographs of captive specimens from the Chong-fa Waterfall on the Andaman coast of Thailand (Plate 2B). The head and body are translucent pearly grey, slightly yellowish to gold-speckled dorsally; belly whitish; five or six dusky internal blocks of pigment just visible through body wall and several indistinct dusky saddles on dorsum (most distinct on posterior half of body); scales with dark margins, on lower half of body, scale margins outlined with black speckles and dense black small round spots. Head pinkish-grey on lower half, dorsal half slightly yellowish to gold-speckled. First dorsal fin transparent, with alternating pale creamy yellow and faint diffuse brown bands and small black oval spot near base of fin posteriorly, elongate first dorsal spine creamy yellow, fin margin translucent. Second dorsal fin and caudal fin with closely spaced irregular alternating bands of pinkish brown and creamy yellow to pinkish, fin margins brownish. Anal fin whitish. Pectoral and pelvic fins translucent blueish white to nearly transparent.

A photograph of a living captive specimen, identified as *Boleophthalmus* sp., appears in Wheeler (1979: Pl. 431). Fish light yellowish-grey, with whitish breast and abdominal region, scale margins narrowly outlined with light greyish brown (darker on back) on dorsal half of body; on ventral half

of body scale margins outlined by series of small blackish dots. No dark midlateral blotches visible, but posterior half of body with about five dusky internal bars. Head (facing away from viewer) with brownish bar extending from eye toward snout tip, some brownish marks directly below eye and diagonal brown bar extending from rear of the eye across cheek. Opercle, pectoral base and pectoral fin yellowish. Both dorsal fins translucent, with rows of elongate black and light yellow spots (two rows on first dorsal fin; four or five on second); greatly elongate first dorsal fin spine broad (membranous?) and yellowish white. Caudal fin translucent yellowish with 10 rows of purplish brown small spots coalescing posteriorly into narrow lines.

Larson & Lim (2005: 143) also show a live specimen. Freshly dead specimens in available slides are similar to preserved specimens, being whitish or whitish yellow with brown and/or greyish-brown body markings and blackish spots on the dorsal fins.

**Colouration of preserved material.** – Head and body yellowish-white, light greyish-brown to pale brownish (depending upon preservation), paler on ventral half, with five elongate, rectangular, brown blotches along midside of body; scale margins on upper half of body outlined narrowly with brown; scales on lower half of body becoming less clearly outlined, with series of tiny black or brown spots (conspicuous against light background) (Fig. 26). Five diffuse brown saddles usually visible, crossing back and reaching down to midside of body, sometimes joining midlateral blotches. Posteriormost midlateral blotch usually wedge-shaped, extending onto caudal fin base. Nape and



Fig. 26. *Pseudogobiopsis oligactis*, CMK 10862, 28.8 and 34.9 mm SL, locality unknown. From colour slide by Maurice Kottelat.

upper half of body often with indistinct brown spotting and mottling. Ventral midline of caudal peduncle with thin black line, usually with three to four evenly spaced narrow black blotches present.

Head with three distinct brown markings: first, short broad bar from front of eye to upper lip but not extending onto lip; second, curved broad to narrow streak from lower edge of eye to jaw, bending sharply rearward and ending on middle of cheek; and third, broad diagonal bar from rear of eye extending backward to end of middle of cheek just above second streak; third bar usually darkest and broadest. Opercle with few diffuse brown spots, usually dark brown irregular marking present near upper rear corner. Lips and chin plain dusky grey to brown. Pectoral base with blackish to brown spot or blotch across bases of uppermost few fin rays. Breast and belly pale to dusky.

First dorsal fin translucent to whitish with two to three rows of elongate black spots on spines and membranes (spots often joining to form irregular rows); filamentous portion of first spine plain whitish. Second dorsal fin similar, with four to seven rows of blackish spots coalescing on posterior half of fin at least, forming wavy rows. Anal fin plain dusky grey. Caudal fin translucent to dusky with 5–10 rows of small elongate dusky spots or fine irregular dusky bars. Pectoral fin translucent to dusky. Pelvic fins translucent dusky, darkest toward fin bases.

**Comparisons.** – This species was found to be frequently been confused with *Pseudogobiopsis siamensis* in museum collections, as the two species can occur syntopically and small female specimens look superficially similar. The headpore arrangement (preopercular pores and rear portion of oculoscapular canal and pore present in *P. oligactis*, but absent in *P. siamensis*) and caudal fin colour pattern (vertically oriented rows of brown spots in *P. oligactis* vs. similarly oriented grey to brown zigzag lines in *P. siamensis*) are the simplest means of distinguishing the two. Additionally, *P. oligactis* tends to be longer bodied with a somewhat flattened head (especially in adult males), while *P. siamensis* is stockier, with the head depth at the preopercle greater than the width.

**Distribution.** – Specimens are known from Thailand through the Indo-Malayan Archipelago to Indonesia. Two specimens are known from the Philippines (but see **Remarks**). Ng & Tan (1999) reported the species for the first time from the Endau River system in southern Peninsular Malaysia.

This species appears to have become extinct in Singapore, with the only known specimens collected in 1959. Despite recent surveys of most habitats on the island by resident biologists, *P. oligactis* has not been found since (Larson et al., 2008).

**Ecology.** – Freshwater, usually from fast-flowing hill streams, out of the main current. Syntopic with *P. siamensis* in Malaysia.

Herre (1940), in his description of *Vaimosa perakensis*, described how the species rapidly increased in abundance along the edges of Chanderoh Dam (Malaysia) after it was built.

Schneider (2003) described captive spawning of specimens originally collected from Santubong Peninsula, Sarawak; the habitat was described as a small stream with pebble and rock substrate. In captivity, the male constructed burrows under stones and became golden-yellow in colour with darker scale margins (dark saddles and lines on the body vanish), a violet hue on the head and bright red fins. A ready to spawn female had a pale body with black pelvic fins. About 1,000 eggs were deposited on the roof of the spawning cave and larvae were planktonic.

Horsthemke (in litt.) observed that captive female specimens often moved up into the water column and rested on top of large stones or on the leaves of aquatic plants, while a male was strictly benthic (and cryptic in behaviour). They ate live food, but nothing larger than chironomid larvae.

**Remarks.** – *Stigmatogobius neglectus* Koumans is based on a Bleeker manuscript name, *Pseudogobius neglectus*, and listed as name only in Koumans (1931) and Bleeker (1983). Bleeker (1983: Pl. 438, Fig. 13) indicated that the black spot drawn on the first dorsal fin on the figure of *Pseudogobius neglectus* was erroneous. Kottelat et al. (1993: pl. 70) reproduced this figure without comment.

Koumans (1940: 126) first recognised that *Glossogobius campbellianus* was a synonym of *P. oligactis*. However, he also thought that *Vaimosa siamensis* was also a synonym (Koumans 1940: 135), which it is not.

Kottelat et al. (1993) combined *P. oligactis* and *P. siamensis* under their account for *Pseudogobiopsis campbellianus*. The specimens in their Fig. 70 are *P. siamensis*; and the batch of specimens from which they came (CMK 7864) included both species. They also listed this species (as *Pseudogobiopsis neglectus*) as a “... species to watch ...” due to its apparent rarity and lack of biological information about it (Kottelat et al., 1993: xxxvi).

Roberts (1993: 44, Fig. 51) published one of Kuhl & van Hasselt’s illustrations, of a fish from Java (artist unknown) which could be *Pseudogobiopsis oligactis*. It is relatively slender, has an elongate first dorsal fin spine, elongate black blotches along the midside of the body, small brown spots on the whitish lower half of the body and finely barred caudal fin. However, the mouth is not enlarged and there is a black blotch on the pectoral base, features which resemble that of specimens of a probably new species not included within this paper.

There appear to be some dwarf (i.e. sexually mature at a small size) populations of this species. Thirteen specimens from Borapet Swamp, Nakornsawan Province, Thailand (NTM S.14241-001), include 23 mm SL males with enlarged mouths and a 19 mm SL female with nearly ripe eggs. Additionally,

the only specimens from the Philippines which are of this species are two very small mature fish (21 mm SL male, 17.5 mm SL female) from the Basey River, Samar (CMK 9978). The male has an enormous mouth reaching to the rear of the preopercle and the female is filled with ripening ova. Both fish are very dark in colour (chocolate-brown, with whitish scale centres) and show some indistinct vertical brown bars on the side of the body. It is possible that these two specimens belong to a separate species (although basic counts agree with *P. oligactis*), but additional material is required to confirm this.

***Pseudogobiopsis paludosus* (Herre, 1940)**

(Figs 27–30; Tables 13–16, 19)

*Ctenogobius paludosus* Herre, 1940: 23, Pl. 18 (north of Kota Tinggi, Johore, Malay Peninsula).

*Calamiana* sp. undet. – Roberts 1989: 168.

*Rhinogobius paludosus* – Kottelat 1989: 19.

*Eugnathogobius paludosus* – Larson 2001: 70.

**Material examined.** – MALAYSIA: Holotype of *Ctenogobius paludosus*, CAS 32998, 1(30.5), 5 miles (8 km) north of Kota Tinggi, Johore, A. W. Herre, May 1937. ZRC 8411, 1(30), Sungai Sedili, Johore, 22 Feb.1968; CMK 7384, 8(12.5–29.0), Sungai Mupor, Johore, M. Kottelat, P. K. L. Ng & K. Lim, 22 Jan.1991; NTM S.16416-001, 2(18–25), C&S, same data as previous. INDONESIA: USNM 230332, 3(18–23), West Kalimantan, Sungai Gentu, near confluence with Kapuas River, T. Roberts, 16 Aug.1976; CAS 49462, 58(7.5–28.0), Sungai Mandai Kecil, near confluence with Kapuas River, 18 km west-south-west of Putissibau, T. Roberts and S. Woerjoatmodjo, 1 Aug.1976; CMK 9009, 5(13–21), Sumatra, Riau district, Sungai Kalesa, north of Seberida, A. J. Whitten, 22 Feb.1992.

**Other material examined (but not used in description).**

MALAYSIA: ZRC 8405, 1, by Gunung Panti, Johore; ZRC 17095, 1, by Gunung Panti, Johore; ZRC 14011, 1, Kota Tinggi. INDONESIA: USNM 230333, 7, Kapuas River tributary, Borneo; USNM 230331, 7, Sungei Seriang, Sungei Palin tributary; CMK 6933, 1, Sungai Sibau, Kalimantan Barat; CMK 6761, 3, Kapuas River tributary, Kalimantan Barat; CMK 11598, 1, Sungai Letang, Kapuas River tributary, Kalimantan Barat; CMK 10141,

14, Sungai Piyam, Nanga Empanang, Kalimantan Barat; CMK 11781, 1, Sungai Barito, Kalimantan Tengah; MHNG 2537.36, 2, N of Sempit, Kalimantan Tengah; CMK 9674, 1, Sungai Serdang, Sumatra, Riau Province.

**Diagnosis.** – Slender *Pseudogobiopsis*, somewhat rounded anteriorly, with second dorsal rays I,7–10 (modally I,8); anal rays I,6–7 (modally I,7); pectoral rays 13–16; longitudinal scales 23–27; TRB 7–9; predorsal scales 5–9, small, reaching to above preopercular margin; headpores absent; mouth enlarged in males; scales on body mostly ctenoid; caudal fin pointed; head and body yellow to whitish with scattered brown spots and five brown bars crossing back and sides, caudal and dorsal fins with rows of fine black spots; single very broad epural; known from fresh waters of Indo-Malaysian Archipelago.

**Description.** – Based on 23 specimens, 16–30.5 mm SL. An asterisk indicates counts of holotype of *Ctenogobius paludosus* (Fig. 27).

First dorsal V (in one), VI\* (in 21), VII (in one); second dorsal I,7–10 (mean I,8\*); anal I,6–7 (mean I,7\*), pectoral rays 13\*–16 (mean 15), segmented caudal rays 15–17\*; caudal ray pattern 6/6 to 8/8 (modally 7/6\*); branched caudal rays 12–16 (mean 14, 13 in holotype); unsegmented (procurrent) caudal rays 5/5 to 6/5; longitudinal scale count 23–27 (mean 25, 24 in holotype); TRB 7\*–9 (mean 8); predorsal scale count 5–9 (mean 8\*); circumpeduncular scales always 12\*. Gill rakers on outer face of first arch 1+6 to 3+6 (modally 2+6). Pterygiophore formula 3-12210 (in eight). Vertebrae 10+15 (in three), 10+16 (in nine), 10+17 (in one). Neural spines of first few vertebrae slender, pointed (in 10). One (in 10) very broad epural; two in one specimen. Two (in 11) anal pterygiophores before haemal spine of first caudal vertebra. Palatine not in contact with quadrate. Pterygoid long, equal to or longer than palatine. Metapterygoid low to moderate, well separate from quadrate in female, slightly overlapping quadrate in adult male (suspensorium shifted back and shortened by enlarged jaws) (Fig. 28). Quadrate shallowly forked. Dentary short, narrow. Pectoral radials poorly ossified. Scapula unossified.



Fig. 27. *Pseudogobiopsis paludosus*. Holotype of *Ctenogobius paludosus* Herre, CAS 32998, 30.5 mm SL male, Kota Tinggi, Johore, Malaysia.

Body slender, compressed, more rounded anteriorly. Body depth at anal fin origin 15.4–19.5% (mean 17.1%) of SL. Head rounded to slightly depressed, wider than deep, but not greatly so, HL 30.5–33.7% (mean 31.9%) of SL; cheeks may be considerably inflated in males. Depth at posterior preopercular margin 47.8–56.9% (mean 51.7%) of HL. Width at posterior preopercular margin 56.9–71.6% (mean 65.3%) of HL. Mouth terminal, lower jaw tip anteriormost, oblique, forming angle of about 25–30° with body axis; jaws reaching past rear of eye in males and to below front half of eye in females (well past rear of eye in holotype). Lips smooth, usually narrow in males; without fleshy fimbriae along edge; lower lip free at sides, broadly fused across front. Upper jaw 32.1–62.5% (mean 34.3% in females, 52.4% in males) of HL. Eyes dorsolateral, close to snout tip, high on head forming part of dorsal profile, 22.1–35.2% (mean 29.3%) of HL. Snout short, flattened, 17.7–27.4% (mean 23.7%) of HL. Interorbital flat, moderate to narrow, 8.5–22.7% (mean 18.8% in males, 14.4% in females) of HL. Caudal peduncle long, compressed, length 22.1–30.1% (mean 26.6%) of SL. Caudal peduncle depth 10.0–12.9% (mean 11.7%) of SL.

First dorsal fin triangular, pointed, third to fifth spines longest or subequal, sometimes elongate, especially in large males (first dorsal spine longest in one female), second or third spine longest in females, third modally longest in males; spines slightly longer in males than females; spines usually reaching second dorsal fin origin when depressed. Second dorsal spine longest in some females, length 15.3–17.3% (mean 16.5%) of SL. Third dorsal spine length 14.0–15.7% (mean 15.1%) of SL. Fourth dorsal spine length in males 15.0–27.3% (mean 22.8%) of SL. Fifth dorsal spine length in males 19.2–35.0% (mean 25.8%) of SL. Second dorsal and anal fins short-based, pointed posteriorly, rays falling well short of caudal fin base when depressed. Pectoral fin pointed, slender, central rays longest, 23.3–31.3% (mean 26.5%) of SL; rays usually all branched. Pelvic fins long, oval, usually reaching to anus, 20.0–25.9% (mean 23.8%) of SL. Caudal fin slender, pointed, 25.2–34.8% (mean 29.7%) of SL.

No mental fraenum, chin blunt, smooth, slightly protuberant. Anterior nostril in very slender tube, placed just at preorbital edge, tube oriented forward and slightly downward, preorbital

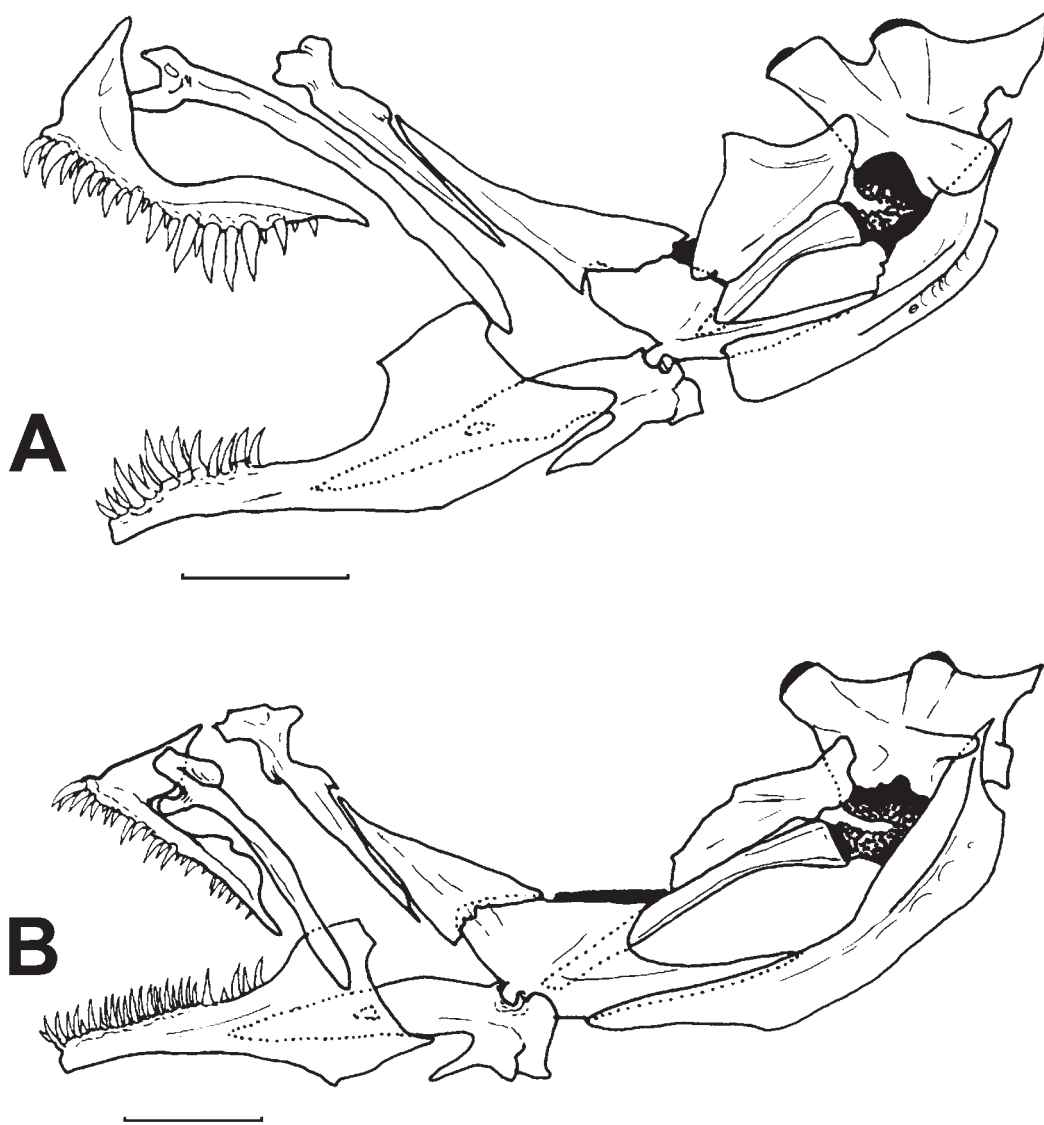


Fig. 28. Jaws and suspensorium of *Pseudogobiopsis paludosus*. A, male, ex CAS 7384, Sungei Mupor, Johore, Malaysia; B, female, CMK 6735, Kalimantan Barat, Borneo (specimens from this lot possibly represent a separate species). Scale bar = 1 mm.

occasionally produced forward to accommodate nostril. Posterior nostril small, oval, placed about midway between front centre margin of eye and anterior nostril. Gill opening extending forward to just under opercle. Inner edge of pectoral girdle with smooth narrow edge (in 14) or with smooth bony flange (in nine) which may be angled outward, rarely with low flat lobes or flaps present. Gill rakers on outer face of first arch usually short knobs, occasionally slender or reduced, shortest rakers on upper limb; rakers on inner face of first arch of similar size but stouter; outer and inner rakers on other arches similar to those of first arch. Tongue long, tip blunt to rounded, occasionally slightly pointed.

Upper jaw teeth in male: teeth in outermost row, across front of jaw to midside of jaw, large, sharp and curved, largest teeth grouped at midside of jaw, rear third or less of jaw without teeth; inner three or four rows consisting of small, curved, sharp teeth. Upper jaw teeth in female: about three rows of small curved sharp teeth across front; one row of teeth at side of jaw. In males, lower jaw with band of five to seven rows of curved sharp teeth across front, band broader toward side of front of jaw and one or two large curved outer teeth at each side. Lower jaw teeth arrangement similar in females, but with four or five rows of curved sharp teeth across front of jaw; one or two slightly enlarged teeth outermost, toward each side of lower jaw. Tips of teeth in both sexes sometimes tinted translucent orange or brown.

Predorsal scales cycloid, moderately sized, reaching forward to at least preopercular margin or to between preopercular margin and rear of eyes. Operculum naked or with one to few cycloid scales. Cheek always naked. Pectoral base naked or with one or two cycloid scales. Prepelvic area usually with few cycloid scales, occasionally naked. Belly with cycloid scales, occasionally naked. Side of body with ctenoid scales extending up to behind pectoral base. Antermost scales on side of body larger than those on caudal peduncle.

Gut short, S-bend shape.

Female genital papilla quite large, swollen and rounded, with two lobes at tip (size probably due to large size of ripe ova). Male genital papilla small, flat and pointed.

Head pores absent.

Sensory papillae pattern longitudinal, as in Fig. 29. Papillae in row *p* few, widely spaced. Papillae in cheek rows *a*, *c* and *cp* enlarged, widely separated; other papillae very small and fine. Cheek row *b* broken into two short sections, with wide gap. Three *s* rows of papillae on snout, of one papilla each. Mandibular *f* row of one papilla on each side. Papillae in row *i* along dentary few, widely separated.

**Colouration of fresh material.** – Colour slide by Maurice Kottelat, of freshly dead specimens, showing colour very like that of preserved material: pale yellowish-white with blackish to dark brownish grey markings on body and blackish markings on fins.

**Colouration of preserved material.** – Head and body yellowish-white to pale yellowish-brown, covered with small dark brown round spots and five oblique to nearly vertical dark brown bars crossing back and sides, evenly spaced from just before first dorsal fin origin to just before upper procurrent rays of caudal fin (Fig. 30). Oblique bars usually ending on lower side of body, often intensified on midside of body forming row of square dark brown blotches, slightly offset from oblique bar. Dark brown spots on body of variable intensity, sometimes very fine and partly outlining scale margins; on side of head, spots usually large and rounded. At midbase of caudal fin, triangular to oblique elongate dark brown blotch present; if oblique, blotch extending down and back onto lower segmented caudal rays. Underside of head and belly plain pale whitish to pale brownish; small patch of dark brown spots on breast just anterior to pelvic fins in males. Ventral midline of caudal peduncle with thin black line and three (occasionally four) narrow black blotches,

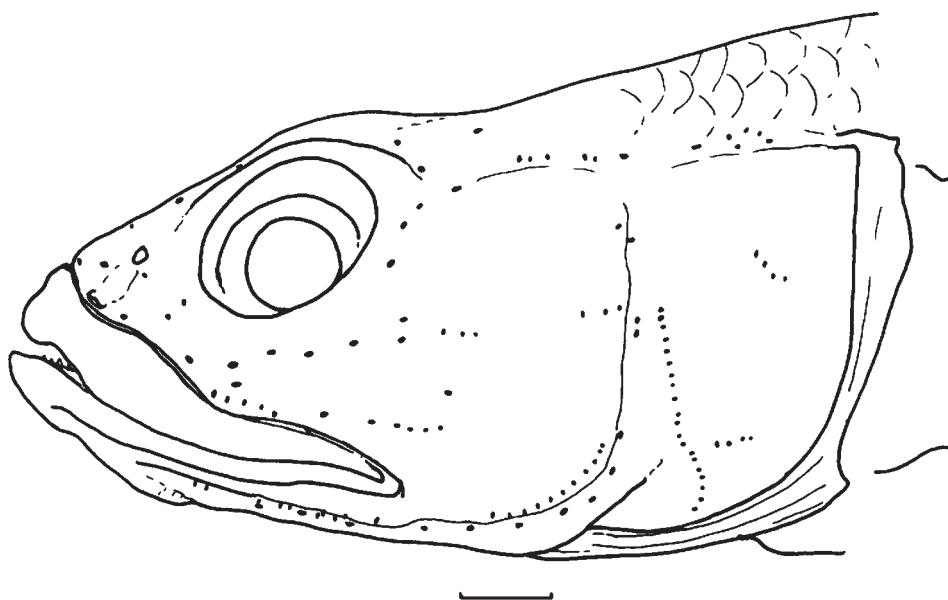


Fig. 29. *Pseudogobiopsis paludosus*, papillae pattern. 29 mm SL male, CMK 7384, Johor, Malaysia. Scale bar = 1 mm.

evenly spaced, from midbase of anal fin to just before lower procurent rays of caudal fin.

Side of head with two short oblique dark brown bars from rear of eye extending down and backward, ending on middle of cheek; and one bar extending from lower front margin of eye to middle of jaws, crossing jaws to meet its counterpart on chin; bars blotchy and often nearly indistinguishable from small dark brown spots covering head. Opercle with dark brown spots often coalescing into dark blotches. Lips nearly uniform brown or with small dark brown spots. Nape and interorbital with small brown blotches and small spots. Pectoral base pale with scattered dark brown round spots.

First dorsal fin translucent to whitish, with broad dark grey to black band across centre, intense black spot within band toward rear of fin usually present, and short narrow oblique blackish streak from base of first dorsal fin crossing bases of first three spines; first dorsal spine always pale with two small dark brown to black spots (regardless of intensity of blackish bands on rest of fin). Second dorsal fin whitish to translucent, with three to five rows of small dark brown to black round to oval spots; unsegmented spine always pale with two black spots. Anal fin plain dusky to brownish, darker toward base. Pectoral fins translucent dusky to pale brownish, rays darkest at bases. Pelvic fins plain dusky grey to brownish. Caudal fin translucent whitish to pale dusky with five to seven rows of vertically oriented, dark brown to black small spots or short lines; spots or short lines closest to fin base sometimes joining to form one or two wavering vertical dark lines.

Sensory papillae often orange-tipped. Peritoneum pale with broad brown dorsal saddle and scattered brown spots (as in colour pattern of surrounding skin).

**Comparisons.** – This species is most similar to *P. festivus*, new species from Sarawak; see **Comparisons** under that species. There may be another undescribed species related to this species-group, see **Remarks** below.

**Distribution.** – Specimens are known from Peninsular Malaysia, western Borneo and the Riau Archipelago, Sumatra.

**Ecology.** – Known from freshwater habitats, including clear, swift “blackwater” (brown to reddish tinted) streams (Roberts, 1989).

Roberts (1989) gives information on reproductive condition of the specimens obtained during the Kapuas River survey, e.g. a 19.5 mm female specimen (out of CAS 49462) had 30 eggs, of 1.5 mm diameter.

**Remarks.** – This species was described from “the type and only specimen, 30 mm. long” (Herre, 1940a). His illustration of the type, despite its simplicity, gives a good impression of the species, and it is apparently the only published illustration of the species. A specimen presently labelled as paratype (CAS 32988) is a species of *Pseudogobius* and is not a type specimen.

Twenty small specimens from Sanggau and Sintan on the Kapuas River drainage in western Kalimantan (CMK 6735, CMK 6799 and CAS 49461) were initially referred to this species. However, they have some headpores, but are lacking preopercular canals and the posterior portion of oculoscapular canal. Three very small specimens in CMK 6735 have no pores or exhibit open canals only. All these specimens are similar in that the colour pattern shows narrow brown scale margins over the pale back and sides, forming an irregular



Fig. 30. *Pseudogobiopsis paludosus*, CMK 7384, 20 and 29.5 mm SL, Johor, Malaysia. From colour slide by Maurice Kottelat.



network pattern, and the five brown saddles and lateral bars are rather indistinct. Additional material, including mature males, is required to determine the status of these specimens, which probably represent an undescribed species. These specimens are not dealt with further in this paper.

***Pseudogobiopsis tigrellus* (Nichols, 1951)**

(Fig. 31; Plate 2C; Tables 13–16, 20)

*Gobius tigrellus* Nichols, 1951: 3, Fig. 2 (Bernhard Camp, Idenburg River, West New Guinea). – Larson 2001: 71–72, Fig. 68 (as incertae sedis).

*Ctenogobius tigrellus* – Allen 1996: 19.

**Material Examined.** Holotype, AMNH 18574, 1(21.5), 75 m altitude, Bernhard Camp, Idenburg River [tributary of Mamberamo River], West New Guinea, W. B. Richardson, Apr. 1939. Paratypes, AMNH 15096, 9(16–22), same data as holotype. WAM P.31752-001, 6(21.0–25.5), Furu Creek, Mamberamo River, West Papua, 0.1–1.0 m, G.R. Allen, 4 Sep. 2000; WAM P.31754-003, 1(24.5), Dabra, Tiri Creek, Mamberamo River, West Papua, 0.1–1.0 m, G. R. Allen, 7 Sep. 2000.

**Description.** – Based on eight specimens, 21.0–25.5 mm SL; osteological information from x-rays of type specimens. An asterisk indicates the counts of the holotype.

First dorsal VI\*; second dorsal I,7\*; anal I,6–7\* (modally I,6), pectoral rays 14\*–16 (modally 15), segmented caudal rays 17\*; caudal ray pattern 9/8; branched caudal rays 14–15, in 7/7 pattern (broken in holotype); longitudinal scale count 23–25 (24 in holotype); TRB 7–8\*; predorsal scale count 2–9 (1 in holotype); circumpeduncular scales 12\*. Gill rakers on outer face of first arch 2+6 (in 1), 2+7 (in 1). Vertebrae 10+16 (in 9), 10+15 (1). Neural spine of second vertebra slightly expanded at tip (in 2), or all pointed (in 1). Two epurals (in 7); nearly fused in two. One to three (modally

2) anal pterygiophores before haemal spine of first caudal vertebra (in 9).

Body slender, compressed. Body depth at anal fin origin 17.1–18.6% (mean 17.9%) of SL. Head slightly depressed, wider than deep, but not greatly so, HL 25.8–31.6% (mean 28.7%) of SL. Depth at posterior preopercular margin 51.5–61.3% (mean 58.4%) of HL. Width at posterior preopercular margin 58.8–75.8% (mean 69.3%) of HL. Mouth subterminal, very slightly oblique, forming an angle of about 12° with body axis; jaws reach to below just past middle of eye in males and to below front half of eye in females. Lips fleshy, smooth. Upper jaw 34.3–47.2% (mean 35.0% in females, 44.2% in males) of HL. Eyes dorsolateral, forming part of dorsal profile, 25.0–29.9% (mean 27.7%) of HL. Snout short, rounded to slightly pointed, 25.4–30.8% (mean 27.7%) of HL. Interorbital narrow, 8.3–13.3% (mean 10.2%) of HL. Caudal peduncle slender, compressed, length 25.6–30.8% (mean 28.5%) of SL. Caudal peduncle depth 11.4–13.5% (mean 12.0%) of SL.

First dorsal fin triangular in males, triangular to slightly rounded in females, tips of spines free; spines slightly longer in males than females; fin barely reaches second dorsal origin when depressed. First dorsal spine always longest, spine length 12.2–16.7% (mean 14.2% in females, 15.7% in males) of SL. In females, second dorsal fin short and triangular, anterior rays longest, posteriormost rays fall well short of caudal fin base when depressed; in males second dorsal fin triangular, anterior rays tall but posteriormost rays longer (about twice height of anteriormost ray), elongate and reaching to caudal fin base in two largest male specimens. Anal fin rounded, posteriormost rays longest, especially in males, but always falling short of reaching caudal fin base. Pectoral fin slender, pointed, central rays longest, 20.0–29.4% (mean 26.2%) of SL; rays all branched. Pelvic fins oval, reaching to anus, 22.8–28.6% (mean 25.9%) of SL; frenum

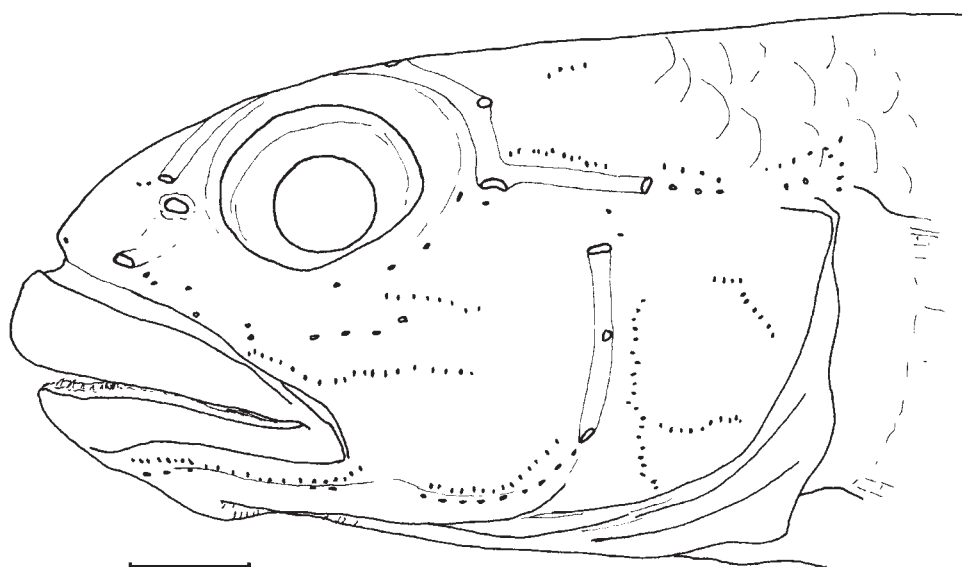


Fig. 31. *Pseudogobiopsis tigrellus*, 25.2 mm SL male, WAM P.31752-001, Mamberamo River, West Papua, showing headpore and papillae pattern. Scale bar = 1 mm.

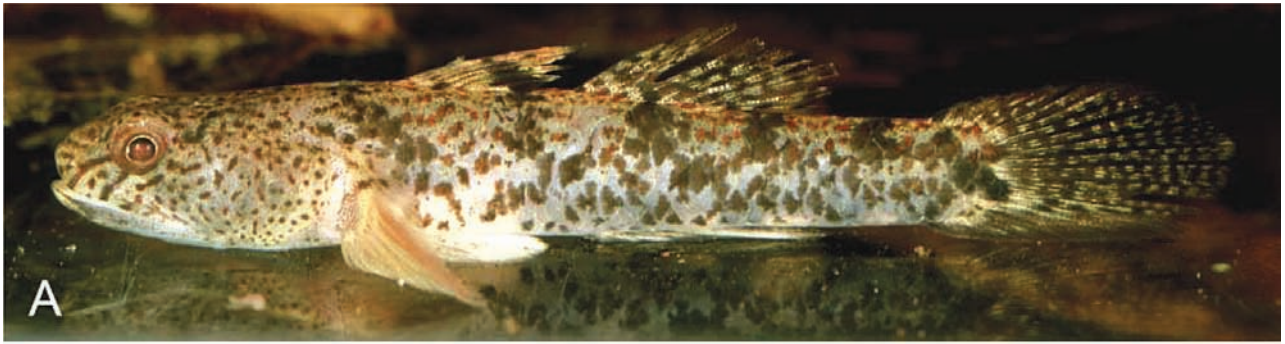


Plate 2.

A. *Pseudogobiopsis festivus*, new species, captive specimen from Bako National Park, Sarawak. Photograph by Peter Ng.

B. *Pseudogobiopsis oligactis*, captive specimen from Andaman coast, Thailand. Photograph by Gerhard Ott.

C. *Pseudogobiopsis tigrellus*, captive male specimen from Furu Creek, Mamberamo River, West Papua (one of WAM P.31752-001). Photograph by Gerry Allen.

fleshy, especially around pelvic spines. Caudal fin oval to slightly pointed, 12.2–16.7% (mean 14.7%) of SL.

No mental fraenum, chin smooth to slightly raised. Anterior nostril tubular, placed just behind upper lip, tube short, oriented upward. Posterior nostril oval, placed close to anterior margin of eye, above level of centre of eye. Gill opening extends forward to under opercle. Inner edge of shoulder girdle smooth. Gill rakers on outer face of first arch very short and stubby, longest rakers near angle of arch. Tongue tip blunt to slightly concave. Teeth in upper jaw in three or four rows, outer row teeth largest and stoutest (in males especially); all teeth small, sharp and conical; largest tooth at mid-side of jaw. Lower jaw small and sharp, in broad band of three to five rows across front of jaw; side of jaw with two rows of slightly more upright sharp teeth; outermost row of teeth across front of jaw largest, stoutest and more curved.

Predorsal scales small, cycloid; arrangement variable (one fish with scales right up to behind eyes, others have scales up to above rear margin of preopercle at least on the side, with only a few scales on midline). Operculum with one to several cycloid scales, usually partly embedded. Cheek, pectoral base and prepelvic area naked. Belly midline broadly naked. Side of body covered with ctenoid scales; scales on midbody slightly larger than others.

Head pores as for *Pseudogobiopsis oligactis*, with three preopercular pores (Fig. 31).

Sensory papillae pattern with cheek rows *a*, *c* and *cp* composed of few large, widely spaced papillae; rows *b* and *d* of small, closely spaced papillae (Fig. 31). Two *s* rows on snout, of one papilla each, just behind upper lip, other papillae close together by posterior nostril. Mandibular papillae widely spaced, with mental *f* row consisting of one papilla on each side of symphysis.

**Colouration of fresh material.** – Based on scans of colour slides of captive male and female by Gerry Allen (Plate 2C). Head and body translucent pearly grey, with 12–14 black to blackish narrow vertical bars along side of body and posterior half of head, dorsum with short blackish lines and blotches partly following scale margins, predorsal region with irregular black blotches and lines; side of body dusted with orange and pink-gold speckles, most noticeable in between vertical black bars. Side of head with two oblique black lines crossing cheek from ventral edge of eye; opercle with vertical black bar posteriorly (continuation of anteriormost vertical bar on nape) and two black blotches anteriorly (ventralmost is a blotch in male and oblique line in female, a continuation of dorsalmost oblique line from eye). Interorbital and snout with irregular blackish lines and spots and intensification of the orange and pink-gold speckles. Iris silvery, becoming pale golden dorsally, and speckled with brown. Tips of lips dull yellowish with dusky blotches extending from snout tip.

Dorsal fins translucent yellowish-white with black markings. In male, first dorsal fin with 5–6 irregular lines, becoming

vermiculate and broken posteriorly, fin margin narrowly dense black, post-margin region plain yellowish white. In female, first dorsal fin similar but with four blackish irregular lines and broad blackish margin and dense black double spot at rear of fin. Second dorsal fin pattern in males similar to that of first dorsal fin but fin margin more diffusely blackish and irregular lines more oblique and broken, especially on posterior half of fin; in females, second dorsal fin similar to first dorsal fin in that fewer dark lines present. Caudal fin transparent, rays yellowish, rear margin of fin slightly dusky, 8–10 vertical blackish lines crossing fin, basalmost line broadest and most intense, forming narrow blotch (within line) at mid-base of fin; ventralmost quarter of fin unmarked. Anal fin plain whitish yellow. Pectoral fin transparent. Pelvic fins transparent, dusted lightly with melanophores.

**Colouration of preserved material.** – Preserved colour is basically the same as live colour, with background colour yellowish white and brown to dark brown body markings, scale margins on upper half of body thinly outlined with fine dark speckling, dorsal fin markings black to dark brown, caudal fin barring dark brown.

**Comparisons.** – The species resembles *Pseudogobiopsis oligactis* in possessing the posterior portion of the oculoscapular canal above the preopercle; the two species are more similar to each other than other species of the genus. Its strongly barred colour pattern is distinctive, and is unlike that of any other related species.

**Distribution.** – Known only from the Mamberamo River system of West Papua.

**Ecology.** – The species has been found only in “... small, clear, relatively fast-flowing rainforest (mostly closed-canopy forest) creeks. The fish were invariably found away from the main flow, around the edge of small pools to about 10 cm depth. They were seen solitary or in loose groups of 2–4 individuals, generally resting on sand or rock substrate” (Jerry Allen, in litt.)

**Remarks.** – The holotype and nine paratypes have been dehydrated at some stage and are not in the best condition, so that at first it was difficult to be sure as to what genus they actually belonged (Larson, 2001). The capture of fresh specimens by Jerry Allen provided the key to the identity of this species.

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### LITERATURE CITED

- Alfred, E. R., 1966. The fresh-water fishes of Singapore. *Zoologische Verhandelingen*, **78**: 1–68.
- Allen, G. R., 1996. In: Kitchener, D. J. & Suyanto, A. (eds.) *Proceedings of the first international conference on eastern Indonesian-Australian vertebrate fauna, Manado, Indonesia, November 22–26, 1994*. Pp. 15–21.
- Aurich, H. J., 1938. Mitteilung XXVIII der Wallacea-Expedition Woltereck. Die Gobiiden. (Ordnung: Gobioida). *Internationale Revue der gesamten Hydrobiologie und Hydrographie*, **38**(1/2): 125–183.
- Birdsong, R. S., E. O. Murdy & F. L. Pezold, 1988. A study of the vertebral column and median fin osteology in gobioid fishes with comments on gobioid relationships. *Bulletin of Marine Science*, **42**(2): 174–214.
- Bleeker, P., 1875. Gobioides species insulindicae novae. *Archives Néerlandaises des Sciences exactes et naturelles*, **10**: 113–134.
- Bleeker, P., 1983. *Atlas Ichthyologique des Indes Orientales Néerlandaises, par M.-P. Bleeker. (Plates originally planned for planned tomes XI–XIV published here for the first time)*. Smithsonian Institution Press: Washington.
- Böhlke, E. B., 1984. Catalog of type specimens in the ichthyological collection of the Academy of Natural Sciences, Philadelphia. *The Academy of Natural Sciences of Philadelphia Special Publication*, **14**: 1–246.
- Chatterjee, T. K., 1980. Record of *Stigmatogobius hoevenii* (Bleeker) from the Gangetic Delta, west Bengal, with a key to the Indian species of *Stigmatogobius*. *Bulletin of the Zoological Survey of India*, **2**(2&3): 229–231.
- Eschmeyer, W. N. & R. M. Bailey, 1990. Genera of recent fishes. In: Eschmeyer, W.N. *Catalog of the genera of recent fishes*. Pp. 7–433. California Academy of Natural Sciences: San Francisco.
- Fowler, H. W., 1934. Zoological results of the third de Schauensee Siamese Expedition, Part I – Fishes. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **86**: 67–163.
- Fowler, H. W., 1937. Zoological results of the third de Schauensee Siamese Expedition. Part VIII, – Fishes obtained in 1936. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **89**: 125–264.
- Fowler, H. W., 1938. A list of the fishes known from Malaya. *Fisheries Bulletin*, **1**: 1–268.
- Herre, A. W. C. T., 1936. Eleven new fishes from the Malay Peninsula. *Bulletin of the Raffles Museum, Singapore*, **12**: 5–16.
- Herre, A. W. C. T., 1940. New species of fishes from the Malay Peninsula and Borneo. *Bulletin of the Raffles Museum, Singapore*, **16**: 5–26.
- Herre, A. W. C. T., 1945. Two new genera and four new gobies from the Philippines and India. *Copeia*, **1945** (1): 1–6.
- Herre, A. W. C. T., 1950. Two new gobies from the Philippines with notes on a third rare goby. *Proceedings of the Biological Society of Washington*, **63**: 73–76.
- Herre, A. W., 1953. Check list of Philippine fishes. *United States Fish and Wildlife Service Research report*, **20**: 1–977.
- Herre, A. W. C. T. & G. S. Myers, 1937. A contribution to the ichthyology of the Malay Peninsula. *Bulletin of the Raffles Museum, Singapore*, **13**: 5–75.
- Hora, S. L., 1923. Fauna of the Chilka Lake. Fish (Part V). *Memoirs of the Indian Museum*, **5**: 737–769.
- Hubbs, C. L. & K. F. Lagler, 1970. *Fishes of the Great Lakes Region*. University of Michigan Press: Ann Arbor.
- Jordan, D. S. & A. Seale, 1908. List of fishes collected in the river at Buytenzorg, Java, by Dr. Douglas Houghton Campbell. *Proceedings of the U.S. National Museum*, **33**(1575): 535–543.
- Kottelat, M., 1989. Zoogeography of the fishes from Indochinese inland waters with an annotated check-list. *Bulletin Zoölogisch Museum*, **12**(1): 1–56.
- Kottelat, M. & K. K. P. Lim, 1995. Freshwater fishes of Sarawak and Brunei Darussalam: a preliminary annotated checklist. *The Sarawak Museum Journal*, **48**(69): 227–256.
- Kottelat, M., A. J. Whitten, with S. N. Kartikasari & S. Wirjoatmodjo, 1993. *Freshwater fishes of Western Indonesia and Sulawesi*. Periplus Editions Ltd: Indonesia.
- Koumans, F. P., 1931. A preliminary revision of the genera of the gobioid fishes with united ventral fins. *Proefschrift Drukkerij Imperator N.V. Lisse*. Pp. 1–174.
- Koumans, F. P., 1932. Notes on gobioid fishes (1–5). *Zoologische Mededeelingen*, **15**: 1–16.
- Koumans, F. P., 1935. Notes on gobioid fishes. 6. On the synonymy of some species from the Indo-Australian Archipelago. *Zoologische Mededeelingen*, **18**: 121–150.
- Koumans, F. P., 1940. Results of a reexamination of types and specimens of gobioid fishes, with notes on the fishfauna of the surroundings of Batavia. *Zoologische Mededeelingen*, **22**: 121–210.
- Koumans, F. P., 1953. X. Gobioida. In: Weber, M. & Beaufort, L.F. de. (eds.). *The Fishes of the Indo-Australian Archipelago*. E. J. Brill: Leiden. 423 pp.
- Larson, H. K., 1995. A review of the Australian endemic gobioid fish genus *Chlamydogobius*, with description of five new species. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory*, **12**: 19–51.
- Larson, H. K., 1999. Allocation to *Calamiana* and redescription of the fish species *Apocryptes variegatus* and *Vaimosa mindora* (Gobioidae: Gobiidae: Gobionellinae), with description of a new species. *Raffles Bulletin of Zoology*, **47**(1): 257–281.

- Larson, H. K., 1999a. Report to Parks Australia North, on estuarine fish monitoring of Kakadu National Park, Northern Territory, Australia. Unpublished report. 35 pp.
- Larson, H. K., 1999b. Report to Parks Australia North, on the estuarine fish inventory of Kakadu National Park, Northern Territory, Australia. Museum and Art Gallery of the Northern Territory Research Report **5**: 1–50.
- Larson, H. K., 2000. Report to Parks Australia North, on estuarine fish monitoring of Kakadu National Park, Northern Territory, Australia. Unpublished report. 26 pp.
- Larson, H. K., 2001. A revision of the gobiid genus *Mugilogobius* (Pisces: Teleostei), and its systematic placement. *Records of the Western Australian Museum*, Supplement No. **62**: 1–233.
- Larson, H. K., 2002. Report to Parks Australia North, on estuarine fish monitoring of Kakadu National Park, Northern Territory, Australia. Unpublished report. 42 pp.
- Larson, H. K. & K. P. Lim, 2005. *A guide to gobies of Singapore*. National Science Centre, Singapore.
- Larson, H. K., Jaafar, Z. & K. P. Lim, 2008. An annotated checklist of gobioid fishes of Singapore. *Raffles Bulletin of Zoology*, **56**(1): 135–155.
- Lim, K. K. P. & H. K. Larson, 1994. A preliminary checklist of the gobiid fishes of Singapore. In: Sudara, S., Wilkinson, C.R., and Chou, L.M. (eds.) *Proceedings, Third ASEAN-Australian Symposium on Living Coastal Resources, Vol. 2: Research Papers*. Chulalongkorn University: Bangkok.
- Miller, P. J., 1987. Affinities, origin and adaptive features of the Australian desert goby *Chlamydogobius eremius* (Zietz, 1896) (Teleostei: Gobiidae). *Journal of Natural History*, **21**: 687–705.
- Miller, P. J., 1989. The classification of bumble-bee gobies (*Brachygobius* and associated genera) (Teleostei: Gobiidae). *Cybium*, **13**(4): 375–383.
- Mohsin, A. K. M. & M. A. Ambak, 1983. *Freshwater fishes of peninsula Malaysia*. Penerbit Universiti Pertanian Malaysia: Kuala Lumpur.
- Ng, H.-H. & H.-H. Tan, 1999. The fishes of the Endau Drainage, Peninsular Malaysia with descriptions of two new species of catfishes (Teleostei: Akysidae, Bagridae). *Zoological Studies*, **38**(3): 350–366.
- Nichols, J. T., 1951. Four new gobies from New Guinea. *American Museum Novitates* **1539**: 1–8.
- Peters, W. C. H., 1869. Über die von Hrn. Dr. F. Jagor in dem ostindischen Archipel. gesammelten und dem Königl. zoologischen Museum übergebenen Fische. *Monatsberichte der Königlich Preussischen Akademie Wissenschaften Berlin*, **1868**: 254–281.
- Pezold, F., 1993. Evidence for a monophyletic Gobiinae. *Copeia*, **3**: 634–643.
- Randall, J. E. & K. K. P. Lim, 2000. A checklist of the fishes of the South China Sea. *Raffles Bulletin of Zoology*, Supplement No. **8**: 569–667.
- Roberts, T. R., 1989. The freshwater fishes of Western Borneo (Kalimantan Barat, Indonesia). *Memoirs of the California Academy of Sciences*, **14**: 1–210.
- Roberts, T. R., 1993. The freshwater fishes of Java, as observed by Kuhl and van Hasselt in 1820–23. *Zoologische Verhandelingen*, **285**: 1–94.
- Sanzo, L., 1911. Distribuzione delle papille cutanee (organiciatiformi) e suo valore sistematico nei Gobi. *Mitteilungen aus der Zoologischen Station zu Neapel*, **20**: 249–328.
- Schneider, M. von., 2003. Ein grosmaul aus Sarawak *Eugnathogobius oligactis*. *Aquaristik-Fachmagazin & Aquarium heute* **35**(4): 66–68.
- Smith, H.M., 1931. Descriptions of new genera and species of Siamese fishes. *Proceedings of the U.S. National Museum*, **79**(2873): 1–48.
- Smith, H.M., 1945. The fresh-water fishes of Siam, or Thailand. *Bulletin of the United States National Museum*, **188**: 1–622.
- Suvatti, C., 1981. *Fishes of Thailand*. Royal Institute of Thailand: Bangkok [in Thai].
- Swofford, D., 2002. *PAUP: Phylogenetic analysis using parsimony. Version 4.0b10*. Champaign: Illinois.
- Tan, S. H. & H. H. Tan, 1994. The freshwater fishes of Pulau Bintan, Riau Archipelago, Sumatera, Indonesia. *Tropical Biodiversity*, **2**(3): 351–367.
- Tweedie, M. W. F., 1940. Additions to the collection of fishes in the Raffles Museum. *Bulletin of the Raffles Museum, Singapore*, **16**: 68–82.
- Watson, R. E. & H. Horsthemke, 1995. Revision of *Euctenogobius*, a monotypic subgenus of *Awaous*, with discussion of its natural history. *Revue Française Aquariologie*, **22**(3–4): 83–92.
- Werner, U. 1981. Meergrundeln, skurrile Pfleglinge im Süßwasser-Aquarium. *Das Aquarium*, **15**(140): 74–79.
- Wheeler, A., 1979. *Fishes of the world*. An illustrated dictionary. Ferndale Editions, London.
- Wu, H.-L. & Y. Ni, 1985. On two new species of *Mugilogobius* Smitt (Perciformes: Gobiidae) from China. *Zoological Research*, **6**(4): 93–98 [in Chinese].
- Zhong, J.-S. & I.-S. Chen, 1997. A new species of the genus, *Pseudogobiopsis* (Pisces, Gobiidae) from China. *Journal of the Taiwan Museum* **50**(2): 77–84.

Table 1. Character matrix of the 20 taxa used for phylogenetic analyses; characters described in full in Larson (2001: 15–31), with the exception of character 41 (see text). Names used are those originally assigned to each species. Missing data is indicated by a question mark. The odontobutids *Micropercops* and *Sineleotris* are outgroups.

Species	Characters																																															
	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4								
<i>Micropercops borealis</i>	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0						
<i>Sineleotris chalmersi</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<i>Calamiana illota</i>	1	0	1	1	0	0	1	1	0	1	0	1	0	0	2	1	0	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	1	1	0	1	1	1	1	1	0				
<i>Calamiana kabila</i>	2	0	1	1	1	0	1	0	1	0	1	1	0	1	0	1	0	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	1	0	1	1	0	0	0				
<i>Calamiana mindora</i>	2	0	1	1	0	0	1	1	0	1	1	0	1	1	0	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0				
<i>Calamiana polylepis</i>	2	0	1	1	0	0	1	1	0	1	1	0	1	0	2	1	0	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	1	1	0	0	0				
<i>Calamiana stictos</i> , new species	2	0	1	1	0	0	1	1	0	1	1	0	1	1	0	1	?	1	0	0	0	1	1	1	1	0	0	1	1	1	0	0	1	1	1	0	1	1	0	?	0	0	0					
<i>Calamiana variegata</i>	1	0	1	1	0	0	1	1	0	1	0	1	0	1	0	2	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	0	0	1	1	1	0	1	0	1	0				
<i>Eugnathogobius microps</i>	2	0	0	1	0	0	1	0	1	0	1	1	0	1	1	0	1	0	0	1	1	1	0	0	1	1	0	0	1	1	0	1	1	0	1	1	1	0	1	1	1	0	0	0				
<i>Pseudogobiopsis festivus</i> , new species	1	0	0	1	0	0	1	0	1	0	1	1	0	1	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	1	1	0	1	1	0	1	1	1	0	1	1	1				
<i>Pseudogobiopsis oligactis</i>	0	0	0	1	0	0	1	1	0	1	1	0	1	1	0	1	2	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	1	0	1	1	0	1	0	1	0			
<i>Pseudogobiopsis paludosus</i>	2	0	0	1	2	0	0	1	0	1	0	1	1	0	1	1	0	0	1	1	0	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	0	1	1			
<i>Pseudogobiopsis siamensis</i>	1	0	0	1	0	0	1	0	1	0	1	1	0	1	1	0	1	0	1	0	0	1	1	0	1	0	1	0	1	1	0	1	1	0	1	1	1	1	1	1	0	1	0	1	0			
<i>Pseudogobiopsis tigrellus</i>	0	0	0	1	0	0	1	?	0	0	1	?	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?			
<i>Pseudogobius javanicus</i>	1	0	1	1	0	2	1	0	1	1	0	1	1	0	1	0	2	0	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	0	1	0			
<i>Pseudogobius melanostictus</i>	1	0	1	1	0	2	1	0	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	?	?	1	0	1	0		
<i>Pseudogobius olorum</i>	1	0	1	1	1	2	1	0	1	1	1	0	1	0	1	2	0	0	1	0	1	0	1	1	0	1	1	0	1	1	0	1	1	1	0	1	1	1	?	?	0	1	0	0	1	0		
<i>Redigobius balteatus</i>	0	0	0	1	1	0	1	0	0	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Redigobius dispar</i>	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Redigobius macrostoma</i>	0	0	0	1	1	0	0	1	0	0	1	0	1	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. Nominal species of *Calamiana*, *Eugnathogobius* and *Pseudogobiopsis* and their status.

Nominal species	Taxonomic allocation
<i>Gnathogobius aliciae</i> Smith, 1945	<i>Eugnathogobius kabilia</i> (Herre, 1940)
<i>Gnathogobius aliciae</i> Smith, 1945	<i>Eugnathogobius kabilia</i> (Herre, 1940)
<i>Glossogobius campbellianus</i> Jordan & Seale, 1908	<i>Pseudogobiopsis oligactis</i> (Bleeker, 1875)
<i>Calamiana illota</i> Larson, 1999	<i>Eugnathogobius illotus</i> (Larson, 1999)
<i>Vaimosa jurongensis</i> Herre, 1940a	<i>Eugnathogobius siamensis</i> (Fowler, 1934)
<i>Vaimosa kabilia</i> Herre, 1940a	<i>Eugnathogobius kabilia</i> (Herre, 1940)
<i>Calamiana magnoris</i> Herre, 1945d	<i>Eugnathogobius kabilia</i> (Herre, 1940)
<i>Glossogobius mas</i> Hora, 1923	<i>Eugnathogobius</i> or <i>Pseudogobiopsis</i>
<i>Vaimosa mawaia</i> Herre, 1936	<i>Eugnathogobius siamensis</i> (Fowler, 1934)
<i>Vaimosa mindora</i> Herre, 1945	<i>Eugnathogobius mindora</i> (Herre, 1945)
<i>Eugnathogobius microps</i> Smith, 1931	<i>Eugnathogobius microps</i> Smith, 1931
<i>Stigmatogobius neglectus</i> Koumans, 1932	<i>Pseudogobiopsis oligactis</i> (Bleeker, 1876)
<i>Gobiopsis oligactis</i> Bleeker, 1875	<i>Pseudogobiopsis oligactis</i> (Bleeker, 1875)
<i>Vaimosa oratai</i> Herre, 1940a	<i>Eugnathogobius siamensis</i> (Fowler, 1934)
<i>Ctenogobius paludosus</i> Herre 1940a	<i>Pseudogobiopsis paludosus</i> (Herre, 1940c)
<i>Vaimosa perakensis</i> Herre, 1940a	<i>Pseudogobiopsis oligactis</i> (Bleeker, 1875)
<i>Mugilogobius polylepis</i> Wu & Ni, 1985	<i>Eugnathogobius polylepis</i> (Wu & Ni, 1985)
<i>Vaimosa rivalis</i> Herre, 1927	<i>Redigobius</i> or <i>Pseudogobiopsis</i> ?
<i>Vaimosa siamensis</i> Fowler, 1934	<i>Eugnathogobius siamensis</i> (Fowler, 1934)
<i>Tamanka tagala</i> Herre, 1927	<i>Pseudogobiopsis</i> ? <i>Mugilogobius</i> ?
<i>Gobius tigrellus</i> Nichols, 1951	<i>Pseudogobiopsis tigrellus</i> (Nichols, 1951)
<i>Tamanka umbra</i> Herre, 1927	<i>Mugilogobius</i> or <i>Pseudogobiopsis</i> ?
<i>Apocryptes variegatus</i> Peters, 1868	<i>Eugnathogobius variegatus</i> (Peters, 1868)
<i>Pseudogobiopsis wuhanlini</i> Zhong & Chen, 1997	<i>Eugnathogobius siamensis</i> (Fowler, 1934)

Table 3. Frequency distribution of dorsal and anal fin soft ray counts in *Eugnathogobius* species.

Species	Second dorsal fin rays					Anal fin rays				
	5	6	7	8	9	5	6	7	8	9
<i>E. indicus</i> , new species	–	–	8	3	–	–	1	10	1	–
<i>E. illotus</i>	–	1	22	1	–	–	–	22	2	–
<i>E. kabilia</i>	–	2	17	3	–	1	4	17	1	–
<i>E. microps</i>	1	12	–	–	–	–	13	–	–	–
<i>E. mindora</i>	–	1	39	3	–	–	1	42	–	–
<i>E. polylepis</i>	–	1	6	37	–	–	–	3	40	1
<i>E. siamensis</i>	–	36	–	–	–	–	36	–	–	–
<i>E. stictos</i> , new species	–	–	–	13	1	–	–	5	8	–
<i>E. variegatus</i>	–	–	1	34	1	–	–	2	34	–

Table 4. Frequency distribution of pectoral fin ray counts (right fin) in *Eugnathogobius* species.

Species	14	15	16	17	18	19	20
<i>E. indicus</i> , new species	–	3	8	–	–	–	–
<i>E. illotus</i>	1	3	15	5	–	–	–
<i>E. kabilia</i>	–	2	5	12	3	–	–
<i>E. microps</i>	–	–	–	–	7	5	1
<i>E. mindora</i>	10	20	10	3	–	–	–
<i>E. polylepis</i>	–	–	8	32	3	–	–
<i>E. siamensis</i>	–	–	–	2	13	18	2
<i>E. stictos</i> , new species	–	7	5	1	1	–	–
<i>E. variegatus</i>	–	–	10	23	2	–	–

Table 5. Frequency distribution of transverse backward scale counts in *Eugnathogobius* species.

Species	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<i>E. indicus</i> , new species	–	–	–	5	3	1	2	–	–	–	–	–	–	–	–	–
<i>E. illotus</i>	–	–	–	–	1	11	8	3	1	–	–	–	–	–	–	–
<i>E. kabilia</i>	–	3	4	6	5	4	–	–	–	–	–	–	–	–	–	–
<i>E. microps</i>	–	4	9	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>E. mindora</i>	–	–	11	17	6	5	3	1	–	–	–	–	–	–	–	–
<i>E. polylepis</i>	–	–	–	–	–	1	–	3	3	11	7	7	2	3	2	2
<i>E. siamensis</i>	6	28	2	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>E. stictos</i> , new species	–	–	–	–	–	–	–	–	1	2	2	5	–	3	–	1
<i>E. variegatus</i>	–	–	–	1	4	16	8	7	–	–	–	–	–	–	–	–



Table 6. Frequency distribution of lateral scale counts in *Eugnathogobius* species.

Species	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	39	40	41	42
<i>E. indicus</i> , new species	-	-	-	-	-	-	-	-	-	-	4	2	-	1	3	-	1	-	1	-
<i>E. illotus</i>	-	-	-	-	-	-	-	-	-	1	-	1	8	8	1	3	2	2	-	-
<i>E. kabilia</i>	-	-	-	1	1	1	1	3	4	4	6	1	1	-	-	-	-	-	-	-
<i>E. microps</i>	-	4	6	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. mindora</i>	-	-	-	-	-	3	10	9	5	4	4	-	1	3	1	2	-	1	-	-
<i>E. polylepis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2
<i>E. siamensis</i>	5	26	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. stictos</i> , new species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. variegatus</i>	-	-	-	-	-	-	-	8	10	6	8	1	3	-	-	-	-	-	-	-
Species	44	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63		
<i>E. indicus</i> , new species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. illotus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. kabilia</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. microps</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. mindora</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. polylepis</i>	1	2	5	4	1	1	3	2	1	6	1	6	-	-	3	-	-	-	2	-
<i>E. siamensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>E. stictos</i> , new species	-	-	1	-	3	-	1	1	1	-	1	2	1	2	-	1	-	-	-	-
<i>E. variegatus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7. Measurements (mm) of *Eugnathogobius indicus*, new species.

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	8.4	4.2	10.0	6.5	6.2	8.4	7.1
Head depth	4.6	2.6	5.8	3.7	3.4	4.6	4.0
Head width	6.1	3.4	8.0	4.9	4.4	6.1	5.2
Body depth	4.6	2.7	5.1	3.6	3.6	4.6	4.0
Body width	2.5	1.6	3.2	2.2	2.1	2.9	2.5
Caud. ped. length	5.9	3.8	9.0	5.9	5.9	7.7	6.6
Caud. ped. depth	3.3	1.9	3.8	2.6	2.6	3.3	3.0
Snout	2.0	1.1	3.0	1.7	1.5	2.1	1.8
Eye	2.1	1.2	2.2	1.6	1.5	2.1	1.8
Jaw	3.1	1.5	4.7	2.5	2.1	3.1	2.5
Interorbit	1.7	1.0	2.5	1.5	0.9	1.7	1.3
Pectoral	6.0	3.1	6.7	4.8	5.2	6.0	5.6
Pelvic	6.0	3.0	7.1	4.5	4.6	6.0	5.1
Caudal	7.3	4.0	10.0	6.1	6.4	7.3	6.8
Longest D1 spine	3.6	1.9	6.5	3.8	3.0	3.6	3.2

Caud. ped., Caudal peduncle

Table 8. Measurements (mm) of *Eugnathogobius kabilia* (Herre, 1940).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	10.5	6.4	15.2	9.6	4.4	10.5	8.0
Head depth	6.2	3.8	8.8	5.4	2.2	6.2	4.8
Head width	8.5	4.8	11.3	7.1	2.9	8.5	5.9
Body depth	7.0	3.6	9.5	5.7	4.7	7.0	5.9
Body width	4.3	2.1	6.7	3.7	3.6	4.5	4.2
Caud. ped. length	9.6	5.5	11.7	8.0	4.5	9.6	7.7
Caud. ped. depth	4.7	2.3	6.4	4.0	3.2	4.7	3.9
Snout	3.1	1.9	4.6	3.0	1.1	3.1	2.0
Eye	2.5	1.5	3.6	2.1	1.4	2.5	2.1
Jaw	4.3	3.4	12.5	7.3	1.4	4.3	3.2
Interorbit	2.5	1.6	6.0	2.7	1.0	2.5	1.9
Pectoral	7.1	5.0	11.0	7.0	5.2	8.0	6.8
Pelvic	6.3	4.3	8.0	5.7	3.0	6.3	5.2
Caudal	9.0	6.1	13.1	9.0	4.1	10.0	7.8
Longest D1 spine	5.1	3.1	5.4	4.8	3.2	5.1	4.2

Caud. ped., Caudal peduncle.

Table 9. Measurements (in mm) of *Eugnathogobius microps* (Smith, 1931).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	9.2	5.8	9.2	7.5	6.2	8.7	7.6
Head depth	4.9	3.4	5.4	4.4	3.7	5.1	4.5
Head width	6.0	4.3	7.5	5.7	4.6	7.0	5.8
Body depth	5.2	3.6	5.9	4.6	3.9	5.7	5.0
Body width	3.1	2.3	4.1	3.1	2.8	3.5	3.3
Caud. ped. length	6.1	4.8	6.8	5.7	4.9	6.4	5.8
Caud. ped. depth	3.8	2.2	3.8	3.0	2.5	3.7	3.2
Snout	2.4	1.5	2.4	1.9	1.5	2.1	1.9
Eye	1.1	1.0	1.8	1.3	0.9	1.6	1.3
Jaw	6.4	3.1	6.4	4.8	2.8	4.7	3.7
Interorbit	2.2	1.6	2.5	2.1	1.7	2.4	2.1
Pectoral	6.6	4.2	6.6	5.4	4.8	5.6	5.1
Pelvic	6.5	4.5	6.6	5.6	4.9	6.2	5.6
Caudal	6.5	5.0	6.6	5.7	4.7	5.8	5.4
Longest D1 spine	–	2.5	3.5	3.0	2.5	2.7	2.6

Caud. ped., Caudal peduncle.

Table 10. Measurements (mm) of *Eugnathogobius polylepis* (Wu & Ni, 1985).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	8.0	4.6	8.0	5.9	4.7	6.4	5.5
Head depth	4.2	2.5	4.2	3.2	2.4	3.5	3.0
Head width	5.4	3.2	5.6	4.3	3.1	4.6	3.9
Body depth	4.4	2.3	4.4	3.2	2.5	4.2	3.1
Body width	–	1.1	3.0	2.1	1.5	2.8	2.2
Caud. ped. length	8.0	4.3	8.0	5.6	4.5	6.5	5.5
Caud. ped. depth	3.4	1.9	3.4	2.6	2.0	3.1	2.6
Snout	2.0	1.1	2.0	1.6	1.1	1.7	1.4
Eye	1.9	1.2	1.9	1.5	1.2	1.8	1.4
Jaw	3.4	1.7	3.4	2.3	1.6	2.3	2.0
Interorbit	1.4	0.9	2.1	1.4	0.8	1.8	1.3
Pectoral	6.0	3.4	6.0	4.3	3.4	4.8	4.1
Pelvic	4.2	2.5	4.2	3.2	2.6	3.5	3.0
Caudal	–	3.7	5.8	4.8	3.8	5.1	4.6
Longest D1 spine	–	1.5	2.6	2.1	1.3	2.2	1.8

Caud. ped., Caudal peduncle.

Table 11. Measurements (mm) of *Eugnathogobius siamensis* (Fowler, 1934).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	10.4	5.7	11.6	9.6	5.5	9.4	7.4
Head depth	6.3	3.4	7.9	6.0	3.1	5.5	4.4
Head width	7.3	4.2	9.8	6.9	3.7	6.2	5.2
Body depth	6.0	3.9	7.9	6.3	3.3	5.5	4.6
Body width	–	2.3	5.2	4.2	1.8	3.8	2.8
Caud. ped. length	9.6	5.1	10.5	8.5	5.2	8.3	6.6
Caud. ped. depth	4.2	2.3	4.7	3.9	2.0	3.4	2.8
Snout	2.7	1.6	3.9	2.7	1.3	2.8	1.9
Eye	2.7	1.8	3.0	2.5	1.8	2.6	2.2
Jaw	6.7	2.2	7.4	5.3	2.0	5.2	2.9
Interorbit	1.4	0.9	2.6	1.7	0.6	1.9	1.0
Pectoral	6.4	4.2	9.2	7.4	4.7	6.8	6.0
Pelvic	6.8	4.0	9.4	7.4	4.6	6.8	6.0
Caudal	–	6.0	10.7	8.9	5.2	7.5	6.5
Longest D1 spine	4.4	4.6	5.6	5.1	3.3	4.4	3.7

Caud. ped., Caudal peduncle.

Table 12. Measurements (mm) of *Eugnathogobius stictos*, new species

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	6.0	4.5	6.0	5.1	4.9	6.0	5.3
Head depth	3.8	2.4	3.8	3.2	2.6	3.5	3.1
Head width	4.6	2.9	4.6	3.8	3.2	4.3	3.8
Body depth	3.6	2.6	3.7	3.1	3.2	3.7	3.4
Body width	2.2	1.6	2.3	1.9	1.6	2.3	1.9
Caud. ped. length	5.5	4.0	5.5	4.7	3.8	5.3	4.7
Caud. ped. depth	2.8	2.0	2.8	2.3	2.2	2.7	2.4
Snout	1.5	1.1	1.6	1.4	1.2	1.5	1.4
Eye	1.5	1.1	1.6	1.3	1.2	1.6	1.4
Jaw	2.8	1.7	2.8	2.2	1.7	2.1	1.9
Interorbit	1.0	0.6	1.2	0.9	1.0	1.3	1.2
Pectoral	4.4	3.1	4.4	3.7	3.9	4.4	4.1
Pelvic	3.5	2.4	3.5	2.9	2.7	3.0	2.9
Caudal	6.4	4.1	6.4	5.1	5.0	5.4	5.2
Longest D1 spine	2.5	1.3	2.5	1.9	1.4	1.4	1.4

Caud. ped., Caudal peduncle.

Table 13. Frequency distribution of dorsal and anal fin soft ray counts in *Pseudogobiopsis* species.

Species	Second dorsal fin rays					Anal fin rays			
	6	7	8	9	10	5	6	7	8
<i>P. festivus</i> , new species	–	32	–	–	–	–	–	31	1
<i>P. oligactis</i>	51	5	–	–	–	2	51	2	–
<i>P. paludosus</i>	–	6	11	5	1	–	10	13	–
<i>P. tigrellus</i>	–	–	8	–	–	–	7	1	–

Table 14. Frequency distribution of pectoral fin ray counts in *Pseudogobiopsis* species.

Species	14	15	16	17	18	19	20
<i>P. festivus</i> , new species	–	–	–	–	5	24	3
<i>P. oligactis</i>	–	–	–	4	23	25	4
<i>P. paludosus</i>	1	3	13	6	–	–	–
<i>P. tigrellus</i>	1	5	2	–	–	–	–

Table 15. Frequency distribution of transverse backward scale counts in *Pseudogobiopsis* species.

Species	6	7	8	9
<i>P. festivus</i> , new species	–	–	32	1
<i>P. oligactis</i>	1	11	44	–
<i>P. paludosus</i>	–	3	19	1
<i>P. siamensis</i>	–	6	28	2
<i>P. tigrellus</i>	–	1	7	–

Table 16. Frequency distribution of lateral scale counts in *Pseudogobiopsis* species.

Species	22	23	24	25	26	27
<i>P. festivus</i> , new species	-	-	5	26	1	-
<i>P. oligactis</i>	7	41	6	2	-	-
<i>P. paludosus</i>	-	1	9	9	3	1
<i>P. tigrellus</i>	-	4	3	1	-	-

Table 17. Measurements (mm) of *Pseudogobiopsis festivus*, new species.

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	10.2	4.4	10.2	6.7	6.1	8.1	7.3
Head depth	6.2	2.3	6.2	3.7	3.1	4.6	4.1
Head width	7.7	2.5	7.7	4.4	3.7	5.6	5.0
Body depth	6.0	2.4	6.0	3.8	3.6	5.1	4.6
Body width	4.3	1.6	4.4	2.8	2.7	4.3	3.6
Caud. ped. length	10.2	4.9	10.2	6.9	6.3	9.0	8.0
Caud. ped. depth	4.5	1.7	4.5	2.9	2.6	3.7	3.3
Snout	2.7	0.9	2.7	1.6	1.2	2.0	1.7
Eye	2.2	1.3	2.7	1.8	1.7	2.4	2.1
Jaw	6.7	1.4	6.7	3.3	2.1	3.2	2.6
Interorbit	3.0	0.5	3.0	1.2	0.9	1.5	1.2
Pectoral	10.0	3.7	10.0	6.1	5.3	7.7	6.6
Pelvic	8.2	3.4	8.2	5.3	4.9	6.8	5.9
Caudal	9.7	4.6	9.7	7.0	6.1	8.6	7.6
Longest D1 spine	7.0	3.0	8.2	5.0	3.6	5.7	4.7

Caud. ped., Caudal peduncle.

Table 18. Measurements (in mm) of *Pseudogobiopsis oligactis* (Bleeker, 1875).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	8.1	5.7	15.2	10.1	7.1	12.3	9.2
Head depth	4.8	3.2	7.9	5.2	3.8	6.8	5.0
Head width	5.6	3.7	11.0	7.0	4.5	8.8	6.4
Body depth	5.5	3.8	9.3	5.6	3.7	8.1	5.3
Body width	-	2.9	7.8	4.3	2.9	6.9	4.2
Caud. ped. leng.	6.6	5.7	12.6	8.5	6.8	11.2	8.6
Caud. ped. depth	2.8	2.6	6.2	3.8	2.7	5.2	3.6
Snout	2.0	1.5	4.7	2.9	1.9	3.4	2.6
Eye	1.8	1.7	3.2	2.4	2.1	3.1	2.5
Jaw	6.6	2.1	11.3	5.9	2.6	5.7	3.8
Interorbit	0.9	0.9	2.5	1.5	1.0	1.7	1.2
Pectoral	5.7	5.1	11.3	7.5	6.5	9.3	7.5
Pelvic	5.4	5.2	10.1	7.0	4.8	8.6	6.8
Caudal	-	5.8	12.0	8.1	6.0	10.4	7.8
Longest D1 spine	-	2.9	16.0	8.1	3.5	6.9	5.3

Table 19. Measurements (mm) of *Pseudogobiopsis paludosus* (Herre, 1940).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	9.5	5.4	9.6	8.0	5.4	6.4	5.9
Head depth	4.9	2.9	5.0	4.1	2.9	3.3	3.1
Head width	6.8	3.7	6.8	5.3	3.3	4.0	3.8
Body depth	5.2	3.0	5.2	4.1	3.0	3.7	3.3
Body width	4.4	2.2	4.4	3.0	2.0	2.9	2.3
Caud. ped. length	7.6	4.8	8.6	6.5	4.3	5.9	5.2
Caud. ped. depth	3.6	2.2	3.6	2.9	1.9	2.7	2.2
Snout	2.6	1.4	2.6	2.0	1.1	1.5	1.3
Eye	2.1	1.6	2.4	2.1	1.8	2.0	1.9
Jaw	5.7	2.2	5.7	4.3	1.8	2.3	2.0
Interorbit	1.8	1.1	2.0	1.5	0.5	1.1	0.9
Pectoral	7.3	4.3	7.5	6.6	4.7	5.4	5.0
Pelvic	6.9	4.1	6.9	5.8	3.8	5.2	4.6
Caudal	7.7	5.1	8.4	7.4	4.8	6.1	5.5
Longest D1 spine	4.7	3.9	7.7	6.2	2.6	3.3	3.1

Caud. ped., Caudal peduncle.

Table 20. Measurements (mm) of *Pseudogobiopsis tigrellus* (Nichols, 1951).

Character	Holotype	Males Minimum	Males Maximum	Males Mean	Females Minimum	Females Maximum	Females Mean
Head length	6.8	5.9	7.5	6.9	6.0	6.7	6.4
Head depth	3.5	3.4	4.4	3.9	3.5	4.1	3.8
Head width	4.0	4.0	5.4	4.7	4.2	4.7	4.5
Body depth	4.0	3.6	4.7	4.2	3.6	4.3	4.0
Body width	-	2.5	3.4	3.0	2.5	2.9	2.8
Caud. ped. leng.	6.0	6.0	7.4	6.8	5.5	7.4	6.4
Caud. ped. depth	2.9	2.6	3.1	2.9	2.4	2.9	2.7
Snout	1.8	1.5	2.1	1.9	1.7	2.0	1.8
Eye	1.7	1.7	2.0	1.8	1.7	2.0	1.8
Jaw	3.2	2.2	3.4	3.1	2.1	2.3	2.2
Interorbit	0.7	0.6	1.0	0.8	0.5	0.7	0.6
Pectoral	4.3	4.3	7.5	6.2	5.2	6.6	5.9
Pelvic	4.9	4.9	7.3	6.1	5.4	6.2	5.9
Caudal	-	6.1	8.4	7.5	5.8	7.0	6.3
Longest D1 spine	-	3.2	4.1	3.7	2.8	4.0	3.2

Caud. ped., Caudal peduncle.