# GALATHEA REPORT

Volume 19

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Volume 19

*Scientific Results*
*of The Danish Deep-Sea Expedition*
*Round the World 1950-52*


ISSUED BY THE GALATHEA COMMITTEE

EDITOR:

*Torben Wolff, D. Sc.*
Deputy Leader of the Expedition

APOLLO BOOKS
Stenstrup · Denmark
2002

Published by means of grants from

THE CARLSBERG FOUNDATION

and

STATENS NATURVIDENSKABELIGE FORSKNINGSRÅD

(The Danish Natural Science Research Council)

Printed by Vinderup Bogtrykkeri A/S

7830 Vinderup

Price: 200 Danish Kroner

# REVISION OF THE INDO-PACIFIC SPECIES OF *NEOBYTHITES* (TELEOSTEI, OPHIDIIDAE), WITH 15 NEW SPECIES

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## ABSTRACT

The Indo-Pacific species of the benthopelagic, oviparous, cosmopolitan genus *Neobythites* were reviewed on the basis of almost 1000 specimens from 30 institutional collections. They were caught at depths between 67 and 950 metres. The numerous material and the use of both traditional and "new" characters, such as form of sagittal otolith, length of longest filaments on anterior gill arch, form of vomer and basibranchial tooth patches resulted in recognizing 42 species. A key to the species is provided. The following 15 species are new: *N. alcocki*, *andamanensis*, *australiensis*, *fijiensis*, *franzi*, *javaensis*, *longispinis*, *macrocelli*, *marianaensis*, *marquesaensis*, *musorstomi*, *nigriventris*, *sereti*, *sinensis*, *soelae*. Lectotypes are selected for *N. macrops*, *malayanus* and *stelliferoides*. *N. nigromaculatus* is treated as a junior synonym of *N. unimaculatus*. Illustrations (including vomer, basibranchial tooth patches, sagitta and map of records) are given for each of the species.

## CONTENTS

## INTRODUCTION

*Neobythites* Goode & Bean, 1885 is by far the most speciose genus within the oviparous family Ophidiidae. *Neobythites* is known from all oceans, in the Atlantic, however, only from the western part except for one specimen caught west of Cape Town. In the Indo-Pacific Ocean it is recorded from 67-950 meters of depth and is consequently well represented in many collections. In eastern Asia it is not uncommonly marketed.

Cohen & Nielsen (1978) recognized 14 species while Nielsen *et al.* (1999) listed 35. Eight species occur in the western Atlantic Ocean, all endemic for the area (Nielsen 1999). In the present paper another 15 species are described so the genus now holds 50 species. For two regions of the Indo-Pacific Ocean the *Neobythites* species have already been treated, the western Indian Ocean (Nielsen 1995) and the New Caledonian waters (Nielsen 1997). Anticipating the present revision, however, the descriptions in these two publications were rather brief, a fact which is remedied here. Since more undescribed species can be expected to come to light, especially from the West Pacific Ocean, it is important to show tables with meristic and morphometric characters of all species.

## MATERIAL AND METHODS

Almost 1000 specimens from 30 collections have been examined including type material whenever accessible. Tables presenting meristic and morphometric characters do not always include data from all specimens listed in the "Material examined" as some can be in such poor condition that only a few diagnostic characters were available. In some species accounts 1-2 specimens are treated as "tentatively referred" as they differ from the typical species, but not enough to warrant establishment of a new species.

Station data for material from the western Indian Ocean and off New Caledonia already published by Nielsen (1995 and 1997) are not repeated here.

The condition of the material examined is generally fine, as *Neobythites* specimens are very robust. Furthermore, they are not caught at such great depths as many other ophidiids which means that net-damage is much less pronounced. The pigmentation, however, bleaches after being preserved for a certain period, especially bars on the body while ocelli on the dorsal and anal fins seem to resist bleaching much better.

Many species have ocelli in dorsal and anal fins. An ocellus is defined as a large, dark, rounded area surrounded by a light ring. When the light ring is missing the black area is named a blotch.

All measurements including snout are from upper jaw symphysis and are in millimeters. Measurements to an ocellus are to the anterior part of the black centre. In Tables 3-40 the mean character is given in brackets. Other counts and measurements follow Nielsen *et al.* (1999). The sagittal terminology follows Schwarzhans (1981). All specimens have been radiographed for vertebral, dorsal and anal fin ray counts. Vomer and basibranchial tooth patches were observed by using plasticine.

Abbreviations: Institutional abbreviations follow Eschmeyer (1998).

## Genus *Neobythites* Goode & Bean, 1885

*Neobythites* Goode & Bean, 1885: 600 (type species by monotypy *Neobythites gilli* Goode & Bean, 1885).

*Watasea* Jordan & Snyder, 1901: 765 (type species by original designation *Watasea sivicola* Jordan & Snyder, 1901).

### Diagnosis

Body short with tapering caudal part covered with small, cycloid scales; lateral line distinct or indistinct; snout most often blunt equal to or slightly longer than horizontal eye window; opercular spine strong; hind margin of preopercle with 0 to 2 spines (rarely 3); posterior part of maxilla sheathed; median basibranchial tooth patches 2; anterior gill arch with 6-34 developed rakers; pectoral fin entire with 22-34 rays; two rays in each ventral fin; precaudal vertebrae 11-14; sagittal otolith with shallow, straight sulcus and separated colliculi, ostial channel more or less distinct; large variation in colour patterns with some species without ocelli and bands, some with one to many ocelli in dorsal and more rarely in anal fins and/or horizontal or vertical, dark bands on body and fins.

### Similarity

Cohen & Nielsen (1978) mentioned that *Neobythites* is possibly related to *Benthocometes* and *Bassogigas*. However, a phylogenetic analysis of ophidiid genera has not yet been undertaken.

### Biology

All specimens treated here were caught in bottom fishing gear. This combined with the presence of a swimbladder strongly indicates that species of *Neobythites* live close to the bottom (benthopelagically). They have been caught from the upper part of the continental shelf to the upper part of the continental slope, between 67 and 950 m of depth. A single specimen of the otherwise western Indian Ocean species, *N. analis*, was trawled west of Cape Town at 1830 m. Table 1 shows that of the 42 Indo-Pacific species known, 40 occur in the depth interval 200-499 m, two species are only found at depths greater than 500 m and two only shallower than 200 m.

*Neobythites* is oviparous. Of the material examined, 51% were females, 26% males and 23% unsexed. The unsexed specimens were either too small to sex or not opened. The reason why females are more numerous most probably is that it is easier to recognize an unripe female than an unripe male. Most of the specimens were rather unripe, a few females and one male had semi ripe gonads and none was ripe. A 195 mm female *N. analis* seemed to be spent. The ovaries hold numerous eggs, the largest about 0.5 mm in diameter. No larvae are known and postlarvae were only found of *N. stefanovi*.

The largest specimen examined is a 310 mm *N. longipes* and the smallest a 27 mm *N. stefanovi*. Since no specimens were ripe it is not possible to make out how large the various species grow. However, in *N. bimarginatus* which is known from 13 specimens, several females were semi ripe at a SL of about 100 mm, and since the largest specimen was only 110 mm it indicates that this species reaches only small size. Also *N. franzi* seems to be a species of small adult size with rather well developed ovaries in females 78-102 mm in SL.

All specimens were radiographed and in less than 10% solid intestinal content showed up on the film. These specimens were opened. Remains of crustaceans were dominating followed by gastropods. Bivalves, felt from polychaetes, brittle stars, foraminiferas, fish (*Bregmaceros* sp.) and fish bones were found in a few specimens. This shows that at least part of the food of *Neobythites* derives from the bottom.

Ocelli on dorsal and/or anal fins were found in 28 species (67%). The biological effect of these ocelli or eyespots in *Neobythites* has never been studied as no specimens with ocelli have been observed alive. However, with the knowledge from coral reef-living fishes it is most likely that ocelli play a role for species recognition, for signaling between specimens by folding and unfolding the fins and for scaring away and/or confusing predators.

Table 1. Bathymetrical distribution of Indo-Pacific *Neobythites* spp.

| Neobythites spp. | Stations | 0-99 | 100-199 | 200-299 | 300-399 | 400-499 | 500-599 | 600-699 | 700-799 | 800-899 | 900-999 | 1830 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *nigriventris* | 25 | | | | | | | | | | | |
| *sivicola* | 21 | | | | | | | | | | | |
| *stefanovi* | 21 | | | | | | | | | | | |
| *stelliferoides* | ca. 40 | | | | | | | | | | | |
| *analis* | 12 | | | | | | | | | | | |
| *crosnieri* | 5 | | | | | | | | | | | |
| *meteori* | 2 | | | | | | | | | | | |
| *longipes* | 20 | | | | | | | | | | | |
| *macrops* | 15 | | | | | | | | | | | |
| *unimaculatus* | 19 | | | | | | | | | | | |
| *purus* | 11 | | | | | | | | | | | |
| *stigmosus* | 9 | | | | | | | | | | | |
| *trifilis* | 5 | | | | | | | | | | | |
| *malayanus* | 16 | | | | | | | | | | | |
| *steatiticus* | 7 | | | | | | | | | | | |
| *kenyaensis* | 3 | | | | | | | | | | | |
| *longiventralis* | 6 | | | | | | | | | | | |
| *malhaensis* | 3 | | | | | | | | | | | |
| *australiensis* | 6 | | | | | | | | | | | |
| *bimaculatus* | 27 | | | | | | | | | | | |
| *franzi* | 7 | | | | | | | | | | | |
| *macrocelli* | 11 | | | | | | | | | | | |
| *zonatus* | 1 | | | | | | | | | | | |
| *vityazi* | 12 | | | | | | | | | | | |
| *andamanensis* | 3 | | | | | | | | | | | |
| *bimarginatus* | 7 | | | | | | | | | | | |
| *multistriatus* | 4 | | | | | | | | | | | |
| *soelae* | 3 | | | | | | | | | | | |
| *somaliaensis* | 7 | | | | | | | | | | | |
| *natalensis* | 2 | | | | | | | | | | | |
| *longispinis* | 1 | | | | | | | | | | | |
| *marianaensis* | 1 | | | | | | | | | | | |
| *marquesaensis* | 2 | | | | | | | | | | | |
| *fasciatus* | 6 | | | | | | | | | | | |
| *alcocki* | 2 | | | | | | | | | | | |
| *fijiensis* | 3 | | | | | | | | | | | |
| *sinensis* | 1 | | | | | | | | | | | |
| *pallidus* | 22 | | | | | | | | | | | |
| *javaensis* | 1 | | | | | | | | | | | |
| *neocaledoniensis* | 5 | | | | | | | | | | | |
| *sereti* | 2 | | | | | | | | | | | |
| *musorstomi* | 1 | | | | | | | | | | | |

Table 2. Geographical distribution of Indo-Pacific *Neobythites spp*.

| | Indian Ocean | | Indo-Australian waters | | | Pacific Ocean | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | West | Bay of Bengal | Philip. | Indonesia | NW Austr. | Japan | Taiwan | E. Austr. | Melanesia | Micronesia | Polynesia | E. Pacific |
| *alcocki* | | ——— | | | | | | | | | | |
| *analis* | ——— | | | | | | | | | | | |
| *andamanensis* | | ——— | | | | | | | | | | |
| *australiensis* | | | | | ——— | | | | | | | |
| *bimaculatus* | | | ——— | | ——— | | | | ——— | | | |
| *bimarginatus* | | | | | | | | | ——— | | | |
| *crosnieri* | ——— | | | | | | | | | | | |
| *fasciatus* | | | ——— | | | | | | | | | |
| *fijiensis* | | | | | | | | | ——— | | | |
| *franzi* | | | | | | | | ——— | | | | |
| *javaensis* | | | | ——— | | | | | | | | |
| *kenyaensis* | ——— | | | | | | | | | | | |
| *longipes* | | | ——— | ——— | ——— | | | | | | | |
| *longispinis* | | | ——— | | | | | | | | | |
| *longiventralis* | | | ——— | | | | | | ——— | | | |
| *macrocelli* | | | | | | | | | ——— | ——— | | |
| *macrops* | | | ——— | ——— | ——— | | | | | | | |
| *malayanus* | | | ——— | ——— | | | | | ——— | | | |
| *malhaensis* | ——— | | | | | | | | | | | |
| *marianaensis* | | | | | | | | | | ——— | | |
| *marquesaensis* | | | | | | | | | | | ——— | |
| *meteori* | ——— | | | ——— | ——— | | | | | | | |
| *multistriatus* | ——— | | | | | | | | | | | |
| *musorstomi* | | | | | | | | | ——— | | | |
| *natalensis* | ——— | | | | | | | | | | | |
| *neocaledoniensis* | | | | ——— | | | | | ——— | | | |
| *nigriventris* | | | | | | | | ——— | | | | |
| *pallidus* | | | | | | | | ——— | ——— | | | |
| *purus* | | | ——— | ——— | ——— | | | | | | | |
| *sereti* | | | | | | | | | ——— | | | |
| *sinensis* | | | ——— | | | | | | | | | |
| *sivicola* | | | | | | ——— | ——— | ——— | | | | |
| *soelae* | | | | | ——— | | | | | | | |
| *somaliaensis* | ——— | | | | | | | | | | | |
| *steatiticus* | ——— | ——— | ——— | | | | | | | | | |
| *stefanovi* | ——— | | | | | | | | | | | |
| *stelliferoides* | | | | | | | | | | | | ——— |
| *stigmosus* | | | | | | ——— | ——— | | | | | |
| *triflis* | ——— | | | | | | | | | | | |
| *unimaculatus* | | | ——— | ——— | ——— | ——— | ——— | ——— | ——— | | | |
| *vityazi* | ——— | | | | | | | | | | | |
| *zonatus* | | | | | | | | | ——— | ——— | | |

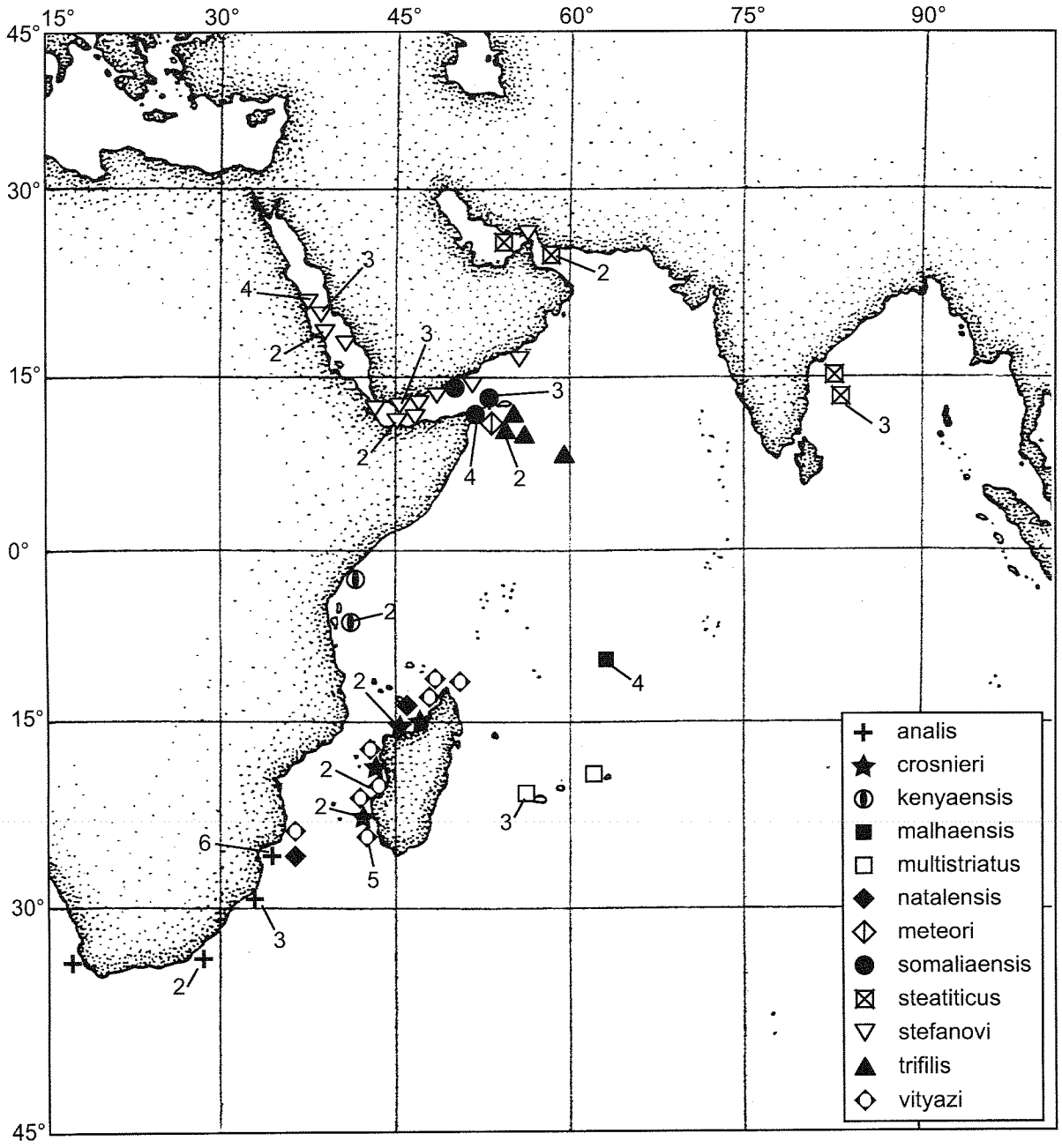


Fig. 1. Records of *Neobythites* spp. from the western Indian Ocean. The numbers indicate the number of neighbouring stations.

## Distribution

Figs. 1-3 and Table 2 show that the Indo-Pacific species of *Neobythites* occur below tropical and subtropical parts of the oceans. Judging from Table 2, the Indo-Australian waters with 16 seem most species rich. The poorest area is the East Pacific with only one species and, judging from the trawling effort that has taken place along the westcoast of the Americas, additional species from here can hardly be expected. This may be due to the fact that in the East Pacific the north-south distribution of water with high enough temperatures is small, there are very few islands and depths shallower than 1000 metres are rare, all conditions that are non-optimal for *Neobythites*. The potentially richest area is the West Pacific. Very little trawling has been carried out on the upper continental slope of Pacific islands using gear with meshes fine enough for catching the small, slender specimens of *Neobythites*.

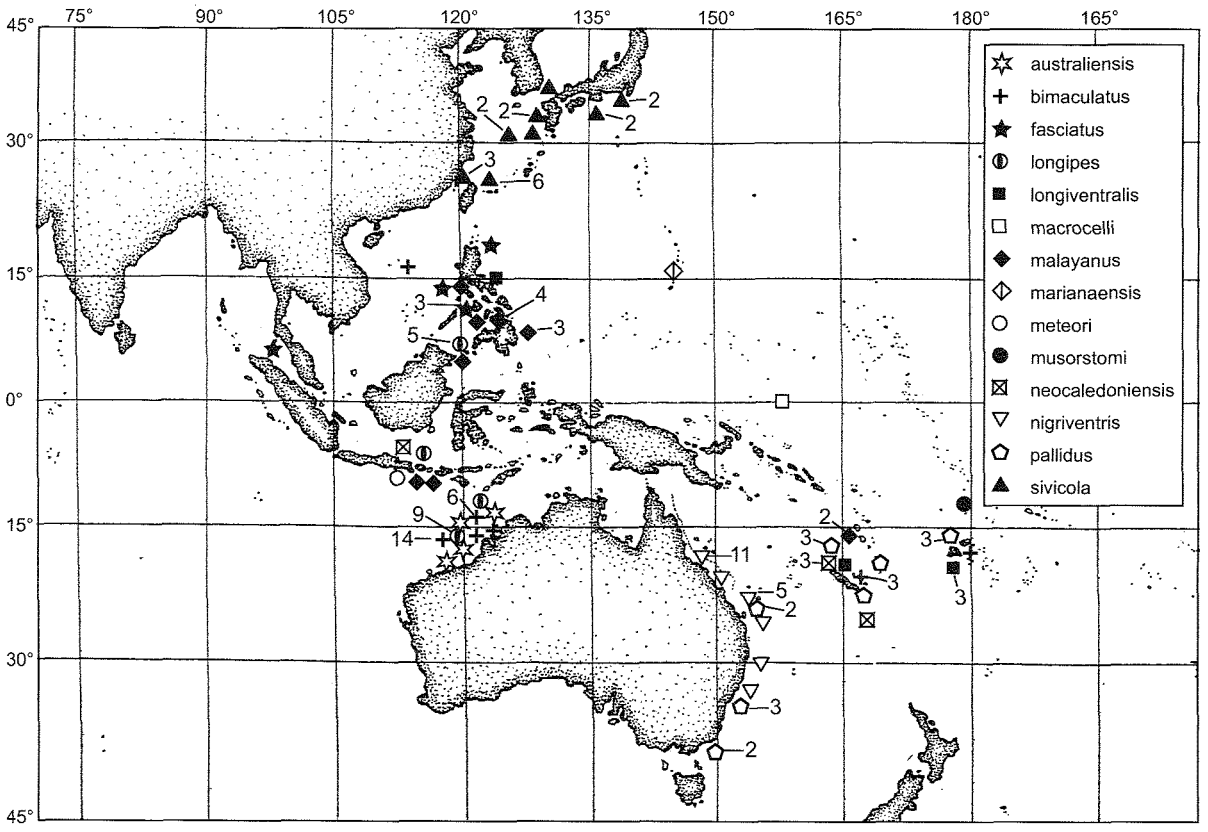


Fig. 2. Records of *Neobythites* spp. from Indo-Australian and West Pacific waters. The numbers indicate the number of neighbouring stations.

Exceptions are the slopes of New Caledonia, Vanuatu and Fiji where intensive fishing with shrimp trawls has revealed 11 species or about 60% of the total number of species found in the West Pacific. Knowing that species of *Neobythites* often have a restricted distribution indicates that many additional species can be expected from other islands in the Pacific Ocean.

## Species

The number of Indo-Pacific species referred to the genus *Neobythites* has exploded within the last decades. It went from 11 in 1978 (Cohen & Nielsen), to 27 in 1999 (Nielsen *et al.*) and now 42 species. The reasons for this increase are that more material has been collected, unidentified museum collections have been studied, ontogenetic series within a number of species have become available, and additional characters have been used. Also the large number of specimens available for examination has resulted in larger specific series which again means that the intraspecific variation has become better known.

Besides the more traditional meristic and morphometric characters the most important characters used for specific separation are:

Ocellus. Number, position and size of ocelli in dorsal and anal fins (67% of *Neobythites* spp. are provided with ocelli). Ocelli may develop with growth, e. g. in *N. javaensis*, *multistriatus*, *nigriventris* and *stefanovi*, or the number may decrease with growth, e. g. in *N. bimaculatus* and *soelae.* Even though ocelli in many specimens remain preserved for more than 100 years, they can disappear. Such specimens may prove very difficult to identify.

Preopercular spines. An important character is presence or absence of spines in preopercular angle. Spines (1-3, most often two) are developed in 31 species while 11 have 0-2 flat, preopercular processes.

Gill filament length. Length of longest gill filaments on anterior gill arch.

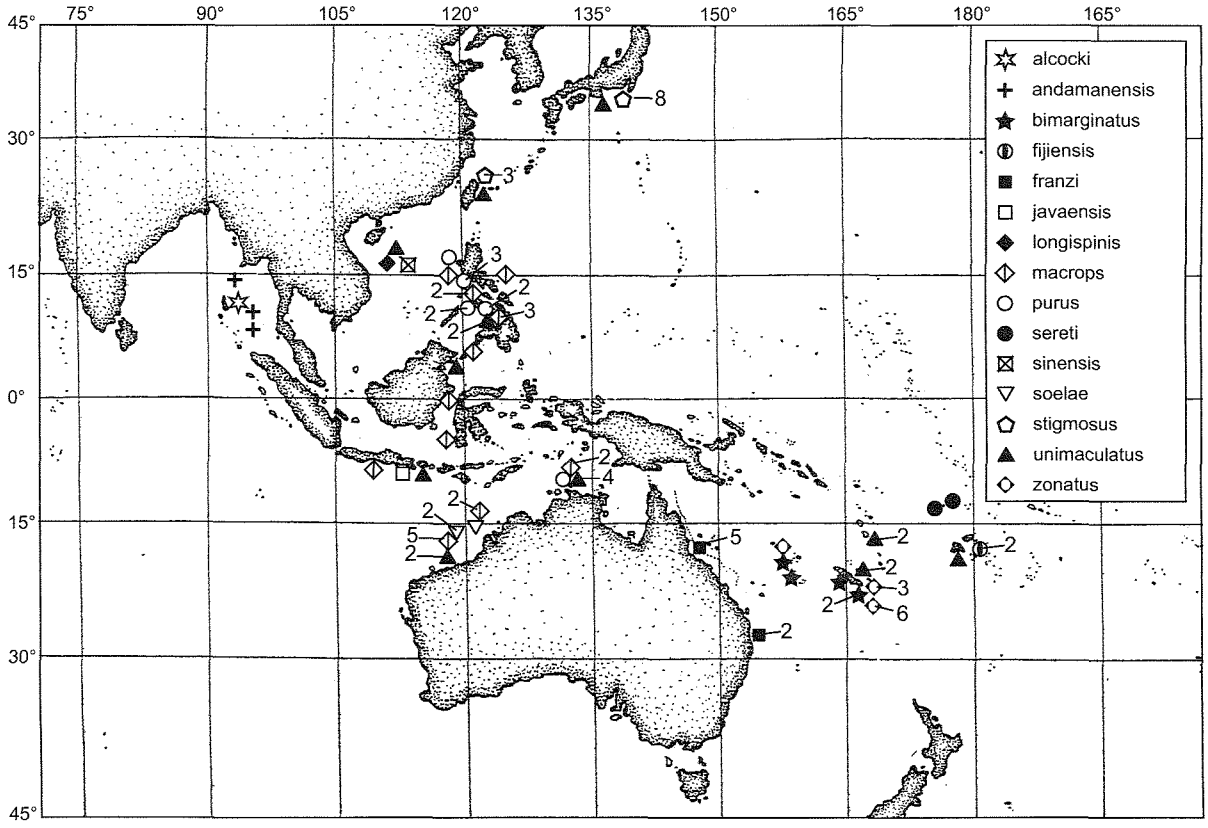


Fig. 3. Records of *Neobythites* spp. from Indo-Australian and West Pacific waters. The numbers indicate the number of neighbouring stations.

Pseudobranchial filaments. Both number, length and thickness vary. They may be difficult to find.

Vomer and basibranchial tooth patches. The form can be obtained by taking an imprint in plasticine. In a few species the form of vomer changes with growth, e. g. *N. multistriatus*, *trifilis* and *vityazi*.

Otolith. A median view of the right, sagittal otolith is illustrated for all species, except for *N. javaensis* in which the sagittas were dissolved. The sagitta is removed by making a cut into the inner ear from the branchial cavity. Schwarzhans (1994) found that the sagitta in most *Neobythites* species shows sexual dimorphism. When compared to species not showing sexual dimorphism it appears that the female sagitta does not change, but the male sagitta becomes i. a. longer, thicker and has a more rounded dorsal rim. Whenever possible, the female sagitta is illustrated. For sagittal terminology see Schwarzhans (1981).

In the species section the species are listed alphabetically. The phylogenetic relationship between the species is not examined yet, but a cladistic analysis is in preparation (Uiblein, Schwarzhans & Nielsen).

The following Indo-Pacific species originally referred to *Neobythites* were later reassigned to other genera:

Recent species:
*Neobythites conjugator* Alcock, 1896,
now *Monomitopus conjugator*
*Neobythites pterotus* Alcock, 1890,
now *Holcomycteronus pterotus*

Species based on fossil otoliths:
*Neobythites joenielseni* Schwarzhans, 1986
*Neobythites verus* Schwarzhans, 1994.

**Key to The Indo-Pacific species of *Neobythites***

(*N. australiensis, sereti, soelae* and *stigmosus* appear twice in the key)

1a Ventral fins reach beyond anus . . . . . 2
1b Ventral fins not reaching beyond anus . . . . . 4
2a Dorsal fin without ocelli; 18-22 long rakers on anterior gill arch . . . . . *stelliferoides* Gilbert, 1890
2b Dorsal fin with 1-2 ocelli; 8-12 long rakers on anterior gill arch . . . . . 3
3a One dorsal ocellus; no preopercular spines . . . . *longipes* Smith & Radcliffe, 1913
3b Two dorsal ocelli; 2 preopercular spines . . . . . *longiventralis* Nielsen, 1997
4a Preoperculum with 2 (rarely 1 or 3) distinct spines . . . . . 5
4b Preoperculum with 0 (rarely 1 weak, flat) spine . . . . . 38
5a Dorsal fin with ocelli or dark blotches . . . . 6
5b Dorsal fin without ocelli or dark blotches . 28
6a Body with distinct, dark, vertical bars . . . . . 7
6b Body without distinct vertical bars . . . . . 12
7a Anterior gill arch with 8-10 long rakers; anal fin with 3-4 distinct blotches . . . . . *fasciatus* Smith & Radcliffe, 1913
7b Anterior gill arch with 11-15 long rakers; anal fin with or without distinct ocelli . . . . . 8
8a Number of fin rays in anal 91-95 and pectoral 28-30 . . . . . *multistriatus* Nielsen & Quero, 1991
8b Number of fin rays in anal 80-91, pectoral 24-28 . . . . . 9
9a Head length 17.5-20.0 % SL; anal fin with 2-3 distinct ocelli .....*stigmosus* Machida, 1984
9b Head length 21.0-24.0 % SL; anal fin with or without distinct ocelli . . . . . 10
10a Anal fin with 3-4 ocelli or blotches . . . . . *javaensis* n.sp.
10b No ocelli or blotches on anal fin . . . . . 11

11a About eight narrow bars on body; longest gill filaments on anterior arch 10.0-13.0 % headlength . . . . . *andamanensis* n.sp.
11b About five broad bars on body; longest gill filaments on anterior arch 3.8-6.4 % head length . . . . . *zonatus* Nielsen, 1997
12a Dorsal fin with 6 or more ocelli, none on anal fin . . . . . *natalensis* Nielsen, 1995
12b Dorsal fin with 1-3 ocelli, anal fin with or without ocelli . . . . . 13
13a Anal fin with 1-4 ocelli or blotches . . . . . 14
13b Anal fin without ocelli . . . . . 16
14a Head length 17.5-20.0 % SL; dorsal with 4-7 and anal with 3-4 ocelli . . . . . *stigmosus* Machida, 1984
14b Head length 21.0-23.5 % SL; dorsal with 3 and anal with 2-3 ocelli . . . . . 15
15a Pseudobranchial filaments 5-7; long gill rakers on anterior arch 10(10.7)12; about 5 indistinct, vertical bars.....*fijiensis* n. sp.
15b Pseudobranchial filaments 3-4; long gill rakers on anterior arch 12(12.9)13; no vertical bars . . . . . *soelae* n. sp.
16a Dorsal fin with 1 ocellus . . . . . 17
16b Dorsal fin with 2-4 ocelli . . . . . 20
17a Ventral edge of body distinctly black . . . . *nigriventris* n. sp.
17b Ventral edge of body not black . . . . . 18
18a Pectoral fin rays 29-31; dorsal fin rays 103-110; vomer triangular (Fig. 64A); long gill rakers 12-14 . . . . . *sereti* n. sp.
18b Pectoral fin rays 26-29; dorsal fin rays 88-96; vomer boomerang shaped (Figs.11A and 85A); long gill rakers 8-11 . . . . . 19
19a Dorsal part of head and body mottled; anterior basibranchial tooth patch short and broad . . . . . .*australiensis* n. sp.
19b Dorsal part of head and body uniformly brownish; anterior basibranchial tooth patch long and rather narrow . . . . . *unimaculatus* Smith & Radcliffe, 1913
20a Dorsal fin with 3-4 ocelli, posterior may be indistinct . . . . . 21
20b Dorsal fin with 2 ocelli . . . . . 22
21a Posterior third of anal fin black; 3-4 ocelli in dorsal fin . . . . . *macrops* Günther, 1887
21b Anal fin not black; 3 ocelli in dorsal fin . . . . . *soelae* n. sp.
22a Ocelli placed on posterior third of dorsal fin . . . . . *crosnieri* Nielsen, 1995
22b Ocelli placed on anterior or middle part of dorsal fin . . . . . 23
23a Weak anterior ocellus on first dorsal fin rays . . . . . *australiensis* n. sp.
23b Both ocelli on middle part of dorsal fin . . 24
24a Black part of ocellus as large as or smaller than horizontal eye diameter . . . . .

. . . . . *bimaculatus* Nielsen, 1996

24b Black part of ocellus 1.5-2 times as large as horizontal eye diameter . . . . . 25

25a Body with 4-6 indistinct, dark bars . . . . . *marquesaensis* n. sp.

25b No bars on body. . . . . .26

26a Long gill rakers on anterior arch 12-14; pectoral fin rays 29-31; precaudal vertebrae 13 . . . . . *sereti* n. sp.

26b Long gill rakers on anterior arch 11; pectoral fin rays 24-27; precaudal vertebrae 14. . 27

27a Ocelli covering 13-14 and 11 dorsal fin rays; sagitta slender (Fig. 36B) . . . . . *macrocelli* n. sp.

27b Ocelli covering 8-11 and 6-9 dorsal fin rays; sagitta less slender (Fig. 44B) . . . . . .*marianaensis* n. sp.

28a Distal part of entire dorsal and/or anal fins with dark band . . . . . 29

28b Distal part of entire dorsal and anal fins dusky or without colour . . . . . .30

29a Dorsal and anal fins dark; longest gill filament on anterior arch 11.0-14.0 % head length . . . . . *somaliaensis* Nielsen, 1995

29b Anal fin dark; longest gill filament on anterior arch 5.4-7.7 % head length . . . . . *analis* Barnard, 1927

30a Jaw teeth needle formed; dark area behind eye . . . . . *trifilis* Kotthaus, 1979

30b Jaw teeth granular (small and close-set); no dark area behind eye . . . . . 31

31a Anterior gill arch with 13-17 long rakers . . . . . *pallidus* Nielsen, 1997

31b Anterior gill arch with 7-13 long rakers . . 32

32a Rays in dorsal fin 90-98 and in anal fin 74-81 . . . . . 33

32b Rays in dorsal fin 99-105 and in anal fin 81 90 . . . . . 35

33a Several faint, rather large white spots on sides of body; pseudobranchial filaments 7-11 . . . . . *sivicola* (Jordan & Snyder, 1901)

33b No white spots on body; pseudobranchial filaments 3-7 . . . . . 34

34a Total no. of rakers on anterior gill arch 10-16; head length 23.0-25.5 % SL; vomer subtrangular (Fig. 62A) . . . . . *purus* Smith & Radcliffe, 1913

34b Total no. of rakers on anterior gill arch 17-20; head length 20.0-21.5 % SL; vomer boomerang shaped (Fig. 23A) . . *franzi* n. sp.

35a Depth at origin of anal fin 13.5-14.0 % SL; vomer boomerang shaped (Fig. 32A) . . . . . *longispinis* n. sp.

35b Depth at origin of anal fin 15.0-20.5 % SL; vomer subtriangular (Figs. 5A,56A,87B)36

36a Posterior edge of vomer convex . . . . . *vityazi* Nielsen, 1995

36b Posterior edge of vomer concave or flat . . 37

37a Upper jaw protruding; posterior end of sagitta rounded (Fig. 56B) . . . . . *neocaledoniensis* Nielsen, 1997

37b Upper jaw not protruding; posterior end of sagitta pointed (Fig. 5B) . . . . . *alcocki* n.sp.

38a Dorsal fin without distinct ocelli . . . . . 39

38b Dorsal fin with 1-4 ocelli . . . . . 41

39a Dorsal and anal fins with dark band; 32-33 pectoral fin rays; 7-9 long gill rakers on anterior arch . . . . . . *bimarginatus* Fourmanoir & Rivaton, 1979

39b No dark band on dorsal and anal fins; 27-29 pectoral fin rays; 10-13 long gill rakers on anterior arch . . . . . 40

40a Opercular spine straight; 2 pseudobranchial filaments; dorsal finrays 101-105 . . . . . *musorstomi* n. sp.

40b Opercular spine curved downwards; 4 pseudobranchial filaments; dorsal finrays 92 . . . . . *sinensis* n. sp.

41a Dorsal fin with 2 ocelli . . . . . *kenyaensis* Nielsen, 1995

41b Dorsal fin with 1 ocellus . . . . . 42

42a Anterior gill arch with 6-7 long rakers; anal fin not black . . . . . *meteori* Nielsen, 1995

42b Anterior gill arch with 8-14 long rakers; anal fin black or not . . . . . 43

43a One black bar below ocellus; dorsal and anal fins not black. . .*malhaensis* Nielsen, 1995

43b None to several diffuse bars; dorsal and/or anal fins black . . . . . 44

44a Distal part of entire dorsal and anal fin black . . . . *stefanovi* Nielsen & Uiblein, 1993

44b Only posteriormost part of dorsal fin black . . . . . 45

45a Middle part of all anal fin rays black; 11-14 long gill rakers . . . . *steatiticus* Alcock, 1893

45b Distal part of most anal fin rays black; 8-11 long gill rakers . . . . . *malayanus* Weber, 1913

## *Neobythites alcocki* n. sp.

Figs. 3, 4, 5

Material examined (4 specimens, SL 97-185): Holotype: USNM 44422, SL 180, female, Andaman Sea, Marine Survey of India, R/V INVESTIGATOR, 344-403 m, catalogued at USNM 14 Mar. 1893.

Paratypes: USNM 365708, SL 185, male, same date as for holotype; USNM 340892, SL 97-109, female and male, Andaman Sea (11°13'40"N, 92°46'6"E), R/V INVESTIGATOR, st. 115, Agassiz trawl, 344-366 m, Dec. 1880.

Diagnosis: Hind margin of preopercle with 1-2 spines, no ocelli or bars, dorsal fin rays 100-104, anal fin rays 84-87, pectoral fin rays 27-29, long rakers on anterior gill arch 11-12, longest gill filaments on anterior arch 8.4-10.0 % length of head, pseudobranchial filaments 5-7, vomer tooth patch subtriangular with undulating or straight posterior edge (Fig. 5A), precaudal vertebrae 13, total vertebrae 59-61.

Similarity: *N. alcocki* seems most similar to *N. neocaledoniensis* with two preopercular spines, without ocelli and bars, 10-12 long gill rakers, dorsal finrays 100-106, anal finrays 84-90, depth at origin of anal fin 15-18 % SL. They differ by the form of the sagitta (Figs. 5B *vs* 56B) and by the upper jaw protruding in *N. neocaledoniensis*. See also comparison to *pallidus* p. 70.

Description: The principal meristic and morphometric characters are shown in Table 3.

Holotype (differences to paratypes in brackets). Elongate fish with distinct lateral line; snout pointed, equal in length to eye window; maxilla ends just behind eye; teeth granular; vomer subtriangular with undulating posterior edge (two paratypes with slightly concave posterior edge) and basibranchial tooth patches of equal width (Fig. 5A); anterior nostril with small flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines (one paratype with one spine); ventral fin reaches about halfway from base to anal fin; anterior gill arch with four long rakers on upper branch (1-2 short and 3-4 long), one long raker in angle, and lower branch with six long and seven short rakers (5-7 short rakers); six (5-7) thin pseudobranchial filaments.

Sagittal otolith (Fig. 5B) more than twice as long as high with pointed posterior end; sulcus closed with complete separation of colliculi; cauda more than half-length of ostium.

Axial skeleton (from radiographs). Tips of all haemal and neural spines pointed except for blunt, depressed spines on vertebrae 4-10; first neural spine half length of second spine; bases of vertebral spines 3-7 enlarged (5-12); parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. Holotype and large paratype light brown with darker brown pigment along lateral line and two small paratypes darker brown with bluish abdomen, gill cover and eye. None of the specimens shows any trace of black pigmentation.

Biology: The material consists of two females and two males none of which is ripe. The stomach contents consist of a brittlestar and remains of crustaceans. Two of the specimens were caught on the

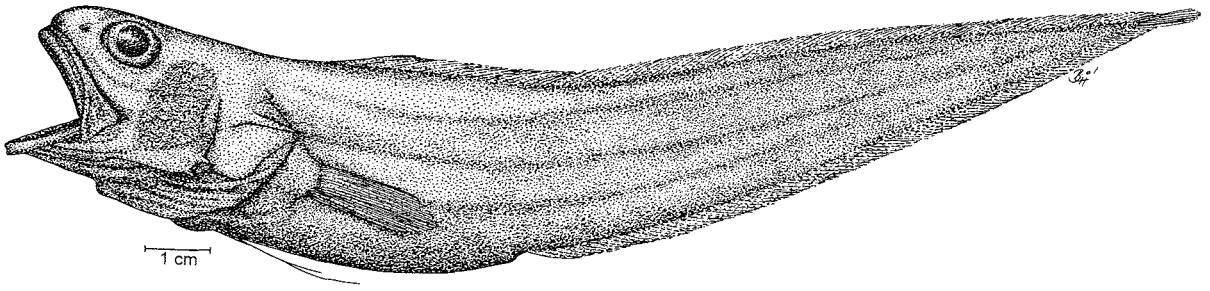


Fig. 4. *Neobythites alcocki* n. sp. Holotype, USNM 44422, SL 180.

upper continental slope and the other two are without indication of depth.

Distribution: Known from two localities in the Andaman Sea (Fig. 3) at depths of 344-366 m.

Etymology: Named in honor of Alfred W. Alcock who contributed much to the knowledge of the fishes of the Bay of Bengal.

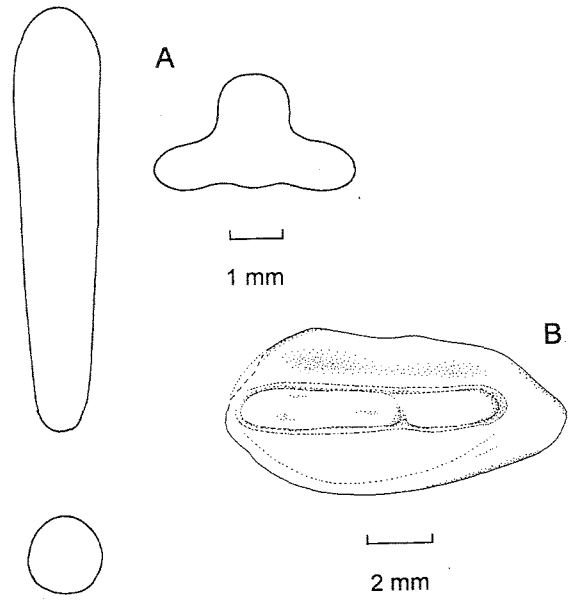


Fig. 5. *Neobythites alcocki* n. sp. A, basibranchial tooth patches and vomer of paratype, USNM 365708, SL 185; B, median view of right sagitta of holotype, USNM 44422.

Table 3. Meristic and morphometric characters of *N. alcocki* and *andamanensis*.

| | *alcocki* | | *andamanensis* | | |
|---|---|---|---|---|---|
| | Holotype | HT and 3 paratypes | Holotype | Paratype | Tent. ref. |
| Standard length | 180 | 97-185 | 166 | 195 | 142 |
| Meristic characters | | | | | |
| Dorsal finrays | 104 | 100 (102.3) 104 | 102 | 101 | 98 |
| Caudal finrays | 8 | 8 | 8 | 8 | 8 |
| Anal finrays | 86 | 84 (85.3) 87 | 86 | 84 | 80 |
| Pectoral finrays | 28 | 27 (27.8) 29 | 25 | 27 | 28 |
| Pseudobr.filaments | 6 | 5 (6) 7 | 5 | 4 | 4 |
| Precaudal vertebrae | 13 | 13 | 13 | 13 | 13 |
| Total vertebrae | 60 | 59 (60) 61 | 60 | 59 | 58 |
| Long rakers on ant. gill arch | 11 | 11 (11.3) 12 | 13 | 13 | 11 |
| Ant. dorsal ray above vertebra no. | 6 | 6 | 5 | 5 | 5 |
| Ant. anal ray below dorsal ray no. | 20 | 19 (19.5) 20 | 20 | 19 | 19 |
| Ant. anal ray below vertebra no | 15 | 15 | 16 | 15 | 15 |
| Morphometric characters | | | | | |
| In % of SL | | | | | |
| Head length | 23.5 | 21.5 (22.8) 24.0 | 24.0 | 24.0 | 23.0 |
| Depth orig. anal fin | 15.5 | 15.0 (15.5) 16.5 | 16.5 | 14.5 | 17.5 |
| Upper jaw length | 11.0 | 10.5 (10.8) 11.0 | 11.5 | 11.5 | 10.5 |
| Hor. eye window | 5.3 | 4.5 (4.9) 5.3 | 5.2 | 5.0 | 5.6 |
| Postorbital length | 13.5 | 13.0 (13.4) 13.5 | 14.5 | 14.5 | 13.0 |
| Preanal length | 47.5 | 45.0 (46.0) 47.5 | 45.0 | 42.0 | 41.0 |
| Predorsal length | 25.5 | 23.5 (24.4) 25.5 | 26.0 | 26.0 | 24.0 |
| Base of ventral fin to anal fin origin | 28.5 | 26.0 (26.6) 28.5 | 28.5 | 26.0 | 26.0 |
| Ventral fin length | 17.0 | 14.5 (16.0) 18.0 | 15.5 | 16.0 | 13.0 |
| In % of head length | | | | | |
| Longest filament on ant. gill arch | 9.7 | 8.4 (9.3) 10.0 | 12.5 | 13.0 | 10.0 |

## *Neobythites analis* Barnard, 1927

Figs. 1, 6, 7

*Neobythites analis* Barnard, 1927: 879 (type locality: 22 miles north of Tulega River, Natal, South Africa).

*Neobythites analis*: Shcherbachev 1980: 159, fig. 15 (in part); Nielsen & Cohen 1986: 349, fig. 96; Schwarzhans 1994, 74, figs. 1-2 (sagitta); Nielsen 1995: 2, fig. 2.

*Neobythites macrops* (non Günther): Gilchrist & Thompson 1914: 89; Gilchrist 1917: 416; Gilchrist & von Bonde 1924: 19.

Material examined: (28 specimens, SL 92-212): Lectotype: SAM 12487 (SL 136), off Natal.

Paralectotypes: BMNH 1902.5.28.16 (1, SL 170), BMNH 1927.12.6.67-68 (2, SL 92-124), SAM 12084, 12087, 12088 (3, SL 95-134) and ZMUC (1, SL 106), east- and southcoast of South Africa and west of Cape Town.

Non-types: RUSI 12355-6 (4, SL 182+-212), USNM 319759 (6, SL 133-204), ZM MGU P-15114 (2, SL 176-197) and ZMUC P77816-20 (5, SL 160-195), east- and southcoast of South Africa. See Nielsen (1995: 2) for station-data.

Additional material: ZMUC P771163, SL 176, male, off Natal, South Africa (25°26'S, 34°19'E), R/V ALGOA , 356 m, 21 June 1994; ZMUC P771164-1165, SL 132-178, 2 females, off Natal, South Africa (25°32'S, 34°19'E), R/V ALGOA , 372 m, June 1994.

Diagnosis: Hind margin of preopercle with 1-2 spines; distal part of entire anal fin black, no ocelli or bars; dorsal fin rays 99-107; anal fin rays 84-89; pectoral fin rays 25-27; long rakers on anterior gill arch 9-11; longest gill filaments on anterior arch 5.4-7.7 % length of head; pseudobranchial filaments 3-6; vomer tooth patch subtriangular (Fig. 7B); precaudal vertebrae 13-14; total vertebrae 58-61.

Similarity: *N. analis* seems most similar to *N. somaliaensis* with two preopercular spines, distal part of entire dorsal and/or anal fin dark and no ocelli. The differ by *analis* having only anal fin dark (*vs* both anal and dorsal fin) and short gill filaments ( 5.4-7.7 *vs* 11.0-14.0 % length of head).

Description: The principal meristic and morphometric characters are shown in Table 4. Elongate fish with distinct lateral line; form of snout varies from pointed to rather blunt, slightly shorter than eye window; maxilla ends just behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch rather narrow (Figs. 7A,B); anterior nostril with low rim and larger posterior nostril a mere hole; hind margin of preopercle in most specimens with two rather flat spines, but number varies between 1-3; ventral fin not reaching halfway from base to anal fin; anterior gill arch with 2-4 short and two long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 5-8 short rakers; 3-6 well developed pseudobranchial filaments.

Sagittal otolith (Fig. 7C) twice as long as high with smooth edges; sulcus closed and deep with or without complete separation of colliculi; cauda half the length of ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine 1/3-1/2 length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 3-10 enlarged; parapophyses, all very

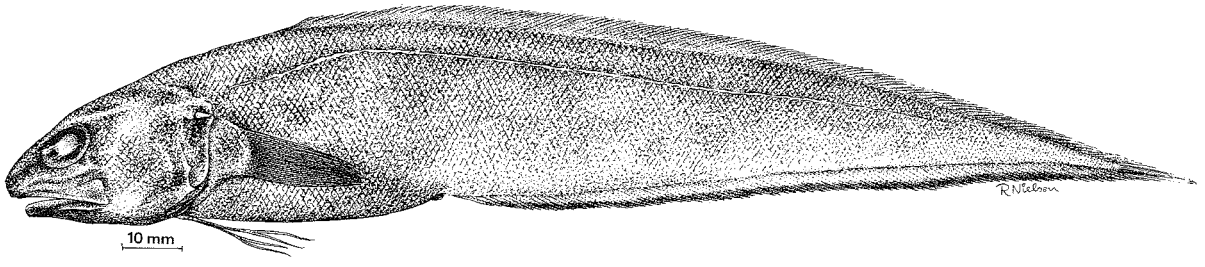


Fig. 6. *Neobythites analis*. A, ZMUC P77816, SL 195.

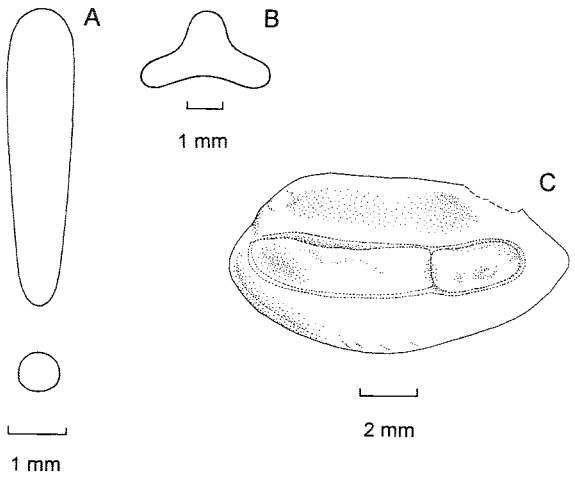


Fig. 7. *Neobythites analis*. A, basibranchial tooth patches of paralectotype, ZMUC P77716, SL 106; B, vomer of lectotype, SAM 12487, SL136; C, median view of right sagitta of RUSI 12356, SL 212.

short, on posterior 7-8 precaudal vertebrae; pleural ribs on vertebrae 3-14; epipleural ribs on vertebrae 3-9.

Coloration. Fresh specimens mottled brown; distal part of entire anal fin black; dorsal and caudal fins brownish; lateral line pale, surrounded with dark brown pigment; peritoneum dark; eyes bluish; all specimens from the type series are completely bleached while RUSI material from 1920 still have the dark anal fin.

Biology: The material examined consists of 15 females, 6 males and 12 unsexed specimens none of which is ripe, but a 195 mm female is spent. The few specimens with stomach contents showed dorsal felt from polychetes and remains of crustaceans. The Indian Ocean material caught on the shelf and upper slope and the Atlantic specimen on the lower slope.

Distribution: Known from 12 localities (Fig.1) from southern Mozambique southwards at 99-366 m depth. One specimen, caught west of Cape Town at a depth of 1830 m, is the only known *Neobythites* specimen from the East Atlantic. The condition of the latter specimen does not indicate that it is "left-over" from an earlier tow which could have explained the unusual depth and locality.

Table 4. Meristic and morphometric characters of *N. analis*.

| | Lectotype | 7 paralectotypes | LT,PLT's+20 spms. | Nos |
|---|---|---|---|---|
| Standard length | 136 | 92-170 | 92-212 | 28 |
| Meristic characters | | | | |
| Dorsal finrays | 107 | 99-103 | 99 (103.3) 107 | 23 |
| Caudal finrays | 8 | 8 | 8 | 16 |
| Anal finrays | 87 | 85-89 | 84 (85.8) 89 | 22 |
| Pectoral finrays | 27 | 25-27 | 25 (25.8) 27 | 22 |
| Pseudobr.filaments | 5 | 3-6 | 3 (4.8) 6 | 24 |
| Precaudal vertebrae | 14 | 13-14 | 13 (13.8) 14 | 24 |
| Total vertebrae | 60 | 58-61 | 58 (59.3) 61 | 22 |
| Long rakers on ant. gill arch | 10 | 9-11 | 9 (10.2) 11 | 24 |
| Ant. dorsal ray above vertebra no. | 6 | 5-6 | 5 (5.2) 6 | 24 |
| Ant. anal ray below dorsal ray no. | 23 | 20-21 | 19 (20.8) 23 | 24 |
| Ant. anal ray below vertebra no | 16 | 14-16 | 14 (15.1) 16 | 24 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 19.5 | 19.5-20.0 | 19.0 (20.5) 22.0 | 24 |
| Depth orig. anal fin | 16.5 | 15.0-17.5 | 14.5 (15.8) 17.5 | 22 |
| Upper jaw length | | 9.9 | 9.1 (9.8) 10.0 | 10 |
| Hor. eye window | 4.4 | 4.4-5.1 | 4.2 (4.8) 5.2 | 24 |
| Postorbital length | | 10.5 | 10.5 (11.5) 12.0 | 7 |
| Preanal length | 41.5 | 38.5-40.5 | 37.0 (39.8) 41.5 | 23 |
| Predorsal length | 21.5 | 21.5-22.5 | 21.5 (22.8) 25.0 | 23 |
| Base of ventral fin to anal fin origin | | 22.5 | 22.5 (24.6) 26.5 | 8 |
| Ventral fin length | | 10.5 | 8.6 (9.9) 10.5 | 9 |
| In % of head length | | | | |
| Longest filament on ant. gill arch | 7.3 | 5.4-7.1 | 5.4 (6.5) 7.7 | 22 |

## *Neobythites andamanensis* n. sp.

Figs. 3, 8, 9

Material examined (3 specimens, SL 142-195): Holotype: ZMUC P771294, SL 166, female, Andaman Sea (8°25'N, 96°30'E), trawl, 465 m, 20 July 1980.

Paratype: ZM MGU P-12399, SL 195, female, Andaman Sea (14°25'N, 93°58'E), R/V AKADEMIK KNIPOVICH, trawl 406, 340-365 m, 24 Feb. 1966.

Tentatively referred: USNM 326147, SL 142, female, Andaman Sea (10°39'N, 97°6'E), R/V ANTON BRUUN st. 22B, 290 m, 24 Mar. 1963.

Diagnosis: (based on holo- and paratype). Hind margin of preopercle with 2-3 spines; dorsal fin with about eight more or less distinct ocelli with corresponding vertical, brown bars on body; dorsal fin rays 101-102; anal fin rays 84-86; pectoral fin rays 25-27; long rakers on anterior gill arch 13; longest gill filaments on anterior arch 12.5-13.0 % length of head; 4-5 long pseudobranchial filaments; vomer tooth patch boomerang shaped (Fig. 9A); precaudal vertebrae 13; total vertebrae 59-60.

Similarity: *N. andamanensis* is similar to *N. fasciatus* and *N. multistriatus* with many rather narrow, vertical bars on body, but differs i. a. from *N. fasciatus* by having more long gill rakers (13 *vs* 8-10), longer gill filaments (12.5-13.0 *vs* 5.9-10.5 % length of head) and shape of vomer (Fig. 9A *vs* 19A). From *N. multistriatus* it differs by having less rays in dorsal fin (101-102 *vs* 106-111), anal fin (84-86 *vs* 91-95) and pectoral fin (25-27 *vs* 28-30) and longer gill filaments (12.5-13.0 *vs* 5.8-6.3 % length of head). See also *N. zonatus* p. 99.

Description: The principal meristic and morphometric characters are shown in Table 3. Holotype (differences with paratype in brackets). Rather elongate fish with distinct lateral line; snout blunt; maxilla ends just behind eye; teeth granular; vomer boomerang shaped and anterior basibranchial tooth patch narrow with great distance to posterior patch (Fig. 9A); anterior nostril with low rim and larger posterior nostril a mere hole; hind margin of preopercle with two spines on right and three on left side (two on both sides); ventral fin reaches about halfway from base to anal fin; anterior gill arch with three small and three long rakers on upper branch (two short and three long), one long raker in angle, and lower branch with nine long and eight short rakers; five long pseudobranchial filaments.

Sagittal otolith (Fig. 9B) almost twice as long as high with smooth edges; sulcus closed with not quite separated colliculi; cauda half the length of ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines (3-9); bases of vertebral spines 4-11 enlarged (5-10); parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-12 (3-13); epipleural ribs indistinct.

Coloration. Body and head dark brown; dorsal fin with about eight more or less distinct ocelli or black blotches with corresponding vertical, brown bars on body; posterior anal fin dark; bluish eye, gill cover and abdomen. Coloration of paratype less distinct.

Biology: The material consists of three females,

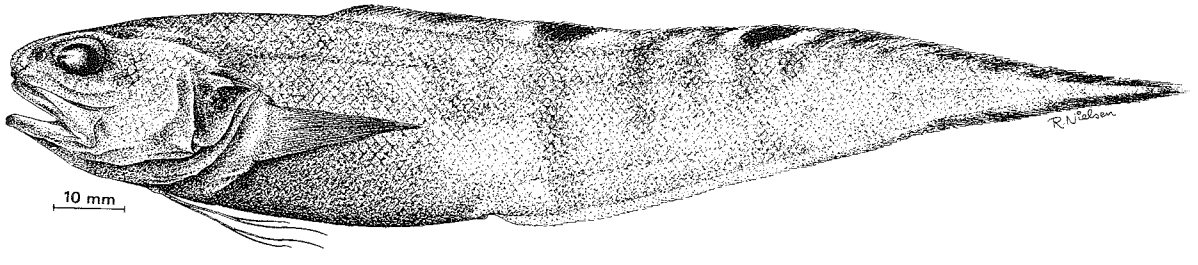


Fig. 8. *Neobythites andamanensis* n. sp. Holotype, ZMUC P771294, SL 166.

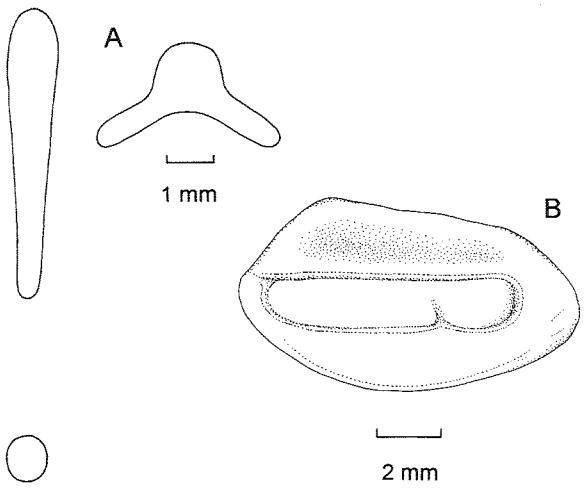


Fig. 9. *Neobythites andamanensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of paratype, ZM MGU P-12399, SL 195.

none of which is ripe. No recognizable stomach contents. Caught on the upper continental slope.

Distribution: Known from three localities in the Andaman Sea (Fig. 3) at 290-465 m depth.

Etymology: Named after the type locality, the Andaman Sea.

Remarks on material: Specimen USNM 326147 is considered tentatively referred as it besides differences in meristic characters (Table 3) also differs by a triangular vomer.

## *Neobythites australiensis* n. sp.

Figs. 2, 10, 11

*Neobythites gilli* (non Goode & Bean): Schwarzhans 1981: 86, fig. 51 (sagitta).

*Neobythites* sp. 22: Schwarzhans 1994: 76, figs. 57-58 (sagitta).

Material examined (7 specimens, SL 180-245): Holotype: WAM P.28107-001, SL 230, female, southwest of Rowley Shoals, Western Australia (18°4.6'S, 118°22'E), 327-328 m, 24 Aug. 1983.

Paratypes: WAM P.25395-008 (SL 212, male) and ZMUC P771325 (SL 188, female), Rowley Shoals, Western Australia (17°17'S, 119°57'E), R/V UMITAKA MARU st. 5, trawl, 350 m, 20 Dec. 1969; WAM P.25401-009, SL 195, female, Browse Is., Western Australia (13°47'S, 123°18'E), R/V UMITAKA MARU st. 11, trawl, 242 m, 23 Dec. 1969; LACM 43621-1, SL 182, female, and WAM P.28107-002, SL 180, male, same data as holotype; WAM P.30585-004, SL 245, female, off Western Australia (15°57'S, 120°46'E), R/V SOELA, trawl, 296-298, 10 Feb. 1984.

Diagnosis: Hind margin of preopercle with two spines, the lower of which is the longer; dorsal fin with one ocellus placed behind line through anus and smaller black blotch covering first 1-3 dorsal

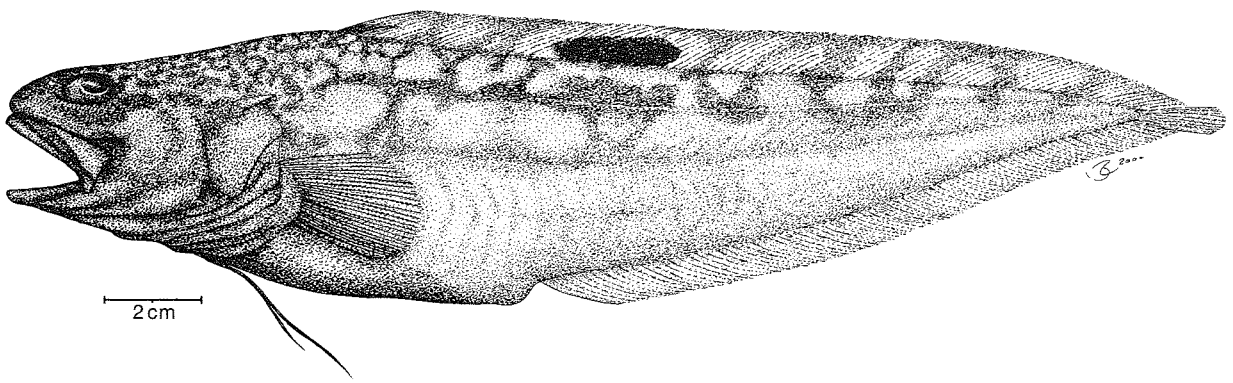


Fig.10. *Neobythites australiensis* n. sp. Holotype, WAM P.28107, SL 230.

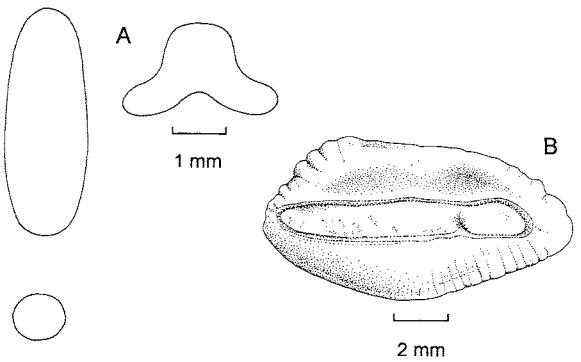


Fig. 11. *Neobythites australiensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of paratype, LACM 433621-1, SL 182.

fin rays (latter not present in all specimens, probably because of bleaching); dorsal fin rays 88-92; anal fin rays 73-77; pectoral fin rays 26-27; long rakers on anterior gill arch 9-10; longest gill filaments on anterior arch 6.9-7.4 % length of head; pseudobranchial filaments 8-11; vomer tooth patch subtriangular (Fig. 11A); precaudal vertebrae 13; total vertebrae 53-54.

Similarity: *N. australiensis* seems most similar to *N. longiventralis* with the single ocellus and the small anteriorly placed black blotch in dorsal fin, the brown mottled head and body and in many meristic and morphometric characters (Tables 5 *vs* 14) e. g. in length of ventral fins (14.0-19.0 *vs* 27.5-34.5 % SL), shape of anterior basibranchial tooth patch (Figs. 11A *vs* 34A) and number of pseudobranchial filaments (8-11 *vs* 4-6). See also *N. unimaculatus* p. 96.

Description: The principal meristic and morphometric characters are shown in Table 5.

Holotype (differences with paratypes in brackets). Robust fish with broad head and distinct lateral line; snout blunt, slightly longer than diameter of eye window; mouth broad with maxilla ending well behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch short and broad (Fig. 11A); anterior nostril with small flap (low rim) and larger posterior nostril a mere hole; hind margin of preopercle with two short spines; ventral fin reaches slightly more than halfway from base to anal fin; anterior gill arch with two short (1-2) and

Table 5. Meristic and morphometric characters of *N. australiensis*.

| | Holotype | Holotype and 6 paratypes | Nos |
|---|---|---|---|
| Standard length | 230 | 180-245 | 7 |
| Meristic characters | | | |
| Dorsal finrays | 92 | 88 (90.6) 92 | 7 |
| Caudal finrays | 8 | 8 | 7 |
| Anal finrays | 75 | 73 (74.6) 77 | 7 |
| Pectoral finrays | 26 | 26 (26.6) 27 | 5 |
| Pseudobr. filaments | 9 | 8 (8.8) 11 | 6 |
| Precaudal vertebrae | 13 | 13 | 7 |
| Total vertebrae | 53 | 53 (53.1) 54 | 7 |
| Long rakers on ant. gill arch | 10 | 9 (9.9) 10 | 7 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.3) 6 | 7 |
| Ant. anal ray below dorsal ray no. | 22 | 21 (21.9) 23 | 7 |
| Ant. anal ray below vertebra no | 16 | 16 (16.1) 17 | 7 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 24.5 | 23.5 (24.1) 24.5 | 7 |
| Depth orig. anal fin | 18.5 | 17.5 (18.3) 19.5 | 7 |
| Upper jaw length | 13.0 | 12.0 (12.7) 13.5 | 7 |
| Hor. eye window | 4.2 | 4.2 (4.5) 4.7 | 7 |
| Postorbital length | 15.5 | 14.0 (14.6) 15.5 | 7 |
| Preanal length | 47.5 | 43.0 (46.8) 49.5 | 7 |
| Predorsal length | 27.0 | 24.5 (26.3) 27.5 | 7 |
| Base of ventral fin to anal fin origin | 28.5 | 24.5 (27.8) 29.0 | 7 |
| Ventral fin length | 15.6 | 14.0 (15.9) 19.0 | 7 |
| Snout to ocellus | 47.5 | 44.5 (47.1) 49.0 | 7 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 7.4 | 6.7 (7.1) 7.4 | 7 |

two long rakers on upper branch, one long raker in angle, and seven long (6-7) and five short (5-7) rakers on lower branch; nine medium sized pseudobranchial filaments.

Sagittal otolith (Fig. 11B) twice as long as high, with pointed posterior end and partly with undulating edges; sulcus long and closed with not quite separated colliculi; ostium almost three times as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine 2/3 the length of second spine; vertebrae 3-7 with depressed neural spines (3-8); bases of vertebral spines 6-11 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12 (3-11); epipleural ribs indistinct.

Coloration. Dorsal fin with distinct ocellus just behind a line through anus, covering 11 dorsal fin rays - nos. 21-31 ( 9-11 dorsal fin rays – nos. 21-34); faint black blotch covering anterior three dorsal fin rays (covering two rays in two specimens and is absent in four specimens); dorsal part of head and body mottled with brown, otherwise uniformly light brown; eyes bluish; many small black dots on entire fish inclusive fins. Older specimens less mottled apparently due to bleaching.

Biology: The material holds five females and two males none of which is ripe. The stomach contents consist of gastropods and remains of crustaceans. All specimens were caught on the upper continental slope.

Distribution: All four localities are from off northwestern Australia (Fig. 2) at depths of 42-350 m.

Etymology: Named after the distribution of the species, Australia.

### *Neobythites bimaculatus* Nielsen, 1997

Figs. 2, 12, 13

*Neobythites bimaculatus* Nielsen, 1997: 62, fig. 11 (type locality: New Caledonia, 22°9'S, 167°7.7'E).

*Neobythites* sp. 3: Schwarzhans 1994: 76, fig. 51 (sagitta).

*Neobythites* sp.15: Schwarzhans 1994: 74, fig. 27 (sagitta).

Material examined (53 specimens, SL 73-304): Holotype: MNHN 1994-730 (SL 128), off New Caledonia.

Paratypes: MNHN 1994-731, 732 (3, SL 73-170) and ZMUC P771153 (1, SL 115), off New Caledonia.

See Nielsen (1997: 62) for station-data.

Additional material: USNM 309000, SL 116-125, 2 males and 1?, Macclesfield Bank, South China Sea (16°20'N, 114°39'E), R/V CAPE ST. MARY cr. 3/64 st. 57, 392-395 m, 20 June 1964; WAM P.31769-001, SL 123, male, off Rowley Shoals, Western Australia (17°17'S, 119°57'E), R/V UMITAKA MARU st. 5, trawl, 350 m, 20 Dec. 1969; WAM P.25400-012, SL 138, female, Browse Is., Western Australia (17°47'S, 123°18'E), R/V UMITAKA MARU st. 11, trawl, 242 m, 23 Dec. 1969; AMS I.22808-018, SL 95-135, 3 females, 3 males and 1 ?, north of Port Hedland, Western Australia (17°59'S, 118°17'E), R/V SOELA st. SO 2/82/17,18, Engel trawl, 404-420 m, 3 Apr. 1982; AMS I.22821-047, SL 127-148, 5 females, off Port Hedland, Western Australia (18°16'S, 118°12'E), R/V SOELA st. SO 2-82-36,37,38, Engel trawl, 298-320 m, 10 Apr. 1982; CSIRO CA 3813 and 3814, SL 138-282, female and male, west of Broome, Western Australia (17°56.7'S, 118°21.2'E), R/V SOELA st. SO 0183/69, 5 Feb. 1983; CSIRO B 4125, SL 157, female, off Rowley Shoals, Western Australia (17°34'S, 119°3'E), R/V SOELA st. SO 0183/73, 360 m, 6 Feb. 1983; WAM P.28057-002, SL 125, female, off Rowley Shoals, Western Australia (18°5'S, 118°6'E), 432 m, 17 Aug. 1983; WAM P.28058-008, SL 122, female, off Rowley Shoals, Western Australia (18°5'S, 118°10'E), 400 m, 17 Aug. 1883; WAM P.28071-010 (SL 140-153+, female and 1 male) and ZMUC P771326 (SL 140, female), off Rowley shoals, Western Australia (18°8'S, 118°13'E), 350-354 m, 17 Aug. 1983; WAM P.28076-003, SL 135, female, off Rowley Shoals, Western Australia (17°28'S,118°52'E), 428-433 m, 18 Aug. 1983; CSIRO CA 4430, SL 162, female, north of Broome, Western Australia (14°37.2'S, 121°47.4'E), R/V

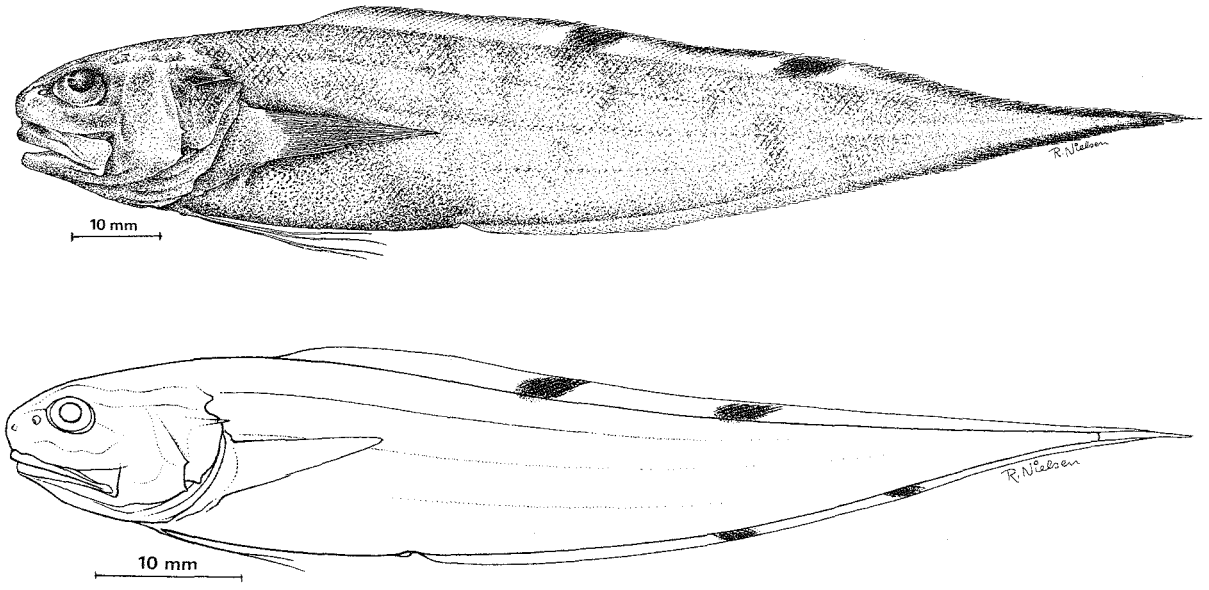


Fig. 12. *Neobythites bimaculatus*. A, holotype, MNHN 1994-730, SL 128; B, paratype, MNHN 1994-731, SL 73.

SOELA st. 0184/82, 16 Feb. 1984; LACM 43619-3, SL 111-127, 2 females, off Rowley Shoals, Western Australia (18°5'S, 118°8'E), 440-442 m, 22 Aug. 1983; WAM P.30578-006, SL 110, female, off Port Hedland, Western Australia (17°57'S, 118°17'E), R/V SOELA, trawl, 450-454 m, 27 Jan. 1984; WAM P.30579-003, SL 130+, female, off Broome, Western Australia (16°19'S, 120°17'E), RV SOELA, trawl, 496-500 m, 5 Feb. 1984; NTM S.12631-008, SL 137-296, 5 females, off Rowley Shoals, Western Australia (17°37'S, 118°40'E), W. Houston WH 85-21, 400 m, 4 Nov. 1985; NTM S.12614-045, SL 225+, male, off Rowley Shoals, Western Australia (17°39'S, 118°38'E), W. Houston WH 85-33, 410 m, 7 Nov. 1985; ASIZP 56352, SL 100, female, off Tachi, Taiwan, 2 May 1988; CSIRO H 2114-01, SL 104, female, off Western Australia (17°00'S, 120°11'E), R/V STRIKER shot 3, 405 m, 4 Apr. 1989; CSIRO H 2109-02, SL 148-157, 2 females and 1 male, off Rowley Shoals, Western Australia (16°52'S, 120°23'E), 405 m, 5 Apr. 1989; CSIRO H 2084-09, SL 131-145, female and male, off Rowley Shoals, Western Australia (17°1'S, 120°13'E), 392 m, 13 Apr. 1989; NTM S.12728-039, SL 150+-287, female and male, off Rowley Shoals, Western Australia (18°1'S, 118°23'E), D. Evans, 420 m, 6 Feb. 1990; NTM S.12727-013, SL 304, female, off Rowley Shoals, Western Australia (17°52'S, 118°28'E), D. Evans shot 3, 410 m, 9 Feb. 1990; NTM S.14378-002, SL 250+, male, off Cartier Reef, Timor Sea (13°7.89'S, 123°12.65'E), R. Williams RW 96-30, 420 m, 19 June 1996; MNHN 2000-0684, SL 195, female, Lakeba, off Fiji Is. (18°16'S, 178°41'E), Camp. Bordau 1, R/V ALIS st. CP 1468, trawl, 478-500 m, 7 May 1999.

Diagnosis: Hind margin of preopercle with two spines; two ocelli on middle part of dorsal fin; dorsal fin rays 99-106; anal fin rays 83-92; pectoral fin rays 26-28; long rakers on anterior gill arch 9-14;

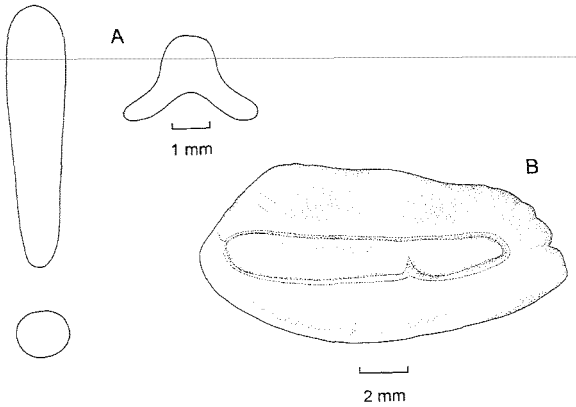


Fig. 13. *Neobythites bimaculatus*. A, basibranchial tooth patches and vomer of paratype, MNHN 1994-732, SL 170; B, median view of right sagitta, NTM, SL 268.

longest gill filaments on anterior arch 3.2-8.8 % length of head; pseudobranchial filaments 2-7; vomer tooth patch triangular to subtriangular (Fig. 13A); precaudal vertebrae 13; total vertebrae 57-62.

Similarity: *N. bimaculatus* seems most similar to *N. crosnieri* (cf. p. 27).

Description: The principal meristic and morphometric characters are shown in Table 6. Elongate fish with distinct lateral line; snout pointed to blunt, slightly shorter than diameter of eye; maxilla ends just behind eye; teeth granular; vomer triangular (most often in smaller specimens) to boomerang shaped and anterior basibranchial tooth patch rather narrow (Fig. 13A); anterior nostril with small tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches 2/3 from base to anal fin; anterior gill arch with 2-4 short and 1-2 long rakers on upper branch, one long raker in angle and lower branch with 8-9 long and 4-6 short rakers; 4-6 rather flat pseudobranchial filaments.

Sagittal otolith (Fig. 13B) 1.5 times as long as high with dorsal edge more flat than ventral; sulcus closed and ostium almost twice as long as cauda from which it is well separated.

Axial skeleton (from radiographs). Tips of neural and haemal spines thin and pointed except for a few specimens with blunt depressed neural spines; first neural spine1/2-2/3 the length of second spine; vertebrae 3-9 with depressed neural spines, a few specimens also with neural spines 1-2 depressed; bases of vertebrae 4-12 enlarged; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. Two ocelli (about size of eye) on middle third of dorsal fin, dark center of anterior ocellus covers 5-6 and that of posterior 4-6 dorsal rays; a few specimens with a posterior more faint, third dark blotch; distance from upper jaw symphysis to anterior edge of black part of ocellus is to 1st, 2nd and 3rd ocellus, respectively 41.0 (45.1) 49.5 - 60 (63.9) 68 - 73 (78.2) 80 % SL; the smallest specimen with two faint dark spots on anal fin (Fig. 12B); caudal and posterior part of dorsal and anal

Table 6. Meristic and morphometric characters of *N. bimaculatus*.

| | Holotype | 4 paratypes | HT, PT's + 41 spms | Nos |
|---|---|---|---|---|
| Standard length | 128 | 73-190 | 73-304 | 46 |
| Meristic characters | | | | |
| Dorsal finrays | 100 | 105 | 99 (101.6) 106 | 46 |
| Caudal finrays | 8 | 8 | 8 | 40 |
| Anal finrays | 86 | 88-92 | 83 (85.9) 92 | 44 |
| Pectoral finrays | 27 | 27-28 | 26 (27.2) 28 | 36 |
| Pseudobr. filaments | 6 | 6 | 2 (4.5) 7 | 42 |
| Precaudal vertebrae | 13 | 13 | 13 | 46 |
| Total vertebrae | 61 | 61-62 | 57 (59.3) 62 | 46 |
| Long rakers on ant. gill arch | 11 | 10-12 | 9 (11.9) 14 | 45 |
| Ant. dorsal ray above vertebra no. | 5 | 5-6 | 5 (5.7) 7 | 46 |
| Ant. anal ray below dorsal ray no. | 18 | 19 | 18 (19.7) 22 | 46 |
| Ant. anal ray below vertebra no | 15 | 15 | 14 (15.2) 16 | 46 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 22.5 | 21.0-22.0 | 19.5 (21.6) 24.5 | 46 |
| Depth orig. anal fin | 16.5 | 14.5-17.0 | 14.5 (15.8) 17.0 | 46 |
| Upper jaw length | 11.0 | 10.5-11.0 | 9.5 (10.7) 13.0 | 45 |
| Hor. eye window | 4.8 | 4.2-4.9 | 4.1 (4.8) 5.5 | 43 |
| Postorbital length | | 12.5 | 11.0 (13.0) 15.5 | 39 |
| Preanal length | 40.0 | 38.0-42.0 | 36.0 (41.2) 47.5 | 44 |
| Predorsal length | 25.0 | 23.5-24.5 | 21.5 (24.6) 29.0 | 40 |
| Base of ventral fin to anal fin origin | 24.0 | 22.0-24.5 | 22.0 (25.8) 32.0 | 45 |
| Ventral fin length | 16.0 | 13.0-15.5 | 11.5 (14.4) 17.0 | 46 |
| Snout to 1st ocellus | 48.5 | 44.5-48.5 | 41.0 (45.1) 49.5 | 42 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 6.0 | 5.9-6.7 | 3.2 (6.0) 8.8 | 43 |

fin dark; body brown dorsally and ventrally lighter with many tiny black spots; head and body mottled with about ten indicated, vertical, brown bars on some specimens, other specimens bleached; eye ring brown; abdomen light blue; eye and gill cover bluish.

Biology: The material consists of 38 females, 13 males and 2 unsexed specimens, with eggs up to 0.5 mm. Intestines often with remains of crustaceans and a few specimens with gastropods. All specimens were trawled on the upper continental slope.

Distribution: Known from 27 localities (Fig. 2) in three major areas: South China Sea, off Northwest Australia and off New Caledonia/Fiji. Considering the intensive fishing effort in the Philippine and Indonesian waters it is surprising that *bimaculatus* is not reported from here. Caught on depths of 242-500 m.

Remarks to material: Specimens from the three areas of distribution have been compared without revealing any differences.

### *Neobythites bimarginatus* Fourmanoir & Rivaton, 1979

Figs. 3, 14, 15

*Neobythites bimarginatus* Fourmanoir & Rivaton, 1979: 416, fig. 9 (type locality: west of Ile des Pins, New Caledonia).

*Neobythites bimarginatus*: Schwarzhans 1994: 74, fig. 29 (sagitta); Nielsen 1997: 63, fig. 12.

Material examined (13 specimens, SL 76-110): Holotype: MNHN 1978-472 (SL 109), off New Caledonia.

Paratype: MNHN 1978-473 (SL 97), off New Caledonia.

Non-types: MNHN 1994-733 to 738 (9, SL 77-110) and ZMUC P771154-1155 (2, SL 76-85), off New Caledonia.

See Nielsen (1997: 63) for station-data.

Diagnosis: Hind margin of preopercular without spines; distal and proximal parts of dorsal and anal fins light and middle part black; dorsal fin rays 106-110; anal fin rays 86-90; pectoral fin rays 32-33; long rakers on anterior gill arch 7-9; longest gill filaments on anterior arch 4.8-6.3 % length of head; pseudobranchial filaments 2; vomer tooth patch triangular (Fig. 15A); precaudal vertebrae 13-14; total vertebrae 59-62.

Similarity: *N. bimarginatus* seems most close to *N. musorstomi* with absence of preopercle spines and no dorsal fin ocelli and bars on body. It differs from *N. musorstomi* by having the median part of dorsal and anal fins black *vs* no black fins, 32-33 pectoral fin rays *vs* 27-29 and 7-9 long gill rakers *vs* 10-12.

Description: The principal meristic and morphometric characters are shown in Table 7. Elongate fish with lateral line visible, marked with brown pigment; snout rounded, longer then eye diameter; maxilla ends below posterior margin of eye; teeth granular; vomer triangular (Fig. 15A); middle part of anterior basibranchial tooth patch slightly constricted (Fig. 15A); anterior nostril with well developed tube and slightly larger posterior nostril with small flap; no spines on hind margin of preopercle;

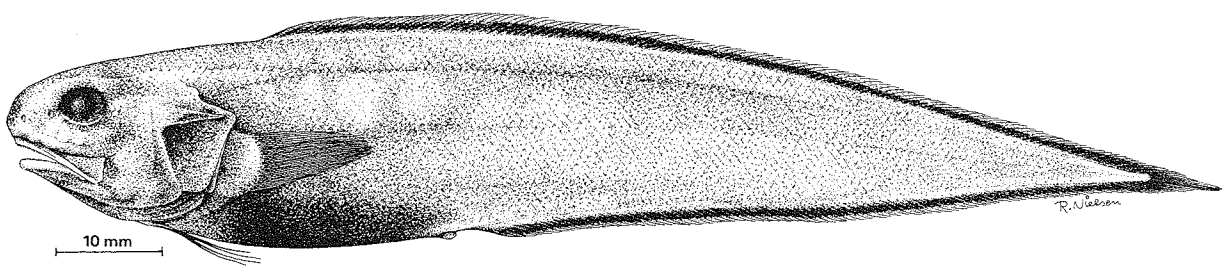


Fig. 14. *Neobythites bimarginatus*. A, holotype, MNHN 1978-472, SL 109.

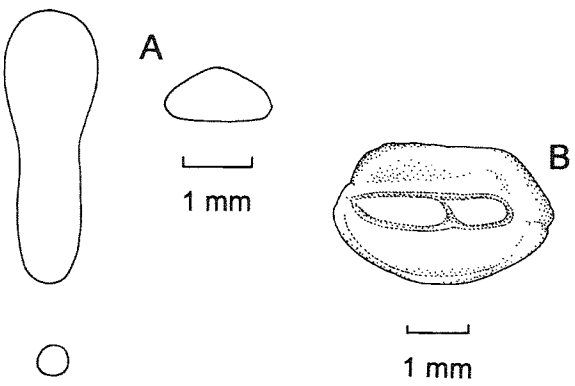


Fig. 15. *Neobythites bimarginatus*. A, basibranchial tooth patches and vomer of ZMUC P771155, SL 85; B, median view of right sagitta of ZMUC P771154, SL 76.

ventral fin reaches halfway from base to anal fin; anterior gill arch with 3-4 short and 0-1 long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 2-3 short rakers; two well developed pseudobranchial filaments.

Sagittal otolith (Fig. 15B) 1.5 times as long as high with smooth edges; sulcus closer to anterior than to posterior end; colliculi completely separated; ostium 1.5 times as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebrae 4-13 enlarged; short parapophyses on posterior 7-8 precaudal vertebrae; pleural ribs on vertebrae 3-14; epipleural ribs indistinct.

Coloration. Distal and proximal parts of dorsal and anal fins light and middle part black; peritoneum black and eyes bluish; series of 6-7 light areas on median part of body immediately behind head; several minute black spots on head and body.

Biology: Known from eight females, four males and one unsexed specimen caught on the upper part of the continental slope in bottom fishing gear. Seven specimens had gastropods in the intestines. It seems to be a species of small adult size as the gonads are rather well developed in specimens about 100 mm SL and the longest specimen known is 110 mm.

Distribution: Known from seven localities (Fig. 3) off New Caledonia and a few neighbouring islands at depths of 296-530 m.

Table 7. Meristic and morphometric characters of *N. bimarginatus*.

| | Holotype | Paratype | HT, PT and 11 spms. | Nos. |
|---|---|---|---|---|
| Standard length | 109 | 97 | 76-110 | 13 |
| Meristic characters | | | | |
| Dorsal finrays | 107 | 107 | 106 (107.8) 110 | 12 |
| Caudal finrays | 8 | 8 | 8 | 12 |
| Anal finrays | 86 | 87 | 86 (87.5) 90 | 13 |
| Pectoral finrays | 33 | 33 | 32 (32.8) 33 | 12 |
| Pseudobr. filaments | 2 | 2 | 2 | 8 |
| Precaudal vertebrae | 13 | 14 | 13 (13.9) 14 | 13 |
| Total vertebrae | 59 | 61 | 59 (60.5) 62 | 13 |
| Long rakers on ant. gill arch | 9 | 8 | 7 (7.9) 9 | 13 |
| Ant. dorsal ray above vertebra no. | 4 | 4 | 3 (3.4) 4 | 13 |
| Ant. anal ray below dorsal ray no. | 25 | 24 | 23 (23.8) 25 | 13 |
| Ant. anal ray be-low vertebra no | 14 | 16 | 14 (15.5) 16 | 13 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 19.5 | 20.5 | 19.0 (20.1) 21.0 | 13 |
| Depth orig. anal fin | 16.0 | 15.5 | 14.5 (15.7) 17.5 | 13 |
| Upper jaw length | 8.9 | 9.7 | 8.9 (9.7) 10.5 | 13 |
| Hor. eye window | 4.0 | 4.6 | 4.0 (4.8) 5.3 | 13 |
| Postorbital length | | | 11.5 | 2 |
| Preanal length | 39.5 | 41.5 | 37.0 (39.9) 43.5 | 12 |
| Predorsal length | 20.5 | 22.5 | 19.0 (21.7) 23.5 | 12 |
| Base of ventral fin to anal fin origin | 25.0 | 26.0 | 23.5 (25.7) 29.0 | 13 |
| Ventral fin length | 12.0 | 12.5 | 11.5 (12.2) 13.5 | 13 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 6.5 | 5.5 | 4.8 (5.4) 6.3 | 12 |

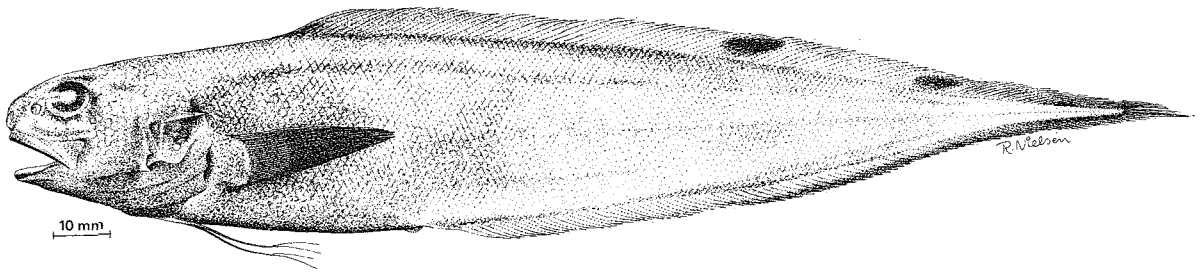


Fig. 16. *Neobythites crosnieri*. Holotype, ZM MGU P-18904, SL 192.

## *Neobythites crosnieri* Nielsen, 1995

Figs. 1, 16, 17

*Neobythites crosnieri* Nielsen, 1995: 4, fig. 3 (type locality: off Madagascar, 22°19.1S, 43°6.1E).

*Neobythites* sp. 3: Schwarzhans 1994: 74, figs. 12-14 (sagitta).

Material examined (5 specimens, SL 113-192): Holotype: ZM MGU P-18904 (SL 192), west of Madagascar.

Paratypes: MNHN 1992-532 to 534 (3, SL 113-165) and ZMUC P77823 (1, SL 125), west of Madagascar.

See Nielsen (1995: 4) for station-data.

Diagnosis: Hind margin of preopercle with two spines; two ocelli on posterior half of dorsal fin; posterior half of anal fin black; dorsal fin rays 94-98; anal fin rays 79-82; pectoral fin rays 25-27; long rakers on anterior gill arch 8-10; longest gill filaments on anterior arch 5.0-6.4 % length of head; pseudobranchial filaments 4-5; vomer tooth patch triangular (Fig. 17B); precaudal vertebrae 13-14; total vertebrae 57-58.

Similarity: *N. crosnieri* seems most close to *N. bimaculatus* with two preopercular spines and dorsal fin with two ocelli the black centre of which is equal to size of eye. They differ from each other by *N. crosnieri* having the anterior ocellus placed far behind a line through anus *vs* just behind anus and less fin rays in dorsal (94-98 *vs* 99-106) and anal fin (79-82 *vs* 83-92).

Description: The principal meristic and morphometric characters are shown in Table 8. Elongate fish with indistinct lateral line; snout blunt slightly longer than eye window; maxilla ends well behind posterior margin of eye; teeth granular; vomer triangular (Fig. 17B); anterior basibranchial tooth patch long and rather narrow (Fig. 17A); anterior nostril with flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches 1/2 to 2/3 of distance from base to anal fin; anterior gill arch with 2-3 short and 1-2 long rakers on upper branch, one long raker in angle and lower branch with 6-7 long and 6-7 short rakers; 4-5 pseudobranchial filaments.

Sagittal otolith (Fig. 17C) twice as long as high with smooth edges; sulcus long and colliculi partly separated with ostium twice the length of cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebrae 3-10 enlarged; parapophyses on posterior 7-8 precaudal vertebrae; pleural ribs on all precaudal verte-

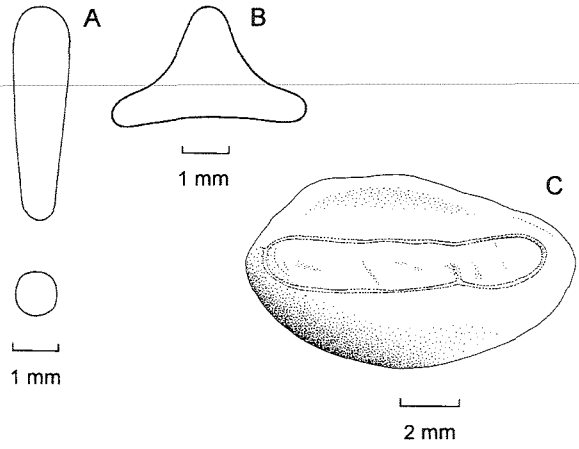


Fig. 17. *Neobythites crosnieri*. A, basibranchial tooth patches of paratype, ZMUC P77823, SL 125; B, vomer of holotype; C, median view of right sagitta of holotype.

Table 8. Meristic and morphometric characters of *N. crosnieri*.

| | Holotype | HT + 4 paratypes | Nos |
|---|---|---|---|
| Standard length | 192 | 113-192 | 5 |
| Meristic characters | | | |
| Dorsal finrays | 98 | 94 (97.0) 98 | 5 |
| Caudal finrays | 8 | 8 | 5 |
| Anal finrays | 82 | 79 (80.2) 82 | 5 |
| Pectoral finrays | 26 | 25 (25.6) 27 | 5 |
| Pseudobr. filaments | 4 | 4 (4.4) 5 | 5 |
| Precaudal vertebrae | 14 | 13 (13.8) 14 | 5 |
| Total vertebrae | 58 | 57 (57.6) 58 | 5 |
| Long rakers on ant. gill arch | 9 | 8 (8.6) 10 | 5 |
| Ant. dorsal ray above vertebra no. | 6 | 5 (5.2) 6 | 5 |
| Ant. anal ray below dorsal ray no. | 19 | 19 (20.2) 21 | 5 |
| Ant. anal ray below vertebra no | 15 | 15 | 5 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 21.0 | 21.0 (21.9) 22.5 | 5 |
| Depth orig. anal fin | 18.0 | 16.5 (17.2) 18.0 | 5 |
| Upper jaw length | 9.9 | 9.9 (10.7) 11.5 | 5 |
| Hor. eye window | 4.2 | 4.2 (4.7) 5.0 | 5 |
| Postorbital length | | 12.5 | 1 |
| Preanal length | 41.5 | 39.5 (41.3) 43.0 | 5 |
| Predorsal length | 25.0 | 25.0 (25.4) 26.0 | 5 |
| Base of ventral fin to anal fin origin | 20.0 | 20.0 (22.2) 25.0 | 5 |
| Ventral fin length | 12.0 | 12.0 (13.5) 15.0 | 3 |
| Snout to 1st ocellus | 65 | 59 (62) 65 | 5 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 5.0 | 5.0 (5.7) 6.4 | 5 |

brae except for two anterior ones; epipleural ribs indistinct.

Coloration. Body mottled brown; two distinct ocelli on posterior half of dorsal fin; outer edge of posterior dorsal and anal fins and caudal fin dark; edge of mouth, oral cavity and peritoneum dark; eyes bluish.

Biology: Known from two females and three males none of which is ripe. Caught on the upper part of the continental slope. Three specimens with unidentifiable remains of crustaceans in the intestine.

Distribution: Known from six localities (Fig. 1) off the west coast of Madagascar from 125-350 m depth.

## *Neobythites fasciatus* Smith & Radcliffe, 1913

Figs. 2, 18, 19

*Neobythites fasciatus* Smith & Radcliffe *in* Radcliffe, 1913: 142, pl. 7, fig. 4 (type locality: off Luzon, 13º40'9"N, 120º59'30"E).

*Neobythites fasciatus*: Shen 1984: 18, fig. 186-5; Schwarzhans 1994: 74, figs. 4-5 (sagitta).

*Neobythites fasciatus* (non Smith & Radcliffe): Kamohara 1952: 92 and 1954: 13-14 (*N. stigmosus*); Okamura 1982: 182, fig. 108 (*N. stigmosus*); Shcherbachev *et al.*1986: 203 (*N. multifasciatus*).

Material examined (10 specimens, SL 40-179): Holotype: USNM 74129, SL 179, female, off Luzon, Philippines (13°40'9"N, 120°59'30"E);

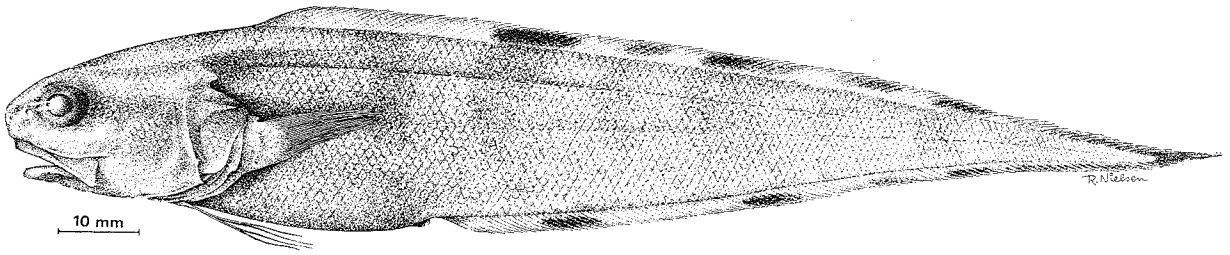


Fig. 18. *Neobythites fasciatus*. Paratype, USNM 99064, SL 137.

R/V ALBATROSS st. 5290, beam trawl, 392 m, 22 July 1909.

Paratypes: USNM 99055, SL 146-172, female and male, off northern Luzon (18°34'15"N, 121°51'15"E), R/V ALBATROSS st. 5325, beam trawl, 410 m, 12 Nov.1908; USNM 99259, SL 135, female, off northern Mindanao (8°47'N, 123°31'15"E), R/V ALBATROSS st. 5519, beam trawl, 333 m, 9 Aug. 1909; USNM 99064, SL 137-139, 1 female and 1 male, and BMNH 1939.4.1.9, SL 130, off Mindanao, Philippines (8°48'44"N, 123°27'35"E), R/V ALBATROSS st. 5523, beam trawl, 10 Aug. 1909.

Non-types: MNHN 1984-637, SL 179, female, Philippines, MUSORSTOM 2, Fourmanoir; PMBC 17718, SL 125, female, Andaman Sea (7°15'N, 97°53'E), R/V CHAKRATONG TONGYAI st. J7, Agassiz trawl, 356-360 m, 17 Feb. 2000.

Tentatively referred specimen: ZMUC P771292, SL 40, off Mindanao, Philippines (7°25'N, 123°14'E), Th. Mortensen Pacific Exped. 1914-16, Sigsbee trawl, 463 m, 9 Mar. 1914.

Diagnosis: (excl. tentatively referred specimen). Hind margin of preopercle with two spines; about six vertical, dark bands on body, each ending with an ocellus or dark blotch on dorsal and anal fins; dorsal fin rays 99-106; anal fin rays 84-89; pectoral fin rays 24-27; long rakers on anterior gill arch 8-10; longest gill filaments on anterior gill arch 5.9-10.5 % length of head; pseudobranchial filaments 2-8; vomer tooth patch subtriangular (Fig. 19A); precaudal vertebrae 12-14; total vertebrae 58-61.

Similarity: *N. fasciatus* seems most similar to *N. multistriatus* with two preopercular spines and several vertical bars on body ending as ocelli or dark blotches on dorsal and anal fin. They differ by *N. fasciatus* having 8-10 long gill rakers *vs* 13-15 rakers and anterior ocellus posterior to line through anus *vs* well in front of line.

Description: The principal meristic and morphometric characters are shown in Table 9. Elongate fish with indistinct lateral line; snout blunt shorter than diameter of eye window; maxilla ends just posterior to eye; teeth granular; vomer subtriangular with convex posterior edge and anterior basibranchial tooth patch becoming more narrow posteriorad (Fig. 19A); anterior nostril with small flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about halfway from base to anal fin; anterior gill arch with two short and 2-3 long rakers on upper branch, one long rakers in angle and lower branch with seven long and 5-6 short rakers; 3-8 pseudobranchial filaments.

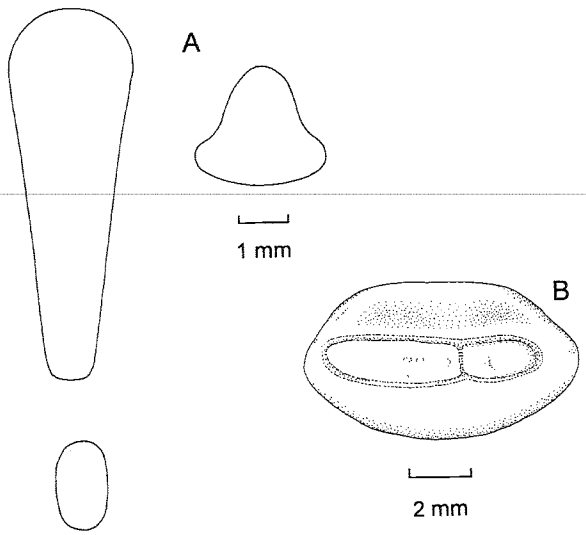


Fig. 19. *Neobythites fasciatus*. A, basibranchial tooth patches and vomer of paratype, USNM 99064, SL 137; B, median view of right sagitta of paratype, USNM 99055.

Sagittal otolith (Fig. 19B) almost twice as long as high, oval with smooth edges; sulcus closed and colliculi completely separated; ostium almost twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-7 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-14; epipleural ribs indistinct.

Coloration. Fig. 18 is based on a paratype after 90 years of preservation. Fig. 4 in Smith & Radcliffe (1913) shows the same number of ocelli and blotches in dorsal (six) and anal (4-5) fins but the vertical bars (six) are much more pronounced.

Biology: The material examined consists of five females, two males and two unsexed none of which is ripe. No recognizable stomach contents were observed. Caught on the upper continental slope.

Distribution: Known from seven localities (Fig. 2) in the Philippine Archipelago and the Andaman Sea from 333-463 m depth.

Remarks on material: One specimen is tentatively referred to *N. fasciatus* even though its meristic and morphometric characters correspond well with Table 9 and the body is provided with seven vertical bars. However, each preopercle is provided with one weak spine only which cannot be explained by its small standard length (40 mm) as preopercle spines develop at smaller lengths in other species (e. g. *N. stefanovi*).

Table 9. Meristic and morphometric characters of *N. fasciatus**.

| | Holotype | 6 paratypes | HT, PT's + 1 spm | Nos |
|---|---|---|---|---|
| Standard length | 179 | 130-172 | 130-179 | 8 |
| Meristic characters | | | | |
| Dorsal finrays | 100 | 99-106 | 99 (101.9) 106 | 8 |
| Caudal finrays | | 8 | 8 | 7 |
| Anal finrays | 85 | 84-89 | 84 (86.1) 89 | 8 |
| Pectoral finrays | 27 | 24-27 | 24 (25.1) 27 | 7 |
| Pseudobr. filaments | 3 | 3-7 | 2 (4.5) 8 | 7 |
| Precaudal vertebrae | 12 | 13-14 | 12 (13.1) 14 | 8 |
| Total vertebrae | 58 | 58-61 | 58 (59.4) 61 | 8 |
| Long rakers on ant. gill arch | 8 | 9-11 | 8 (9.1) 10 | 8 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 5 (5.1) 6 | 8 |
| Ant. anal ray below dorsal ray no. | 19 | 18-21 | 18 (19.4) 21 | 8 |
| Ant. anal ray below vertebra no | 15 | 14-16 | 14 (15.0) 16 | 8 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 21.0 | 19.5-23.5 | 19.5 (20.9) 22.0 | 8 |
| Depth orig. anal fin | - | 14.5-17.0 | 14.5 (15.5) 17.0 | 5 |
| Upper jaw length | 10.0 | 9.2-10.5 | 9.2 (9.9) 10.5 | 8 |
| Hor. eye window | 5.1 | 4.5-5.8 | 4.5 (5.1) 5.8 | 8 |
| Postorbital length | - | 11.0-12.5 | 11.0 (12.2) 14.0 | 5 |
| Preanal length | 42.0 | 38.0-40.5 | 38.0 (39.9) 42.0 | 8 |
| Predorsal length | 25.0 | 23.0-25.0 | 23.0 (24.3) 26.5 | 8 |
| Base of ventral fin to anal fin origin | 28.0 | 23.5-26.5 | 23.5 (26.4) 30.0 | 8 |
| Ventral fin length | 14.0 | 10.5-13.0 | 10.5 (12.4) 14.0 | 7 |
| Snout – 1st ocellus | 44.5 | 40.5-44.0 | 40.5 (42.8) 44.5 | 7 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 8.2 | 5.9-10.5 | 5.9 (8.0) 10.5 | 7 |

• Tentatively referred specimen not included

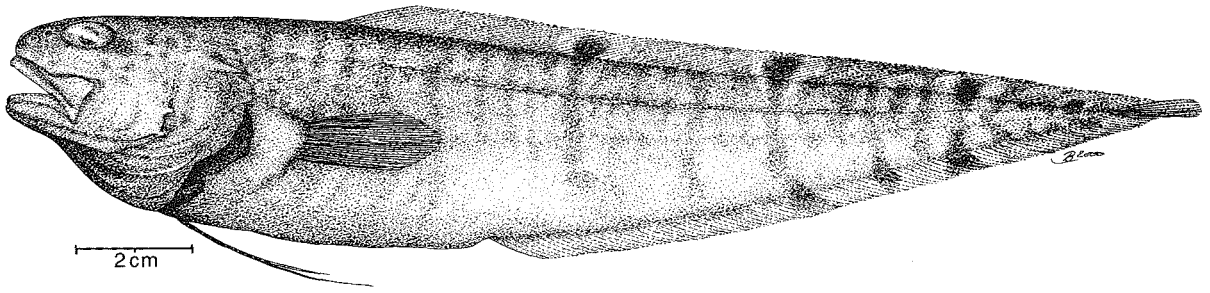


Fig. 20. *Neobythites fijiensis* n. sp. Holotype, MNHN 2000- 685, SL 188.

***Neobythites fijiensis* n. sp.**
Figs. 3, 20, 21

Material examined (9 specimens, SL 83-290): Holotype: MNHN 2000-685, SL 188, male, Natewa Bay, Fiji Is.(16°39'S, 179°37'W), CAMP. BORDAU 1, R/V ALIS st. CP 1406, beam trawl, 360-380 m, 25 Feb. 1999.

Paratypes: MNHN 2000-1561, SL 83-133, 2 females and 1 ?, sama data as for holotype; MNHN 2000-686 (SL 222-290, 2 females) and ZMUC P771320 (SL 195, male), Natewa Bay, Fiji Is.(16°40'S, 179°39'W), CAMP. BORDAU 1, R/V ALIS st. 1407, beam trawl, 499-527 m, 25 Feb. 1999.

Tentatively referred specimens: ZMUC P771316-1317, SL 196-275, male and female, off Bali, JETINDOFISH, TGT, bottom trawl, 1981.

Diagnosis: (excl. tentatively referred specimens). Hind margin of preopercle with two spines, lower spine the larger; dorsal fin with three and anal fin with two ocelli; dorsal fin rays 98-102; anal fin rays 84-87; pectoral fin rays 25-28; long rakers on anterior gill arch 10-12; longest gill filaments on anterior arch 4.0-6.0 % length of head; pseudobranchial filaments 5-7; vomer tooth patch boomerang shaped (Fig. 21A); precaudal vertebrae 12-13; total vertebrae 58-61.

Similarity: *N. fijiensis* seems most similar to *N. stigmosus* with two preoperculer spines, ocelli on dorsal and anal fins and indistinct vertical bars on body. They differ by *fijiensis* having only three ocelli on dorsal fin (*vs* 4-7) and a larger head (21.0-23.5 *vs* 17.5-20.0 % SL). See also comparison to *soelae* on page 80.

Description: The principal meristic and morphometric characters are shown in Table 10. Holotype (differences with paratypes in brackets). Rather elongate fish with distinct lateral line; snout blunt; mouth broad with maxilla ending below posterior eye margin; teeth granular; vomer boomerang shaped and anterior basibranchial tooth patch long and rather narrow (Fig. 21A); anterior nostril with large flap and larger posterior nostril a mere hole; opercular spine straight (four paratypes with downward bent spine) hind margin of preopercle with two spines; ventral fin reaches 2/3 from base to anal fin; anterior gill arch with three (2-3) short and two

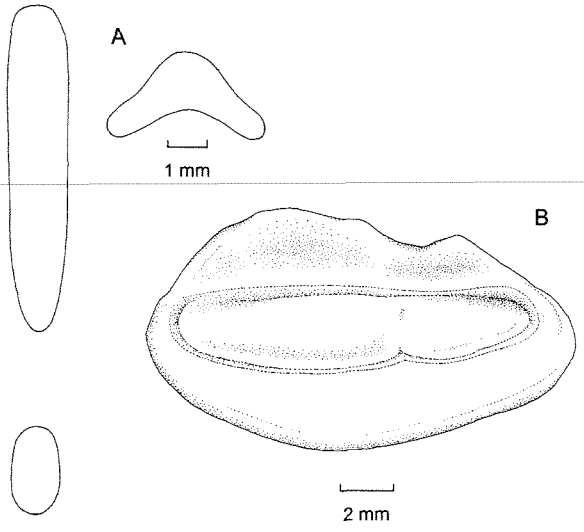


Fig. 21. *Neobythites fijiensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of paratype, MNHN 2000-686, SL 290.

(2-3) long rakers on upper branch, one long raker in angle and lower branch with seven (6-9) long and five (4-6) short rakers, long rakers relatively slender in small specimens; five (5-7) pseudobranchial filaments.

Sagittal otolith (Fig. 21B) elongate with undulating dorsal rim about twice as long as high; sulcus large and closed with only partly separated colliculi; ostium almost twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines thin and pointed except for precaudal vertebrae 3-9 (3-8) with depressed and rather blunt neural spines; first neural spine half length of second spine (1/2-2/3); bases of vertebral spines 5-13 enlarged; parapophyses on posterior six precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. Dorsal fin with three ocelli of which anterior covers fin rays nos. 25-30 placed 47.5 (43.5-49.5) % SL behind upper jaw symphysis, middle covers nos. 45-49 placed 66 (60-67) % SL behind upper jaw symphysis and posterior covers nos. 70-75 placed 81 (77-84) % SL behind upper jaw symphysis; anal fin with two ocelli with anterior covering rays nos. 32-37 placed 69 (64-70) % SL behind upper jaw symphysis and posterior covering nos. 52-57 placed 81 (78-85) % SL behind upper jaw symphysis; dorsal part of head and body with dark brown pigmentation and ventral part light with tiny black spots; indistinct vertical, dark bars on body in small specimen; eye, posterior part of operculum and abdomen bluish.

Biology: The material consists of five females, three males and one unsexed, none of which is ripe. No recognizable stomach contents. Caught on the upper continental slope. Three specimens had in the gill cavity a 15-20 mm long crustacean *Lironeca* aff. *reynaudi* (Edwards, 1840), family Cymothoidae.

Distribution: Known from two localities off Fiji Is. (Fig. 3) at 360-527 m depth. The two tentatively referred specimens are from off Bali.

Etymology: Named after the type locality, Fiji.

Table 10. Meristic and morphometric characters of *N. fijiensis*.

| | Holotype | HT and 6 paratypes | Nos | Tent. ref. spms. |
|---|---|---|---|---|
| Standard length | 188 | 83-290 | 7 | 196-275 |
| Meristic characters | | | | |
| Dorsal finrays | 99 | 98 (100.3) 102 | 7 | 102-103 |
| Caudal finrays | 8 | 8 | 7 | 8 |
| Anal finrays | 84 | 84 (85.7) 87 | 7 | 85 |
| Pectoral finrays | 27 | 25 (26.7) 28 | 6 | 27-28 |
| Pseudobr. filaments | 5 | 5 (5.6) 7 | 7 | 4-5 |
| Precaudal vertebrae | 13 | 12 (12.9) 13 | 7 | 13 |
| Total vertebrae | 58 | 58 (59.9) 61 | 7 | 60-61 |
| Long rakers on ant. gill arch | 10 | 10 (10.7) 12 | 7 | 13 |
| Ant. dorsal ray above vertebra no. | 6 | 5 (5.9) 6 | 7 | 5 |
| Ant. anal ray below dorsal ray no. | 21 | 18 (19.4) 21 | 7 | 20-21 |
| Ant. anal ray below vertebra no | 16 | 15 (15.1) 16 | 7 | 15-16 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 23.5 | 21.0 (22.6) 23.5 | 7 | 23.5-24.0 |
| Depth orig. anal fin | 18.0 | 15.0 (16.4) 18.0 | 7 | 16.0 |
| Upper jaw length | 11.5 | 10.5 (11.2) 11.5 | 7 | 11.5-12.5 |
| Hor. eye window | 5.2 | 4.9 (5.1) 5.4 | 7 | 5.4-6.1 |
| Postorbital length | 13.5 | 11.5 (13.0) 14.0 | 7 | 14.0-14.5 |
| Preanal length | 43.0 | 40.5 (42.9) 47.5 | 7 | 40.0-41.5 |
| Predorsal length | 26.5 | 24.0 (25.1) 26.5 | 7 | 25.0-25.5 |
| Base of ventral fin to anal fin origin | 23.5 | 23.5 (25.2) 27.5 | 7 | 24.5-27.5 |
| Ventral fin length | 16.0 | 15.0 (16.1) 17.0 | 7 | 15.0-17.0 |
| Snout to 1st ocellus | 47.5 | 43.5 (46.5) 49.5 | 7 | - |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | - | 4.0 (5.0) 6.0 | 6 | 7.5-7.6 |

Remarks on material: The two tentatively referred specimens agree with *N. fijiensis* in sagitta morphology and in most meristic and morphometric characters. However, due to a few diverging characters (cf. Table 10) and especially the much bleached condition they cannot be referred to *fijiensis* with certainty.

## *Neobythites franzi* n. sp.

Figs. 2, 22, 23, 24

Material examined (10 specimens, SL 32-102): Holotype: NTM S-11782-004, SL 99, female, off Dunk Is., Queensland (18°1'S, 147°7'E), R/V SOELA st. HL 86-36, bottom trawl, 298-300 m, 20 June 1986.

Paratypes: AMS I-15528-004, SL 33, off Brisbane, Queensland (26°31'S, 153°53'E), coll. A. Bruce, Agassiz trawl, 366-373 m, 27 July 1968; AMS I-15534-011, SL 32, off Brisbane, Queensland (26°47'S, 153°47'E), coll. A. Bruce, Agassiz trawl, 362 m, 28 July 1968; AMS I-25827-004, SL 88, north of Townsville, Queensland (18°3'S, 147°9'E), R/V SOELA, bottom trawl, 300 m, 17 Jan. 1986; NTM S-11779-004, SL 78, female, off Dunk Is., Queensland (18°0'S, 147°4'E), R/V SOELA st. HL 83-33, bottom trawl, 260 m, 19 Jan. 1986; NMV A6907, SL 92-93, female and male, off Dunk Is., Queensland (18°1'S, 147°8'E), R/V SOELA st. SO 1/86/69, bottom trawl, 298-300 m, 20 Jan. 1986; NTM S-11782-004, SL 102, female, same data as for holotype; AMS S-25826-008 (SL 97, female) and ZMUC P771332 (SL 95, male), north of Townsville, Queensland (17°57'S, 147°5'E), 300 m, 1986.

Diagnosis: Hind margin of preopercle with two spines; no ocelli or bars; dorsal fin rays 93-98; anal fin rays 77-81; pectoral fin rays 24-27; long rakers on anterior gill arch 10-12; longest gill filaments on anterior arch 2.9-5.3 % length of head; pseudobranchial filaments 3-6; vomer tooth patch subtriangular (Fig. 23A); precaudal vertebrae 13; total vertebrae 55-57.

Similarity: *N. franzi* seems most similar to *N. purus* and *N. sivicola* with two preopercular spines, no pigmentation and relatively few rays in dorsal and anal fins and few long gill rakers. Franz Uiblein, University of Salzburg, kindly made a principal components and discriminant functions analyses of the three species which clearly shows that they are well separated especially in meristic characters (Fig. 24 A,B). The most salient characters used are number of rays in pectoral fin, number of pseudobranchial filaments and length of head, upper jaw, predorsal and postorbital.

Description: The principal meristic and morphometric characters are shown in Table 11. Holotype (differences with paratypes are in brackets). Elongate, compressed fish with indistinct lateral line; slightly pointed snout shorter than diameter of eye window; maxilla ends just behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch large (Fig. 23A); anterior nostril with small flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about halfway from base

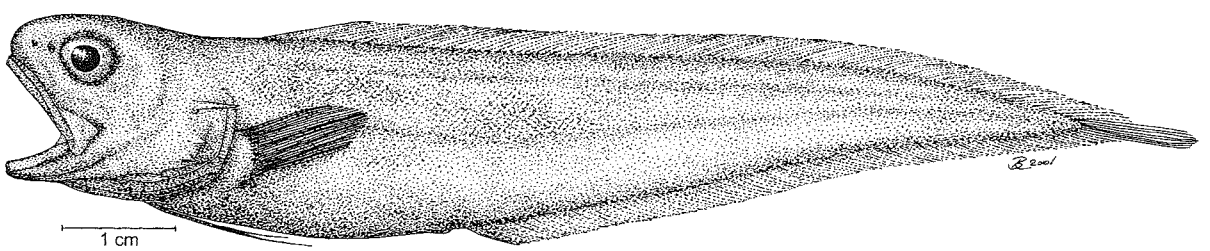


Fig. 22. *Neobythites franzi* n. sp. Holotype, NTM S.11782-004, SL 99.

to anal fin; anterior gill arch with three (2-3) short and three (2-3) long rakers on upper branch, one long raker in angle and lower branch with six (7-8) long and four (4-6) short rakers; five (3-6) small pseudobranchial filaments.

Sagittal otolith (Fig. 23B) oval with pointed posterior end and smooth edges, one and a half times as long as high; sulcus with partly separated colliculi; ostium almost twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. No indication of ocelli, blotches or bars; the only pigmentation is sparse tiny, black spots on head and ventral part of body; otherwise light brown with bluish eyes and abdomen.

Biology: The material consists of six females, two males and two unsexed specimens none of which is fully ripe. In some specimens, however, the ovaries are rather well developed and considering that the largest specimen is 102 mm *N. franzi* must be regarded a species of small adult size. Stomach contents consist of unidentifiable remains of crustaceans. Caught on upper part of the continental slope.

Distribution: Known from seven localities off Queensland (Fig. 3) at a depth of 260-373 m.

Etymology: Named after Franz Uiblein with whom I have had many fruitful discussions on *Neobythites* problems.

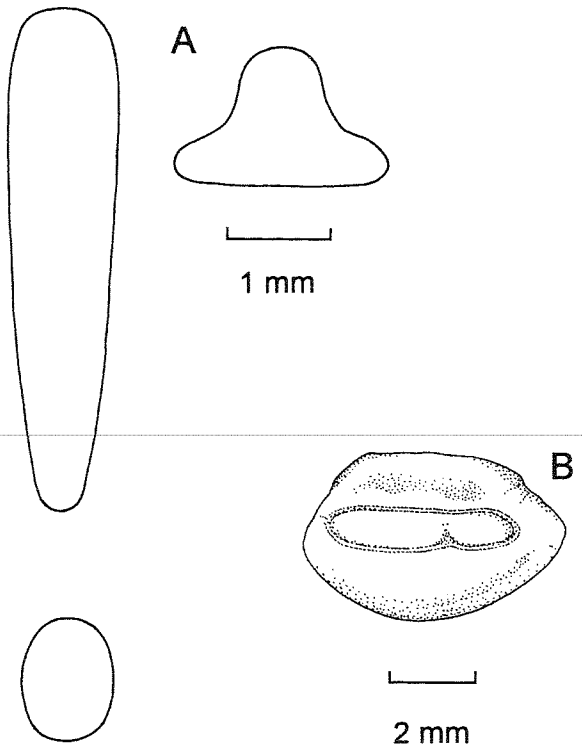


Fig. 23. *Neobythites franzi* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

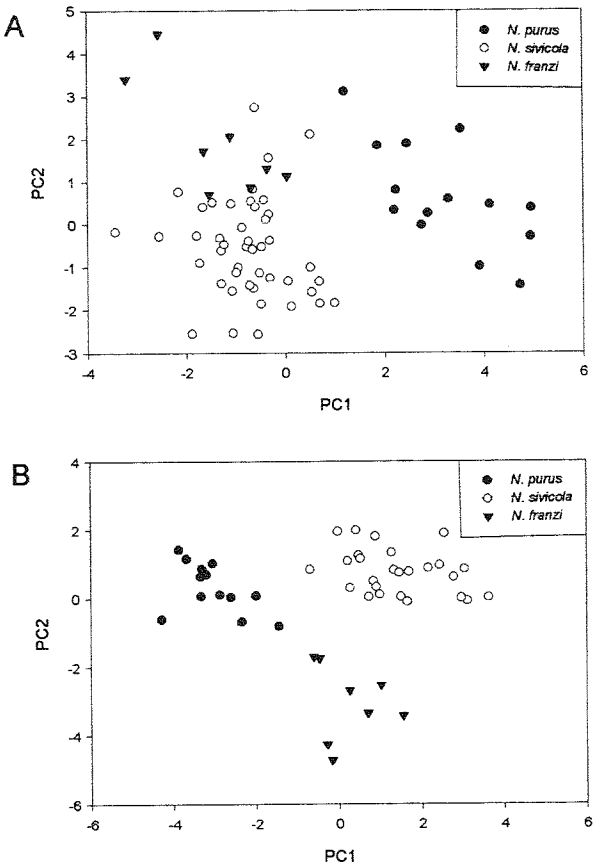


Fig. 24. A principal components analyses. A, morphometric characters; B, meristic characters. PC1 = most separating character; PC2 = second most separating character.

Table 11. Meristic and morphometric characters of *N. franzi*.

| | Holotype | HT + 9 paratypes | Nos |
|---|---|---|---|
| Standard length | 99 | 32-102 | 10 |
| Meristic characters | | | |
| Dorsal finrays | 94 | 93 (95.4) 98 | 10 |
| Caudal finrays | 8 | 8 | 8 |
| Anal finrays | 79 | 77 (79.2) 81 | 10 |
| Pectoral finrays | 26 | 24 (25.2) 27 | 10 |
| Pseudobr. filaments | 5 | 3 (4.4) 6 | 8 |
| Precaudal vertebrae | 13 | 13 | 10 |
| Total vertebrae | 56 | 55 (55.9) 57 | 10 |
| Long rakers on ant. gill arch | 10 | 10 (10.8) 12 | 8 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.3) 6 | 10 |
| Ant. anal ray below dorsal ray no. | 20 | 18 (19.7) 21 | 10 |
| Ant. anal ray below vertebra no | 15 | 14 (14.9) 16 | 9 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 20.5 | 20.0 (20.7) 21.5 | 8 |
| Depth orig. anal fin | 16.0 | 14.5 (15.4) 16.0 | 8 |
| Upper jaw length | 10.5 | 9.2 (10.3) 11.5 | 8 |
| Hor. eye window | 5.1 | 4.5 (5.2) 5.8 | 8 |
| Postorbital length | 11.0 | 11.0 (11.5) 12.0 | 8 |
| Preanal length | 43.0 | 37.5 (39.6) 43.0 | 8 |
| Predorsal length | 23.0 | 21.0 (22.8) 24.0 | 8 |
| Base of ventral fin to anal fin origin | 25.5 | 23.5 (24.6) 26.0 | 8 |
| Ventral fin length | 11.5 | 10.0 (12.2) 15.0 | 8 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 5.0 | 2.9 (4.6) 5.3 | 8 |

## *Neobythites javaensis* n. sp.

Figs. 3, 25, 26

Material examined (4 specimens, SL 62-111): Holotype: ZMUC P771295, SL 111, male, off Java (8°30'S, 114°38'E), Th. Mortensen Pacific Exped. 1929-30, Sigsbee trawl, ca. 450 m, 7 Apr. 1929.

Paratypes: ZMUC P771296-1298, SL 62-81, 1 female and 2? (same data as for holotype).

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with 8-10 and anal fin with 3-5 dark blotches or ocelli; 8-10 dark, narrow bars on body; dorsal fin rays 99-103; anal fin rays 82-87; long rakers on anterior gill arch 11-13; longest gill filaments on anterior arch 5.4-6.3 % length of head;

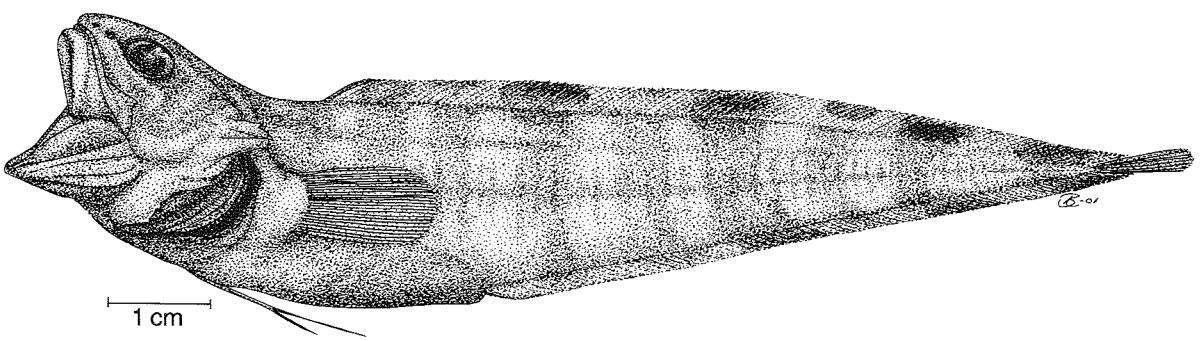


Fig. 25. *Neobythites javaensis* n. sp. Holotype, ZMUC P771295, SL 111.

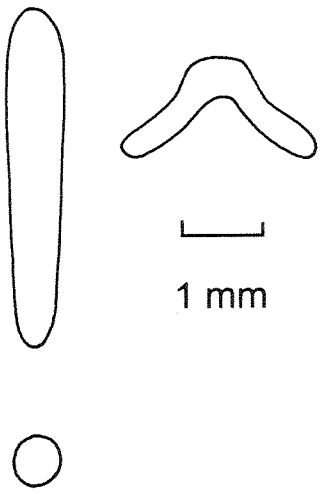


Fig. 26. *Neobythites javaensis* n. sp. Basibranchial tooth patches and vomer of holotype.

pseudobranchial filaments 4-5; vomer tooth patch boomerang shaped (Fig. 26); precaudal vertebrae 13-14; total vertebrae 59-60.

Similarity: *N. javaensis* seems most similar to *N. zonatus* with two preopercular spines, 5-10 bands on body and length of head 21.0-24.0 % SL. They differ by *javaensis* having more bands (8-10 *vs* 5-6) and 3-5 blotches on anal fin (*vs* no blotches on anal fin).

Description: The principal meristic and morphometric characters are shown in Table 12. Holotype (differences with paratypes in brackets). Elongate, compressed fish with indistinct lateral line; snout pointed equal in length to eye window; maxilla ends just behind eye; teeth granular; vomer boomerang shaped and anterior basibranchial tooth patch long and narrow (Fig. 26); anterior nostril with low rim and larger posterior nostril a mere hole; ventral fin reaches a little more than halfway from base to anal fin; anterior gill arch with two (1-2) short and three (2-3) long rakers on upper branch, one long raker in angle, and lower branch with nine (8-9) long and five (3-5) short rakers; five (4-5) pseudobranchial filaments.

Sagittal otolith disintegrated due to long period of preservation in formaldehyde.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 2-8 (3-10)

Table 12. Meristic and morphometric characters of *N. javaensis*.

| | Holotype | HT and 3 paratypes | Nos |
|---|---|---|---|
| Standard length | 111 | 62-111 | 4 |
| Meristic characters | | | |
| Dorsal finrays | 99 | 99 (101.0) 103 | 4 |
| Caudal finrays | 8 | 8 | 4 |
| Anal finrays | 82 | 82 (84.3) 87 | 4 |
| Pectoral finrays | 26 | 25 (26.5) 28 | 4 |
| Pseudobr. filaments | 5 | 4 (4.8) 5 | 4 |
| Precaudal vertebrae | 14 | 13 (13.3) 14 | 4 |
| Total vertebrae | 59 | 59 (59.3) 60 | 4 |
| Long rakers on ant. gill arch | 13 | 11 (12.3) 13 | 4 |
| Ant. dorsal ray above vertebra no. | 6 | 6 | 4 |
| Ant. anal ray below dorsal ray no. | 20 | 19 (20.0 ) 21 | 4 |
| Ant. anal ray below vertebra no | 16 | 15 (15.5) 16 | 4 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.0 | 22.0 (22.6) 23.0 | 4 |
| Depth orig. anal fin | 16.5 | 15.5 (16.5) 17.5 | 4 |
| Upper jaw length | 11.5 | 11.5 (11.5) 12.0 | 4 |
| Hor. eye window | 5.3 | 4.8 (5.1) 5.3 | 4 |
| Postorbital length | 12.5 | 12.5 (13.3) 14.0 | 4 |
| Preanal length | 44.5 | 40.0 (42.5) 44.5 | 4 |
| Predorsal length | 24.5 | 23.0 (24.4) 26.0 | 4 |
| Base of ventral fin to anal fin origin | 24.5 | 23.5 (24.1) 24.5 | 4 |
| Ventral fin length | 15.5 | 14.5 (15.3) 16.0 | 4 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 6.3 | 5.4 (5.8) 6.3 | 3 |

with depressed neural spines; bases of vertebral spines 4-9 (5-10) enlarged; parapophyses on posterior 8-14 (8-13) precaudal vertebrae; pleural ribs on vertebrae 3-13 (3-12); epipleural ribs indistinct.

Coloration. Dorsal fin with eight (9-10) ocelli and blotches, continuing on body as dark bars; three (3-4) ocelli on anal fin; dorsal part of head and body brownish, lighter ventrally; eye and peritoneum bluish. The smallest paratype, SL 62, differs from the rest of the material (SL 72-111) by having dorsal fin with three ocelli and three blotches only and anal fin with posterior half blackish without ocelli or blotches, apparently a juvenile condition.

Biology: The material consists of two females, one male and one unsexed none of which is ripe. No recognizable stomach contents. Caught on the upper continental slope.

Distribution: Known from one locality off Java (Fig. 3) at about 450 m depth.

Etymology: Named after the type locality, Java.

## *Neobythites kenyaensis* Nielsen, 1995

Figs. 1, 27, 28

*Neobythites kenyaensis* Nielsen, 1995: 5, fig. 4 (type locality: off Kenya, 2º50'S, 40º31'E).

*Neobythites steatiticus* (non Alcock): Norman 1939: 76 (in part).

*Neobythites* sp. 7: Schwarzhans 1994: 76, fig. 70 (sagitta).

Material examined (3 specimens, SL 103+ 140):

Holotype: RUSI 13952 ( SL 124+), off Kenya.

Paratype: BMNH 1939.5.24.1439, (SL 103+), off Tanzania.

See Nielsen (1995: 5) for station-data.

Additional material: USNM 340896, SL 140, female, off Kenya (2º56'S, 40º28'E), R/V ANTON BRUUN cr. 8 st. 421G, bottom trawl, 240 m, 8 Nov.1964.

Material: Both the holotype and paratype have lost part of the caudal but a third intact specimen now makes it possible to show the number of rays in dorsal and anal fin, the vertebral count and morphometric characters.

Diagnosis: No spines on hind margin of preopercle; two distinct ocelli on dorsal fin, the anterior and smaller one in front of anus and the posterior and larger well behind anus; dorsal fin rays 98; anal fin rays 83; pectoral fin rays 29; developed rakers on anterior gill arch 9-10; longest gill filament on anterior arch 6.9-8.3 % length of head; pseudobranchial filaments 2-3; precaudal vertebrae 13; total vertebrae 58.

Similarity: None of the other *Neobythites* species without spines on preopercle have two distinct ocelli in dorsal fin. Among those with spines on preopercle only two species have two dorsal ocelli placed like *N. kenyaensis,* viz. *N. australiensis* and *longiventralis* both with very long ventral fins.

Description: Meristic characters: Dorsal fin rays 98, caudal fin rays 8, anal fin rays 83; pectoral fin rays 29; anterior dorsal fin above vertebrae nos. 4-5; anterior anal fin ray below vertebrae nos. 15-16 and dorsal fin rays nos. 20-22; precaudal vertebrae 13 and caudal vertebrae 45; developed rakers on

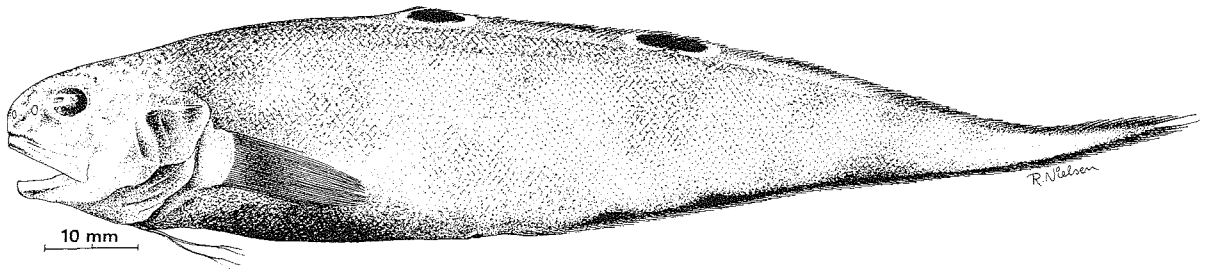


Fig. 27. *Neobythites kenyaensis*. Holotype, RUSI 13952, SL 124+.

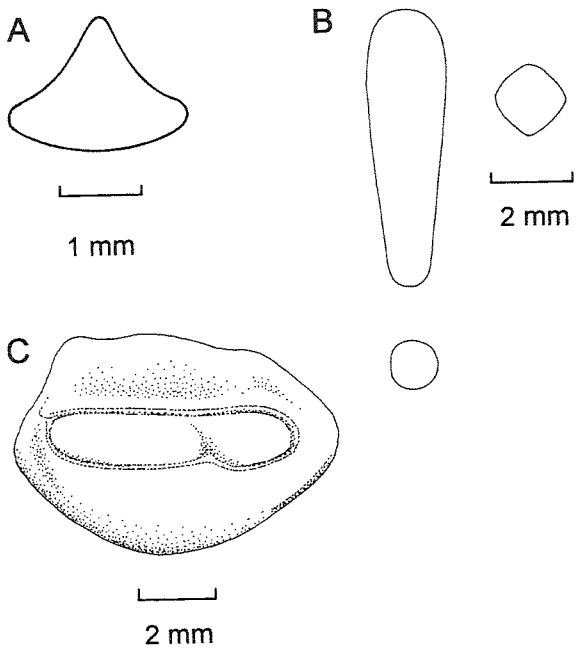


Fig. 28. *Neobythites kenyaensis*. A, vomer of holotype; B, basibranchial tooth patches and vomer of USNM 340896, SL 140; C, median view of right sagitta of USNM 340896.

anterior gill arch 9-10; pseudobranchial filaments 2-3; black part of 1st ocellus covering 6-8 dorsal fin rays (nos. 12-20) and of 2nd ocellus 8-9 dorsal fin rays (nos. 35-44). Morphometric characters: In % of SL: Length of head 20.0; depth at origin of anal fin 18.5; upper jaw 9.6; horizontal eye window 4.8; postorbital 11.5; preanal 44.5; predorsal 24.0; from base of ventral fins to anal fin 26.0; ventral fin 10.5; from upper jaw symphysis to 1st ocellus 31.5 and to 2nd ocellus 55. In % of head length: Longest filament on anterior gill arch 6.9-8.3. General description: Elongate fish with anterior 3/4 of lateral line distinct; snout blunt and slightly shorter than eye window; maxilla ends below posterior margin of eye; teeth granular except needle-like in upper jaw of holotype; vomer tooth patch subtriangular in holo- and paratype and diamond shaped in nontype, anterior basibranchial tooth patch rather short and broad (Figs. 28A,B); anterior nostril with low tube and larger posterior nostril a mere hole; hind margin of preopercle without spines or flat processes; ventral fin reaches one third from base to anal fin; anterior gill arch with 2-3 small knobs and two long rakers on upper branch, one long raker the angle, and lower branch with 6-7 long rakers and 6-7 small knobs; 2-3 well developed pseudobranchial filaments.

Sagittal otolith (Fig. 28C) 1.5 times as long as high, with somewhat undulating anterior and posterior edges; sulcus with separated colliculi; cauda about half the length of ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-7 with depressed neural spines; bases of vertebral spines 4-9 enlarged; parapophyses on posterior 6-7 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs indistinct.

Coloration. Body mottled brown with 5-7 indistinct, broad, darker, vertical bars; peritoneum and eye bluish; two ocelli on dorsal fin, the smaller anterior one placed in front of a line through anus and the larger posterior well behind; posterior third of dorsal, caudal and posterior 5/6 of anal fin dark; lips with or without brown pigmentation.

Biology: One unripe female and two specimens not sexed. Caught on the upper continental slope. The intestines contained unidentifiable remains of crustaceans.

Distribution: Known from three localities off Zanzibar and Kenya (Fig. 1) at 238-293 m depth.

## *Neobythites longipes* Smith & Radcliffe, 1913

Figs. 2, 29, 30

*Neobythites longipes* Smith & Radcliffe *in* Radcliffe, 1913: 139, pl. 7, fig. 1 (type locality: Philippines, 6°2'N, 120°44'40"E).

*Neobythites longipes*: de Beaufort & Chapman 1951: 416; Gloerfelt-Tarp & Kailola 1984: 89 (colour photo); Paxton *et al.* 1989: 313; Schwarzhans 1994: 76, figs. 52-54 (sagitta).

Material examined (32 specimens, SL 90-301): Holotype: USNM 74126, SL 276, female, off Jolo, Philippines (6°2'N, 120°44'40"E), R/V ALBATROSS st. 5550, trawl, 472 m, 17 Sep. 1909.

Paratypes: USNM 99091, SL 207, male, and BMNH 1939.4.1.10, SL 185+, male, off Jolo, Philippines (6°1'15"N, 120°44'20"E), R/V ALBA-

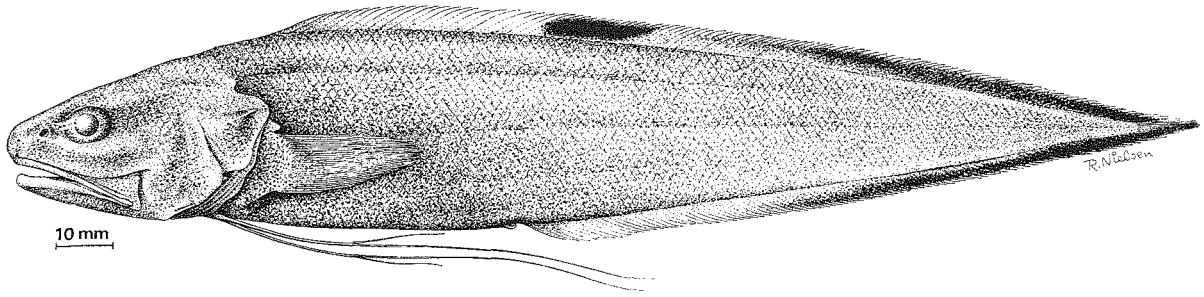


Fig. 29. *Neobythites longipes*. Paratype, USNM 99091, SL 207.

TROSS st. 5549, trawl, 481 m, 17 Sep. 1909; USNM 99070, SL 165-242, 2 females, Philippines (5°50'N, 120°31'E), R/V ALBATROSS st. 5564, dredge, 432 m, 21 Sep. 1909; USNM 99073, SL 90, female, off Borneo (4°52'45"N, 119°6'45"E), R/V ALBATROSS st. 5580, trawl, 296 m, 25 Sep. 1909.

Non-types: ZMUC P779, SL 195, female, off Jolo, Philippines, Th. Mortensen, trawl, 463 m, 27 Mar. 1914; WAM P.29125-001, SL 163, female, Rowley Shoals, Western Australia (17°27'S, 119°44'E), R/V UMITAKA MARU, trawl, 20 Dec. 1969; ZMUC P77740, SL 98, male, southeast of Lombok (ca. 9°S, 117°E), JETINDOFISH TGT 1718, trawl, 150-280 m, July 1981; AMS I.22808-019, SL 204, female, 220 km north of Port Hedland, Western Australia (17°59'S, 118°17'E), R/V SOELA st. SO 2/82/17,18, Engel trawl, 404-420 m, 3 Apr. 1982; AMS I.22821-027, SL 165-180, female and male, 190 km northwest of Port Hedland (18°16'S, 118°12'E), R/V SOELA st. SO 2/82/36,37,38, Engel trawl, 298-320 m, 10 Apr. 1982; AMS I.23425-007, SL 240-242, 2 males, northwest shelf, Western Australia (18°46'S, 117°00"E), R/V SOELA st. SO 4/82/leg1, bottom trawl, 400 m, 1 Aug. 1982; CSIRO CA3916-17-18-19, SL 212-301, 2 females and 2 males, off Port Hedland, Western Australia (17°45.1'S, 118°30.4'E), R/V SOELA st. SO 183/70, 442-460 m, 5 Feb. 1983; CSIRO CA3996, SL 155-245, 8 specimens, northwest shelf, Western Australia (17°34.5'S, 119°3.9'E), R/V SOELA st. SO 183/73, 318-360 m, 6 Feb. 1983; WAM P.28081-001, SL 230, female, 45 km northeast of Rowley Shoals, Western Australia (17°44'S, 120°5'E), Sinclair and Berry, 431-433 m, 20 Aug. 1983; NTM S.12588-020, SL 194, female, off Rowley Shoals, Western Australia (17°22'S, 118°38'E), W. Houston st. WH 85-15, 430 M, 2 Nov. 1985; NTM S.12631-005, SL 226-264, 1 female and 2 males, off Rowley Shoals, Western Australia (17°37'S, 118°40'E), W. Houston st. WH 85-21, 400 m, 4 Nov. 1985; NTM S.14378-001, SL 245, male, off Cartier Reef, Timor Sea (13°7.89'S, 123°12.65'E), R. Williams st. RW 96-30, 420 m, 19 June 1996.

Diagnosis: No spines on hind margin of preopercle; one large ocellus on dorsal fin just behind a line through anus, distal part of anal fin black; ventral fin ends posterior to anus; dorsal fin rays 96-103; anal fin rays 79-86; pectoral fin rays 27-30; long rakers on anterior gill arch 8-10; longest gill filaments on anterior arch 5.7-11.0 % length of head; pseudobranchial filaments 5-10; vomer tooth patch boomerang shaped (Fig. 30A); precaudal vertebrae 13-14; total vertebrae 57-60.

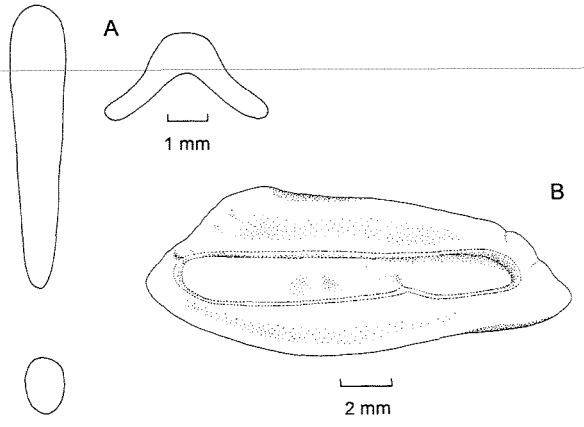


Fig. 30. *Neobythites longipes*. A, basibranchial tooth patches and vomer of paratype, USNM 99070, SL 165; B, median view of right sagitta of paratype, USNM 99070, SL 242.

Similarity: *N. longipes* seems most close to *N. malayanus* with absence of preopercular spines and dark bars on body, one distinct ocellus on dorsal fin and distal part of anal fin black. They differ by *longipes* having very long ventral fins (28.5-54 *vs* 15.5 % SL) and in many meristic characters (Tables 13 *vs* 16).

Description: The principal meristic and morphometric characters are shown in Table 13. Elongate fish with distinct lateral line; snout pointed and slightly longer than diameter of eye window; maxilla ends well behind eye; teeth granular; vomer tooth patch boomerang shaped and anterior basibranchial tooth patch rather narrow (Fig. 30A); anterior nostril with low rim and larger posterior nostril a mere hole; hind margin of preopercle with flat, broad process; ventral fin reaches just or well beyond origin of anal fin, its length shows positive allometric growth; anterior gill arch with two long rakers on upper branch, one long raker in angle, and lower branch with 5-7 long rakers; short rakers above and below long rakers extremely small; 5-10 small pseudobranchial filaments.

Sagittal otolith (Fig. 30B) very elongate, almost three times as long as high, highest anteriorly; sulcus dominating with not quite separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for blunt depressed spines on vertebrae 3-9; first neural spine 1/2-4/5 length of second spine; bases of vertebral spines 3-9 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 7-13; epipleural ribs on vertebrae 3-10.

Coloration. Dorsal fin with an ocellus just behind a line through anus; dorsal fin posterior to ocellus dark brown; distal part of entire anal fin black; older material with black on anterior part of anal fin bleached; dorsal part of head and body brownish, some specimens with a horizontal brown line in front of eyes; many tiny black spots on ventral part of head and body; eye and peritoneum bluish.

Table 13. Meristic and morphometric characters of *N. longipes*.

| | Holotype | 5 paratypes | HT, PT's + 18 spms | Nos |
|---|---|---|---|---|
| Standard length | 276 | 90-242 | 90-301 | 24 |
| Meristic characters | | | | |
| Dorsal finrays | 103 | 102-103 | 96 (106.5 103 | 23 |
| Caudal finrays | 8 | 8 | 8 | 22 |
| Anal finrays | 84 | 84-85 | 79 (82.4) 86 | 23 |
| Pectoral finrays | 27 | 27-29 | 27 (28.5) 30 | 17 |
| Pseudobr. filaments | 6 | 5-8 | 5 (7.2) 10 | 19 |
| Precaudal vertebrae | 13 | 14 | 13 (13.9) 14 | 23 |
| Total vertebrae | 59 | 59 | 57 (58.3) 60 | 23 |
| Long rakers on ant .gill arch | 8 | 8-9 | 8 (8.9) 10 | 22 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 5 (5.0) 6 | 22 |
| Ant. anal ray below dorsal ray no. | 22 | 21 | 19 (21.1) 22 | 23 |
| Ant. anal ray below vertebra no | 16 | 15-16 | 15 (16.0)17 | 23 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 24.5 | 23.0-25.5 | 22.5 (23.5) 25.5 | 23 |
| Depth orig. anal fin | - | 15.5-17.5 | 13.5 (15.4) 17.5 | 22 |
| Upper jaw length | 12.0 | 12.0-13.5 | 12.0 (12.5)13.5 | 23 |
| Hor. eye window | 4.6 | 4.1-5.0 | 3.9 (4.4) 5.0 | 23 |
| Postorbital length | - | 12.5-15.5 | 12.5 (13.7) 15.5 | 22 |
| Preanal length | 48.5 | 41.0-45.0 | 41.0 (43.7) 48.5 | 22 |
| Predorsal length | 27.0 | 23.5-26.5 | 23.0 (25.4) 28.5 | 23 |
| Base of ventral fin to anal fin origin | 30.5 | 23.5-28.5 | 23.5 (26.1) 30.5 | 23 |
| Ventral fin length | 54 | 28.5-47.0 | 28.5 (36.5) 54 | 23 |
| Snout to 1st ocellus | 53 | 40.5-53 | 40.5 (48.1) 53 | 23 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 11.0 | 7.2-11.0 | 5.7 (7.6) 11.0 | 22 |

Biology: The material consists of 14 females, 10 males and eight unsexed specimens. No recognizable stomach contents. Caught on the upper continental slope.

Distribution: Known from 16 localities (Fig. 2) from Philippines to off Western Australia at 150-481 m depth.

## *Neobythites longispinis* n. sp.

Figs. 3, 31, 32

*Neobythites* sp. 15 (in part): Schwarzhans 1994: 74, fig. 28.

Material examined (2 specimens, SL145-191): Holotype: USNM 309001, SL 191, female, Macclesfield Bank, South China Sea (16°10'6"N, 114°29'12"E), R/V CAPE ST. MARY cr. 3/64 st. 13, 307-311 m, 12 June 1964.

Paratype: USNM 365705, SL 145, male, same data as for holotype.

Diagnosis: Two long spines on hind margin of preopercle; opercular spine reaching beyond posterior margin of opercle; no ocelli or bars; dorsal fin rays 104-105; anal fin rays 87-90; pectoral fin rays 26-27; developed rakers on anterior gill arch 10-11; longest fill filaments on anterior arch 6.8-7.0 % length of head; pseudobranchial filaments 5-6; vomer tooth patch boomerang shaped (Fig. 32A); precaudal vertebrae13; total vertebrae 60-61.

Similarity: *N. longispinis* seems most similar to *N. neocaledoniensis* with two preopercular spines, no ocelli and bars, dorsal fin with 104-106 fin rays and anal fin with 87-90 fin rays. They differ by the more slender body of *longispinis* (depth at origin of anal 13.5-14.0 *vs* 16.0-18.0 % SL), the form of vomer (Figs. 32A *vs* 56A) and opercular spine reaching beyond posterior margin of opercle (*vs* spine ending on opercle).

Description of holotype (differences with paratype in brackets).

Meristic characters: Dorsal fin rays 105 (104), caudal fin rays 8, anal fin rays 90 (87) and pectoral fin rays 26 (27); anterior dorsal fin ray above vertebra no. 6 (5); anterior anal fin ray below vertebra no. 15 and dorsal fin ray no. 20 (19); precaudal vertebrae 13; caudal vertebrae 48 (47); developed rakers on anterior gill arch 10 (11), pseudobranchial filaments 5 (6).

Morphometric characters: In % of SL: Length of head 21.0 (21.5); depth at origin of anal fin 13.5 (14.0); upper jaw 10.0 (10.5); horizontal eye window 5.0 (5.2); postorbital 12.0 (12.5); preanal 40.5; predorsal 22.5 (24.0); from base of ventral fin to anal fin 24.5 (25.0); ventral fin 15.0 (13.0). In % of head length: Longest filament on anterior gill arch 6.8 (7.0).

General description: Elongate, slender fish with indistinct lateral line; snout blunt, equal in length to eye window; maxilla ends just behind eye; teeth granular; vomer boomerang shaped and short distance between basibranchial tooth plates, posterior of which almost square (Fig. 32A); anterior nostril with large flap and larger posterior nostril a mere hole; hind margin of preopercle with two well developed spines; ventral fin reaches a little more than halfway between base to anal fin; anterior gill arch with three (3-4) short and two long rakers on anterior arch, one long raker in angle, and lower

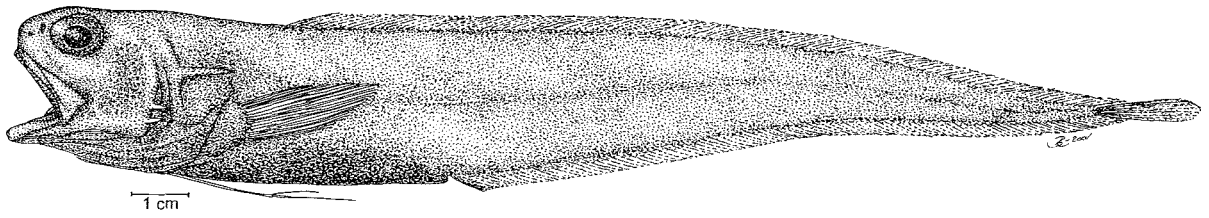


Fig. 31. *Neobythites longispinis* n. sp. Holotype, USNM 309001, SL191.

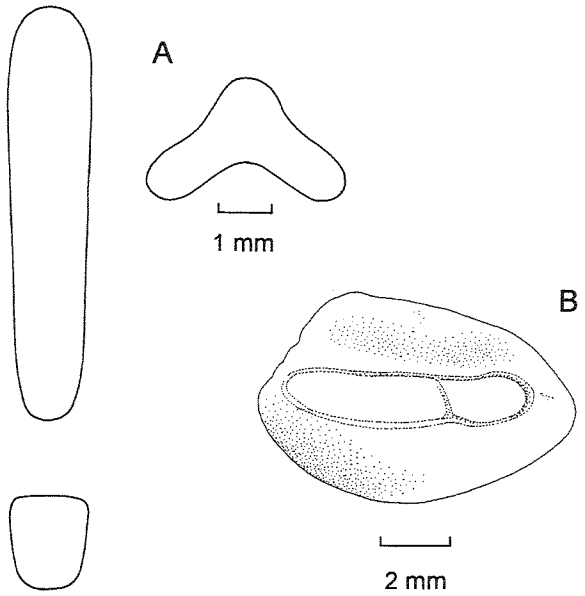


Fig. 32. *Neobythites longispinis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of paratype, USNM 365705, SL 145.

branch with seven (eight) long and 6-7 (5-6) short rakers; five (six) short pseudobranchial filaments.

Sagittal otolith (Fig. 32B) short and highest anteriorly, height 70 % of length; sulcus closed with completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for tblunt, depressed spines on vertebrae 3-8; first neural spines half length of second spine; bases of vertebrae 5-11 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12, epipleural ribs indistinct.

Coloration. Except for bluish eyes and peritoneum specimens light brown (cf. "Remarks on material" below).

Biology: The material consists of one female and one male neither of which is ripe. No identifiable stomach contents. Caught on the upper continental shelf.

Distribution: Known from the type locality (Fig. 3), the South China Sea, at 307-311 m depth.

Etymology: The name refers to the long opercular and preopercular spines.

Remarks on material: The present two specimens were caught in the same trawl haul as three specimens of *N. bimaculatus*. The five specimens have been kept together ever since so the lack of ocelli in *longispinis* is not a result of bleaching as the ocelli are well preserved in the *bimaculatus* specimens.

## *Neobythites longiventralis* Nielsen, 1997

Figs. 2, 33, 34

*Neobythites longiventralis* Nielsen, 1997: 66, fig. 13 (type locality: New Caledonia, 18°59.3'S, 163°25'E).

Material examined (7 specimens, SL 108-148): Holotype: MNHN 1994-739 (SL 137), off New Caledonia.

Paratype: MNHN 1994-740 (SL 108), off New Caledonia.

See Nielsen (1997: 66) for station-data.

Additional material: MNHN 2000-1562, SL 123, female, off Mindora, Philippines (12°5.6'N, 121°15.6'E), MUSORSTOM 3, R/V CORIOLIS st. 120, beam trawl, 219-220 m, 3 June 1985; MNHN 2000-680 (SL 148, male) and ZMUC P771324 (SL 132, female), off Lakeba, Fiji Is.(18°12'S, 178°36'W), CAMP. BORDAU 1, R/V ALIS, CP 1467, beam trawl, 417-427 m, 6 Mar. 1999; MNHN 2000-679, SL 147, female, Yangasa Cluster, Fiji Is.(18°42'S, 178°26'W), CAMP. BORDAU 1, R/V ALIS st. CP 1500, beam trawl, 366-389 m, 12 Mar. 1999; MNHN 2000- 678, SL 134, male, Yangasa Cluster, Fiji Is.(18°40'S, 178°30'W), CAMP. BORDAU 1, R/V ALIS CP 1501, beam trawl, 350-357 m, 12 Mar. 1999.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with 2-3 ocelli, smaller anterior one placed on first dorsal rays and other 1-2 well behind line through anus; ventral fin ends well behind anus (32.0-34.5 % SL); dorsal fin rays 90-94; anal fin rays 73-76; pectoral fin rays 25-27; long

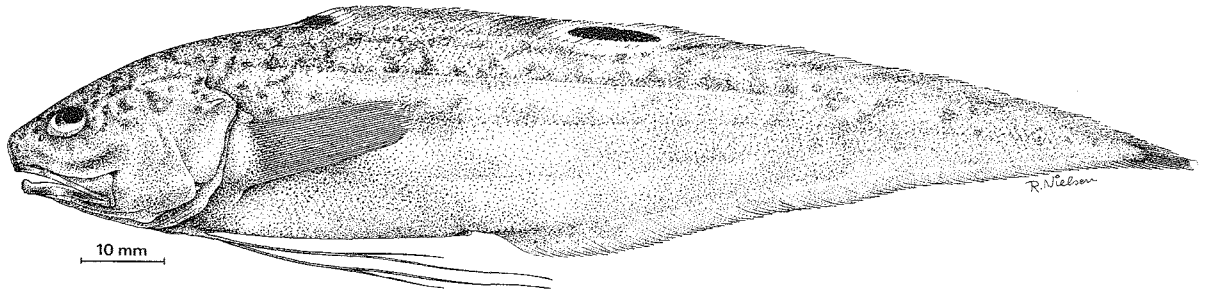


Fig. 33. *Neobythites longiventralis*. Holotype, MNHN 1994-739, SL 137.

rakers on anterior gill arch 10-12; longest gill filaments on anterior arch 5.3-8.3 % length of head; pseudobranchial filaments 4-6; vomer tooth patch boomerang shaped (Fig. 34A); precaudal vertebrae 13; total vertebrae 53-55.

Similarity: *N. longiventralis* seems most similar to *N. australiensis* (cf. p. 20).

Description: The principal meristic and morphometric characters are shown in Table 14. Elongate fish with indistinct lateral line; snout blunt, almost equal in length to eye window, maxilla ends well posterior to eye; teeth granular; vomer boomerang shaped and anterior basibranchial tooth patch long and narrow (Fig.34A); anterior nostril with small flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches well beyond origin of anal fin; anterior gill arch with 2-4 short and two long rakers, one long raker in angle and lower branch with 7-9 long and 4-5 small rakers (all short rakers very small); 4-6 small pseudobranchial filaments.

Sagittal otolith (Fig. 34B) oval with undulating dorsal rim and about twice as long as high; sulcus not quite separated into colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for blunt, depressed spines on vertebrae 3-9; first neural spine1/2-3/4 length of second spine; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. Dorsal fin with 2-3 ocelli; black part of anterior covers first 2-4 dorsal fin rays, second ocelli covers 8-10 dorsal fin rays (nos. 21-31) and one of the seven specimens also with a third ocellus placed 69 % SL behind upper jaw symphysis covering seven rays (nos. 45-51); often 3-4 brown blotches on dorsal fin behind posterior ocellus; anal fin with or without brown pigmentation; ventral part of head and body with many tiny, black spots; dorsal part of head and body marbled brown; eye and peritoneum bluish.

Biology: The material consists of four females and three males none of which is ripe. Many specimens with remains of crustaceans and one with gastropods in the intestine. Caught on the upper continental slope.

Distribution: Known from six localities (Fig. 2) from the Philippines over New Caledonia to the Fiji Is. at 219-427 m depth.

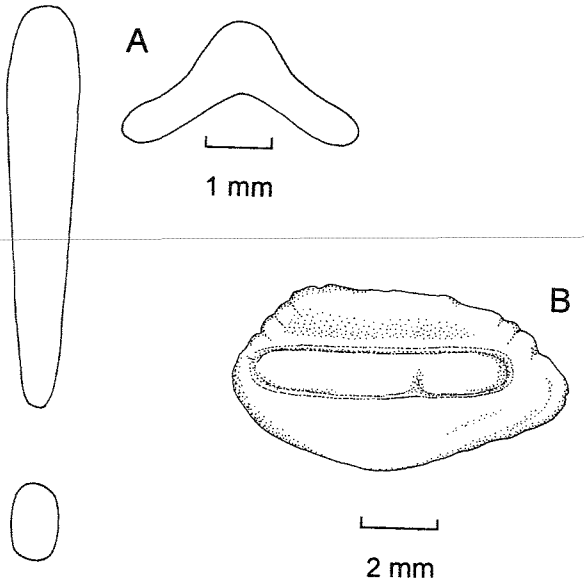


Fig. 34. *Neobythites longiventralis*. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

Table 14. Meristic and morphometric characters of *N. longiventralis*.

| | Holotype | HT, PT + 5 spms | Nos |
|---|---|---|---|
| Standard length | 137 | 108-148 | 7 |
| Meristic characters | | | |
| Dorsal finrays | 91 | 90 (91.6) 94 | 7 |
| Caudal finrays | 8 | 8 | 6 |
| Anal finrays | 76 | 73 (75.0) 76 | 7 |
| Pectoral finrays | 26 | 25 (26.0) 27 | 7 |
| Pseudobr. filaments | 4/5 | 4 (5.0) 6 | 7 |
| Precaudal vertebrae | 13 | 13 | 7 |
| Total vertebrae | 54 | 53 (54.1) 56 | 7 |
| Long rakers on ant. gill arch | 11 | 10 (11.1) 12 | 7 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 7 |
| Ant. anal ray below dorsal ray no. | 20 | 20 (20.6) 22 | 7 |
| Ant. anal ray below vertebra no | 15 | 15 (15.3) 16 | 7 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.0 | 22.0 (23.2) 24.0 | 7 |
| Depth orig. anal fin | 18.5 | 14.5 (17.1) 18.5 | 7 |
| Upper jaw length | 12.5 | 11.0 (11.8) 12.5 | 7 |
| Hor. eye window | 4.7 | 4.7 (5.0) 5.5 | 7 |
| Postorbital length | 14.0 | 13.0 (13.7) 14.5 | 7 |
| Preanal length | 43.0 | 42.5 (44.6) 47.5 | 7 |
| Predorsal length | 26.5 | 25.5 (25.6) 27.5 | 7 |
| Base of ventral fin to anal fin origin | 24.5 | 23.0 (24.6) 25.5 | 7 |
| Ventral fin length | 32.0 | 32.0 (33.3) 34.5 | 5 |
| Snout to 2nd ocellus | 50 | 46.0 (47.2) 50 | 7 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 7.9 | 5.3 (6.9) 8.3 | 7 |

## *Neobythites macrocelli* n. sp.

Figs. 2, 35, 36

*Neobythites* sp. 14a: Schwarzhans 1994: 74, figs. 19-20 (otolith).

Material examined (2 specimens, SL 195-198):
Holotype: USNM 309004, SL 195, female, off Christmas Is. (1º50'42"N, 157º30'36"E), R/V TOWNSEND CROMWELL cr. 60 st. 50, bottom trawl, 285 m, 22 Aug. 1972.

Paratype: USNM 365706, SL 198, female, same data as for holotype.

Diagnosis: Hind margin of preopercle with two spines; two large ocelli on dorsal fin both behind a line through anus, anterior covering 13 and posterior 11 dorsal fin rays; dorsal fin rays 103-105; anal fin rays 85-87; pectoral fin rays 24-26; developed rakers on anterior gill arch 11; longest gill filaments 7.5-8.3 % length of head; pseudobranchial filaments 3-4; vomer tooth patch subtriangular (Fig. 36A); precaudal vertebrae 14; total vertebrae 60.

Similarity: *N. macrocelli* seems most similar to *N. marianaensis* with two spines on hind margin of preopercle and two ocelli larger than eye on dorsal fin. They differ by the form of the vomer (Figs. 36A *vs* 44A) and by *macrocelli* having larger ocelli covering 13 and 11 *vs* 8-11 and 6-9 dorsal fin rays and longer gill filaments on anterior arch (7.5-8.3 % length of head *vs* 5.1-6.8 %). See also comparison to *N. sereti* on p. 74.

Description of holotype (differences with paratype in brackets).

Meristic characters: Dorsal fin rays 105 (103), caudal fin rays 8, anal fin rays 85 (87) and pectoral fin rays 24 (26); anterior dorsal fin ray above vertebra no. 5; anterior anal fin ray below vertebra no.15 and dorsal fin ray no. 19; precaudal vertebrae 14; caudal vertebrae 46; developed rakers on anterior gill arch 11; pseudobranchial filaments 3 (4).

Morphometric characters: In % of SL: Length of

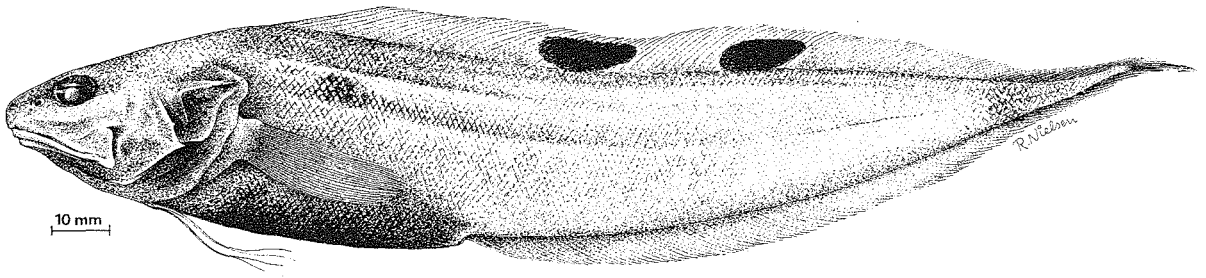


Fig. 35. *Neobythites macrocelli* n. sp. Holotype, USNM 309004, SL 195.

head 24.5 (24.0); depth at origin of anal fin 17.5 (16.5); upper jaw 12.0 (11.5); horizontal eye window 4.8 (4.3); postorbital 15.0 (14.5); preanal 43.0 (41.0); predorsal 25.5 (25.0); from base of ventral fin to anal fin 26.0 (22.5); ventral fin 15.5 (13.5). In % of head length: Longest filament on anterior gill arch 8.3 (7.5).

General description: Elongate fish with lateral line visible to caudal fin base but not distinct; snout pointed, a little longer than eye window; maxilla ends well behind eye; teeth granular; vomer tooth patch subtriangular and anterior basibranchial tooth patch long and slender (Fig. 36A); anterior nostril with low tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches a little longer than halfway to anal fin; anterior gill arch with two (three) small knobs and two developed rakers on upper branch, one developed raker in angle and lower branch with eight developed rakers and six (five) small knobs; three (four) small pseudobranchial filaments.

Sagittal otolith (Fig. 36B) twice as long as high and rather thick with pointed posterior end; sulcus 4/5 length of sagitta with ostium almost twice length of cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebrae 4-11 enlarged; parapophyses on posterior eight precaudal vertebrae; pleural ribs on 3-13 vertebrae; epipleural ribs on vertebrae 3-10.

Coloration. Two large ocelli on middle part of dorsal fin, black of first covering 13 (13) dorsal fin rays (nos. 21-34) and second 11 (11) dorsal fin rays (nos. 42-55); peritoneum dark brown and eyes bluish; lower part of body and head with many minute, black spots, upper part brownish; holotype with what seems to be remains of a horizontal brown band on body.

Biology: Two semi-ripe females (egg-diameter up to 0.5 mm) caught on upper continental slope. Intestines with gastropods and unidentifiable remains of crustaceans.

Distribution: Known from the type locality off Christmas Island (Fig. 2) from 285 m depth.

Etymology: The specific name refers to the large ocelli on the dorsal fin.

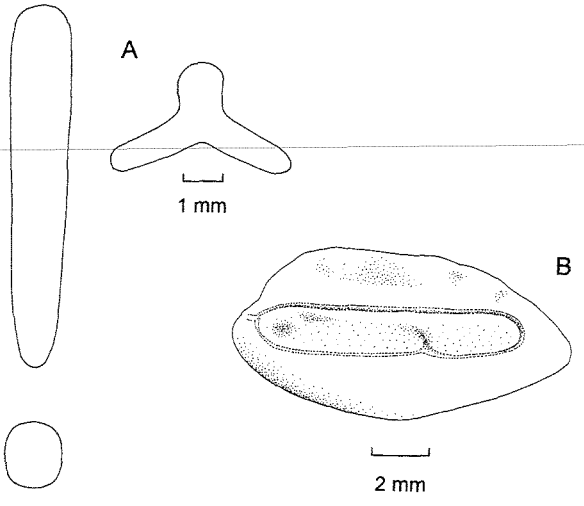


Fig. 36. *Neobythites macrocelli* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

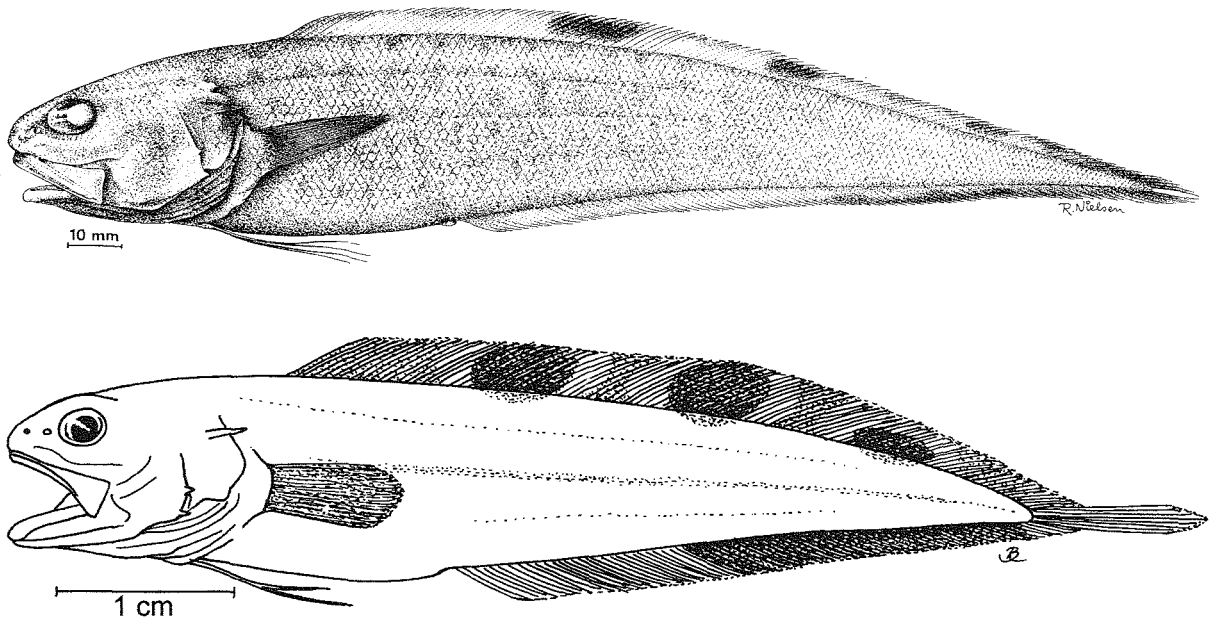


Fig. 37. *Neobythites macrops*. A, lectotype, BMNH 1887.12.7.41, SL 208+; B, NCPI, SL 63.

## *Neobythites macrops* Günther, 1887

Figs. 3, 37, 38

*Neobythites macrops* Günther, 1887: 102, pl. 20, fig. A (type locality: off Mindanao, Philippines). Second syntype from off Fiji Is. now referred to *N. pallidus* (see below).

*Neobythites macrops*: Shcherbachev 1980: 161; Gloerfelt-Tarp & Kailola 1984: 1989 (colour photo); Schwarzhans 1994: 74, fig. 3 (sagitta).

*Neobythites macrops* (non Günther) – all *N. analis*: Gilchrist & Thompson 1914: 89 and 1917: 416; Gilchrist & von Bonde 1924: 19.

Material examined (43 specimens, SL 58-310): Lectotype (here selected): BMNH 1887.12.7.41, SL 208+, female, off northern Mindanao, Philippines (ca. 9°N, 124°E), R/V CHALLENGER st. 210, trawl, 686 m, 26 Jan 1875.

Non-types: USNM 99117, 67-178, 1 female and 1?, between Cebu and Leyte, Philippines (10°40'15'N, 124°15'E), R/V ALBATROSS st. 5408, beam trawl, 280 m, 18 Mar. 1909; USNM 99125, SL 190, female, off northern Mindanao, Philippines (8°36'26"N, 124°36'8"E), R/V ALBATROSS st. 5503, beam trawl, 414 m, 4 Aug. 1909; ZMUC P771293, SL 240, female, off Jolo, Philippines (ca. 6°N, 121°E), Th. Mortensen Pacific Exped. 1914-15, Sigsbee trawl, 460 m, 27 Mar. 1914; BMNH 1984.1.1.57, SL 152, male, off Java (7°55'S, 109°42'E), JETINDOFISH, 1981; NCIP and BSKU 53291, SL 58-63, 2?, Flores Sea (5°47.3'S, 119°35.4E), R/V HAKUHO MARU, cr. KH-85-1, beam trawl, 250-285 m, 12 Feb. 1985; MNHN 2001-31, SL 100-198, 4 females and 1 male, off southern Luzon (13°52.6'N, 120°29.6'E), MUSORSTOM 3, R/V CORIOLIS st. 105, beam trawl, 398 m, 1 June 1985; MNHN 2001-32, SL 111-197+, 4 females, 2 males and 1?, off southern Luzon (11°57.7'N, 121°28.5'E), MUSORSTOM 3, R/V CORIOLIS st. 125, beam trawl, 388-404 m, 4 June 1985; MNHN 2001-33, SL 136-232, 4 females, off southern Luzon, Philippines (11°58.6'N, 122°1.8'E), MUSORSTOM 3, R/V CORIOLIS st. 135, beam trawl, 486-551 m, 5 June 1985; NTM S.12589-003, SL 85, male, off Rowley Shoals, Western Australia (17°32'S, 118°48'E), st. WH 85-16, 430 m, 2 Nov. 1985; NTM S.12590-013, SL 121-310, 2 females and 1 male, off Rowley Shoals, Western Australia (17°23'S, 118°57'E), st. WH 85-17, 430 m, 3 Nov. 1985; NTM S.14270-

001, SL 132, off Rowley Shoals, Western Australia, 360 m, 17 July 1987; NTM S.12901-022, SL 137, off Cape Don, Arafura Sea (9°19'S, 132°49'E), 143 m; NTM S.12902, SL 140, Arafura Sea, 143 m, 7 Nov. 1990; CAS 83056 and 83060, SL 172-258, 2 females, off Luzon, Philippines (13°8'59"N, 124°4'43"E), R/V FISHER RESEARCHER I, st. TI-95-2, 363-385 m, 23 Sep. 1995; NTM S.12588-024, SL 144-233, 2 ?, off Rowley Shoals, Western Australia (17°22'S,118°38'E), 430 m; NTM S.12593-008, SL 122-230, 4 ?, off Rowley Shoals, Western Australia (17°24'S, 118°52'E), 445 m; NTM S.12641-018, SL 207, off Lynher Bank, Western Australia (14°50'S, 121°35'E), 275-280 m; NTM S.13115-023, SL 115-210, 2 ?, north of Cape Leveque, Western Australia (14°7'S, 122°6'E), 423 m; MNHN 1985-367, SL 250, female, Makassar Strait (1°57'S, 119°15'E), CORINDON, 220 m, Fourmanoir.

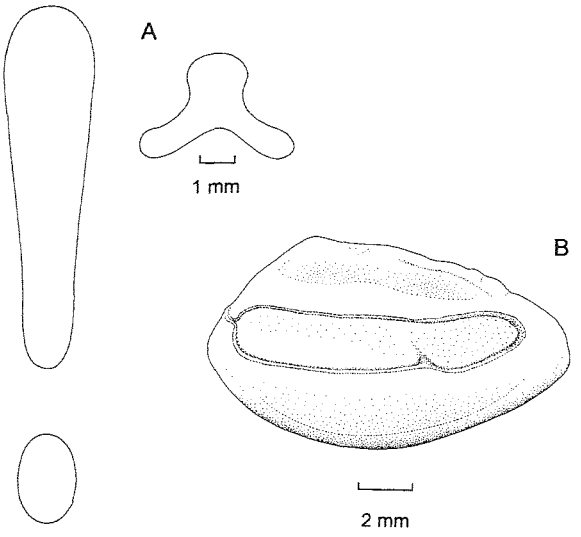


Fig. 38. *Neobythites macrops*. A, basibranchial tooth patches and vomer of lectotype; B, median view of right sagitta of lectotype.

Remarks on material: Günther based his new species on two specimens, one from the Philippines (BMNH 1887.12.7.41) and one from Fiji Is. (BMNH 1887.12.7.42). They do not belong to the same species and the Philippine specimen is here selected as the lectotype while the Fiji specimen is referred to *N. pallidus*.

Besides the material listed here the USNM fish collection holds 62 specimens from 45 ALBATROSS stations all from Philippine waters. None of these is examined in detail for this revision.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with 3-4 ocelli all placed posterior to a line through anus; posterior third of anal fin black; dorsal fin rays 98-104; anal fin rays 83-88; pectoral fin rays 25-28; long rakers on anterior gill arch 9-13; longest gill filaments on anterior arch 5.4-11.0 % length of head (positive allometric growth); pseudobranchial filaments 3-7; vomer tooth patch subtriangular (Fig. 38A); precaudal vertebrae12-13; total vertebrae 57-60.

Similarity: *N. macrops* seems most similar to *N. soelae* with two preopercular spines, three ocelli in dorsal fin and absence of vertical bars on body. They differ by form of sagitta (Figs. 38B *vs* 70B) and vomer (Figs. 38A *vs* 70A) and in coloration of anal fin having posterior part black in *macrops* while unpigmented in adult and with 2 blotches in juvenile specimens of *soelae*.

Description: The principal meristic and morphometric characters are shown in Table 15.

Elongate fish with lateral line indistinct in older bleached material; snout blunt, equal in size to eye window; maxilla ends just or well behind eye; teeth granular; vomer subtriangular and first basibranchial tooth plate rather broad anteriorly (Fig. 38A); anterior nostril with low tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches a little more than halfway from base to anal fin; anterior gill arch with 2-3 short and 2-3 long rakers, one long raker in angle, and lower branch with 6-8 long and 6-7 short rakers; 3-7 rather long pseudobranchial filaments.

Sagittal otolith (Fig. 38B) oval and highest anteriorly, about twice as long as high; large sulcus only partly separated into colliculi; cauda half the length of ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine 1/2-3/4 length of second spine; vertebrae 3-8 with depressed spines; bases of vertebral spines 5-12 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs indistinct.

Coloration. Dorsal part of head and body brown with dark brown coloured lateral line; ventral part of head and body light brown with many tiny black spots; dark ring around eye; rays of pectoral and ventral fins often brown; dorsal fin with 3-4 ocelli

Table 15. Meristic and morphometric characters of *N. macrops*

| | Lectotype | LT and 26 spms | Nos |
|---|---|---|---|
| Standard length | 208+ | 58-310 | 26 |
| Meristic characters | | | |
| Dorsal finrays | 98+ | 98 (100.6) 104 | 25 |
| Caudal finrays | | 8 | 22 |
| Anal finrays | 80+ | 83 (85.1) 88 | 22 |
| Pectoral finrays | 25 | 25 (26.1) 28 | 19 |
| Pseudobr. filaments | 6 | 3 (5.7) 7 | 18 |
| Precaudal vertebrae | 13 | 12 (12.9) 13 | 27 |
| Total vertebrae | 56+ | 57 (58.8) 60 | 25 |
| Long rakers on ant. gill arch | 10 | 9 (10.7) 13 | 26 |
| Ant. dorsal ray above vertebra no. | 6 | 5 (5.4) 6 | 25 |
| Ant. anal ray below dorsal ray no. | 19 | 18 (19.1) 21 | 27 |
| Ant. anal ray below vertebra no | 15 | 15 (15.0) 16 | 27 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | | 21.0 (22.7) 24.0 | 26 |
| Depth orig. anal fin | | 14.0 (15.7) 17.5 | 26 |
| Upper jaw length | | 9.9 (11.1) 12.0 | 26 |
| Hor. eye window | | 4.5 (5.2) 6.0 | 26 |
| Postorbital length | | 11.5 (13.2) 14.5 | 26 |
| Preanal length | | 38.0 (41.8) 45.5 | 26 |
| Predorsal length | | 24.0 (25.5) 26.5 | 25 |
| Base of ventral fin to anal fin origin | | 23.5 (25.7) 30.0 | 25 |
| Ventral fin length | | 13.0 (16.2) 18.5 | 24 |
| Snout to 1st ocellus | | 41.5 (45.3) 49.5 | 26 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 6.9 | 5.4 (7.0) 11.0 | 24 |

(less distinct in larger specimens), posterior 1-2 tend to bleach after a period of preservation; distance from upper jaw symphysis to black part of first ocellus 41.5-49.5 % SL, to second ocellus 61-69 % SL and to third ocellus 79-83 % SL; posterior to ocelli distal part of dorsal fin rays dark; posterior 1/2-1/3 of anal fin dark; peritoneum and eye bluish.

Biology: The material consists of 21 females, six males and 16 unsexed specimens none of which is ripe; a 310 mm specimen had eggs 0.5 mm in diameter. Gastropods found in the intestines of five specimens. Most specimens with remains of crustaceans. Caught on the lower continental shelf and upper slope.

Distribution: The material examined is from 20 localities (Fig. 3), eight from Philippine waters, three from Indonesian waters, two from the Arafura Sea and seven from off Western Australia at 143-686 m depth.

## *Neobythites malayanus* Weber, 1913

Figs. 2, 39, 40

*Neobythites malayanus* Weber, 1913: 554, pl. 1, fig. 2 (type locality: Sumbawa, 8°19'S, 117°41'E).

*Neobythites malayanus*: Gloerfelt-Tarp & Kailola 1984: 89 (colour photo); Schwarzhans 1994: 76, figs. 46-47 (sagitta).

*Neobythites steatiticus*: de Beaufort & Chapman 1951: 417 (senior synonym of *N. malayanus*).

Material examined (46 specimens, SL 76-199): Lectotype (here selected): ZMA 110.841, SL 137, male, off Sumbawa, Indonesia (8°19'S, 117°41'E), R/V SIBOGA st. 312, trawl, 274 m, 14 Feb. 1900.

Paralectotypes: ZMA 110.841, SL 87-148, 3 females and 1 male (same data as for lectotype).

Non-types: USNM 99132, SL 132-143, female

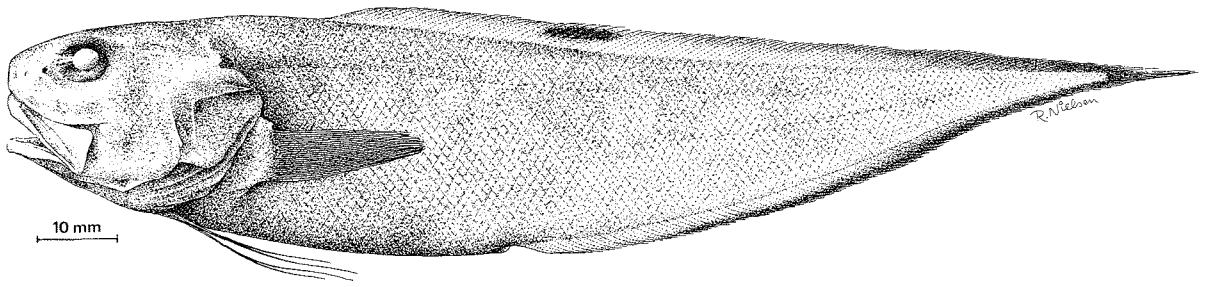


Fig. 39. *Neobythites malayanus*. Lectotype, ZMA 110.841, SL 137.

and male, Pescador Is., Philippines (9°44'N, 123°14'20"E), R/V ALBATROSS st. 5188, trawl, 549 m, 1 Apr. 1908; USNM 99133, SL 131-173, 2 females and 3 males, Pescadore Is., Philippines (9°56'30"N, 123°15'E), R/V ALBATROSS st. 5189, trawl, 549 m, 1 Apr. 1908; USNM 99054, SL 114-129, 6 females and 1 male and ZMUC P771288-1290, 3 females, Uanivan Is., Philippines (6°50'45"N, 126°14'38"E), R/V ALBATROSS st. 5241, trawl, 393 m, 14 May 1908; USNM 99130, SL 85-161, 2 females, 2 males and 1?, Uanivan Is., Philippines (6°50'55"N, 126°14'35"E), R/V ALBATROSS st. 5243, trawl, 399 m, 14 Mar. 1908; USNM 99127, SL 199, male, Bongo Is., Philippines (7°21'45"N, 124°7'15"E), R/V ALBATROSS st. 5256, trawl, 289 m, 22 May 1908; USNM 99131, SL 141-153, female and male, Verde Is., Philippines (13°44'36"N, 120°59'15"E), R/V ALBATROSS st. 5266, trawl, 183 m, 8 June 1908; USNM 99150, SL 119+-129, female and male, between Leyte and Cebu, Philippines (11°11'45"N, 124°15'45"E), R/V ALBATROSS st. 5402, trawl, 344 m, 16 Mar. 1909; USNM 99128, SL 76-128, female and male, between Leyte and Cebu, Philippines (11°10'N, 124°17'15"E), R/V ALBATROSS st. 5403, trawl, 333 m, 16 Mar. 1909; USNM 99138, SL 154, female, off Leyte, Philippines (10°50'N, 124°26'18"E), R/V ALBATROSS st. 5404, trawl, 348 m, 17 Mar. 1909; USNM 99129, SL 133-143, 2 females, between Cebu and Leyte, Philippines (10°40'15"N, 124°15'E), R/V ALBATROSS st. 5408, trawl, 291 m, 18 Mar. 1909; CAS 56373, SL 140, male, southeast of Salomague Is., Philippines, F.B. Steiner coll. st. 108, 287-313 m, 20 Oct. 1960; CAS 33088, SL 140, male, Luzon Is., Philippines, F.B. Steiner coll. st. 59, 220-238 m, 19 July 1966; ZMUC P77741-742, SL 138-171+, female and male, Saleh Bay, Lombok (ca. 9°S, 117°E), JETINDOFISH st. TGT 1897, bottom trawl, 180-300 m, July 1981; MNHN 1995-918, SL 119, female, and 1995-921, SL 88, male, Vanuatu, West Pacific (15°6'58"S, 166°53'25"E), MUSORSTOM 8 st. CP 1121, trawl, 315-360 m, 9 Oct. 1994; MNHN 1995- 915, SL 84-159, 3 females, Vanuatu, West Pacific (15°7'11"S, 166°55'12"E), MUSORSTOM 8 st. CP 1123, trawl, 262-352 m, 9 Oct. 1994.

Diagnosis: Hind margin of preopercle with an indistinct spine or a flat process; one ocellus on dorsal fin placed posterior to anus; distal part of anal fin black, fin rays anterior and posterior to ocellus brown; dorsal fin rays 90-96; anal fin rays 74-79; pectoral fin rays 26-28; long rakers on anterior gill arch 8-11; longest gill filaments on anterior arch

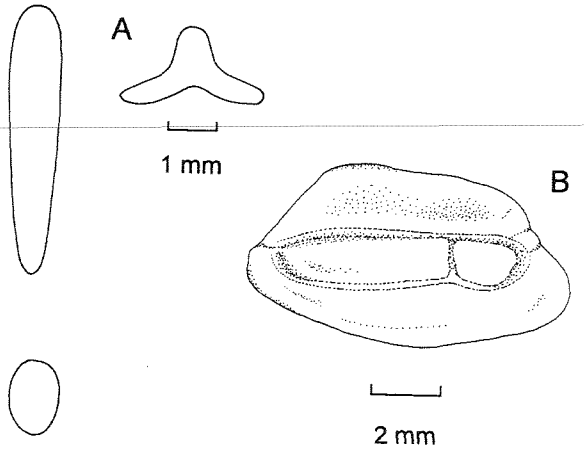


Fig. 40. *Neobythites malayanus*. A, basibranchial tooth patches and vomer of lectotype; B, median view of right sagitta of USNM 099133.

5.2-13.0 % length of head; pseudobranchial filaments 2-4; vomer tooth patch subtriangular (Fig. 40A); precaudal vertebrae 12-13; total vertebrae 54-57.

Similarity: *N. malayanus* seems most close to *N. steatiticus* with one ocellus on dorsal fin, none to one flat process on preopercle and posterior part of dorsal fin dark. They differ by *malayanus* having anal fin rays with a black band distally (*vs* on median part of fin rays), long rakers on anterior gill arch 8-11 (*vs* 11-14) and different form of sagitta (Figs. 40B *vs* 74C).

Description: The principal meristic and morphometric characters are shown in Table 16. Rather short bodied fish with indistinct lateral line; head large, up to 28.5 % SL; form of snout blunt to pointed, slightly shorter than eye window; maxilla ends just or well behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch rather small (Fig. 40A); anterior nostril with a small flap or low rim and larger posterior nostril a mere hole; hind margin of preopercle with flat process; ventral fin reaches almost or a little more than halfway from base to anal fin; anterior gill arch with two short and two long rakers on upper branch, one long raker in angle and lower branch with 5-7 long and 5-8 short rakers, all short rakers very small; 2-4 pseudobranchial filaments.

Sagittal otolith (Fig. 40B) almost twice as long as high, highest anteriorly; sulcus large with completely separated colliculi; ostium 2.5 times as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed except for depressed, blunt neural spines on precaudal vertebrae 3-9; first neural spine 1/2-2/3 length of second spine; bases of vertebral spines 6-12 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 2-12; epipleural ribs indistinct.

Coloration. Fig. 39 is a recently made illustration of the lectotype caught about 100 years ago. Freshly caught material shows distinct ocellus in dorsal fin placed behind line through anus; ocellus covers 6-8

Table 16. Meristic and morphometric characters of *N. malayanus*.

| | Lectotype | 4 paralectotypes | LT, PLT's + 38 spms | Nos |
|---|---|---|---|---|
| Standard length | 137 | 987-148 | 76-199 | 43 |
| Meristic haracters | | | | |
| Dorsal finrays | 92 | 90-93 | 90 (93.2) 96 | 23 |
| Caudal finrays | 8 | 8 | 8 | 20 |
| Anal finrays | 76 | 74-75 | 74 (76.1) 79 | 23 |
| Pectoral finrays | 27 | 27 | 26 26.8) 28 | 13 |
| Pseudobr. filaments | 3 | 3-4 | 2 (2.9) 4 | 34 |
| Precaudal vertebrae | 13 | 12-13 | 12 (12.9) 13 | 23 |
| Total vertebrae | 55 | 54-55 | 54 (55.5) 57 | 23 |
| Long rakers on ant. gill arch | 10 | 10 | 8 (9.8) 11 | 42 |
| Ant. dorsal ray above vertebra no. | 6 | 5-6 | 5 (5.5) 6 | 23 |
| Ant. anal ray below dorsal ray no. | 20 | 19-20 | 17 (19.2) 21 | 23 |
| Ant. anal ray below vertebra no | 15 | 15 | 15 (15.1) 16 | 23 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 23.5 | 23.0-24.5 | 21.5 (24.3) 28.5 | 43 |
| Depth orig. anal fin | 19.0 | 18.5-20.0 | 16.5 (18.9) 20.0 | 21 |
| Upper jaw length | 11.5 | 11.5-12.0 | 11.0 (11.7) 12.5 | 20 |
| Hor. eye window | 5.0 | 4.7-5.0 | 4.2 (4.8) 5.6 | 36 |
| Postorbital length | 14.5 | 14.0-14.5 | 13.0 (15.1) 18.0 | 29 |
| Preanal length | 47.0 | 44.5-46.5 | 39.0 (42.9) 47.0 | 20 |
| Predorsal length | 26.5 | 26.0-27.5 | 24.0 (26.7) 29.5 | 42 |
| Base of ventral fin to anal fin origin | 27.0 | 25.0-26.5 | 22.0 (25.3) 30.0 | 19 |
| Ventral fin length | 14.5 | 15.0-15.5 | 13.5 (16.3) 19.9 | 35 |
| Snout to 1st ocellus | 48.0 | 46.5-49.0 | 43.0 (47.9) 52 | 41 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 8.8 | 8.0-9.1 | 5.2 (8.6) 13.5 | 43 |

Table 17. *N. malayanus* (groups A and B).

| | Group A - 28 specimens SL 84-199 | | Group B - 15 specimens SL 76-164 | |
|---|---|---|---|---|
| Head length in % of SL | 21.5 (23.5) 24.5 | (28 | 23.5 (26.0) 28.5 | (15 |
| Postorbital length in % of SL | 13.0 (14.2) 15.0 | (16 | 14.5 (16.0) 18.0 | (13 |
| Gill filament length in % of head | 5.2 (7.2) 9.1 | (28 | 9.3 (11.8) 13.5 | (15 |

rays placed between dorsal fin rays nos. 21-32; distal part of almost entire anal fin black; fin rays both anterior and posterior to ocellus brown; dorsal part of head and body brown, ventral part lighter often with tiny, black spots; pectoral fins often dark brown; upper lip brown; eyes and peritoneum bluish.

Biology: The material consists of 28 females, 17 males and one unsexed specimen, none of which is ripe. Some specimens with remains of crustaceans and one specimen with gastropods. Caught on lower continental shelf and upper slope.

Distribution: Known from 16 localities (Fig. 2) from the Philippines, Indonesia and Vanuatu from 180-549 m depth.

Remarks on material: Table 17 shows that the present 43 specimens can be split up into two groups (A and B), differing distinctly in three characters: length of head, postorbital length and length of gill filaments on anterior arch. The differences cannot be explained by allometric growth (same SL-range) or sexual dimorphism. Also the two groups were caught in the same depth-interval and in the same geographical areas (Philippine-Indonesia and Vanuatu). The only difference which can be related to geographical areas is "Length of gill filaments" within Group A. In the 22 specimens from the Philippines and Vanuatu the length is 5.2 (6.8) 8.1 % head length while in the six specimens from Indonesian waters the length is 8.0 (8.4) 9.1 % head length. However, it seems impossible to make any taxonomical conclusions based on the above mentioned differences.

## *Neobythites malhaensis* Nielsen, 1995

Figs. 1, 41, 42

*Neobythites malhaensis* Nielsen, 1995: 6, fig. 5 (type locality: Saya de Malha Bank, 11°2'S, 62°15'E).

*Neobythites* sp.: Shcherbachev *et al.* 1986: 203.

*Neobythites* sp. 6: Schwarzhans 1994: 76, fig.71 (sagitta).

Material examined (4 specimens, SL 117-135): Holotype: ZM MGU P-18915 (SL 123), Saya de Malha Bank, Indian Ocean.

Paratypes: ZM MGU P-18916-7 (2, SL 117-132), ZMUC P77840 (1, SL 135), Saya de Malha Bank, Indian Ocean.

See Nielsen (1995: 6) for station-data.

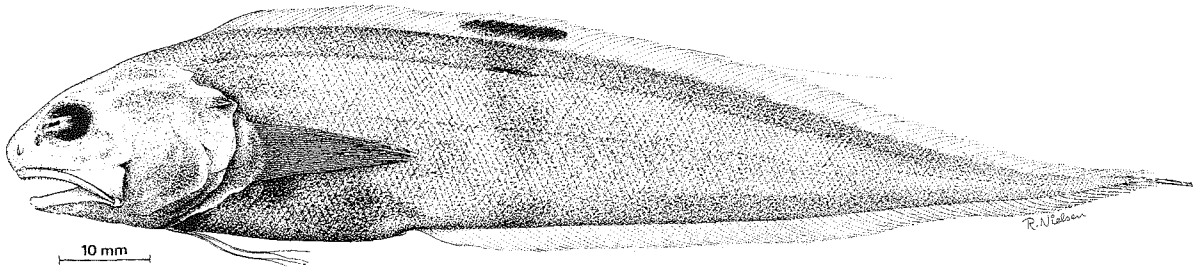


Fig. 41. *Neobythites malhaensis*. Holotype, ZM MGU P-18915, SL 123.

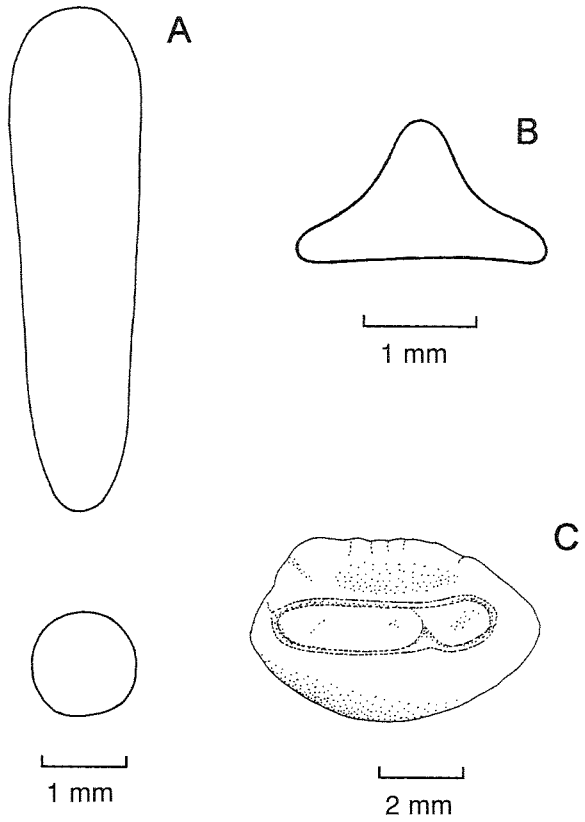


Fig. 42. *Neobythites malhaensis*. A, basibranchial tooth patches of paratype, ZMUC P77840, SL135; B, vomer of holotype; C, median view of right sagitta of paratype, ZM MGU P-18916, SL 117.

Diagnosis: None or one weak, flat spine on hind margin of preopercle; one distinct ocellus on dorsal fin with a corresponding vertical, black bar on body; dorsal fin rays 99-103 originating above operculum; anal fin rays 78-82; pectoral fin rays 30; long rakers on anterior gill arch 12-13; longest gill filaments on anterior arch 7.5-8.9 % length of head; pseudobranchial filaments 3-4; vomer triangular (Fig. 42B); precaudal vertebrae 13; total vertebrae 57-59.

Similarity: *N. malhaensis* seems most close to *N. meteori* with no distinct spines on hind margin of preopercle, one ocellus on dorsal fin and anal fin without black band. They differ by *malhaensis* having a black bar below ocellus (*vs* no bar) and 12-13 long gill rakers on anterior arch (*vs* 6-7).

Table 18. Meristic and morphometric characters of *N. malhaensis*

| | Holotype | HT and 3 paratypes | Nos |
|---|---|---|---|
| Standard length | 123 | 117-135 | 4 |
| Meristic characters | | | |
| Dorsal finrays | 99 | 99 (101) 103 | 4 |
| Caudal finrays | 8 | 8 | 4 |
| Anal finrays | 78 | 78 (79.8) 82 | 4 |
| Pectoral finrays | 30 | 30 | 4 |
| Pseudobr. filaments | 3 | 3 (33.3) 4 | 4 |
| Precaudal vertebrae | 13 | 13 | 4 |
| Total vertebrae | 57 | 57 (57.8) 59 | 4 |
| Long rakers on ant. gill arch | 12/13 | 12 (12.5) 13 | 4 |
| Ant. dorsal ray above vertebra no. | 2 | 2 (2.3) 3 | 4 |
| Ant. anal ray below dorsal ray no. | 25 | 23 (24.3) 25 | 4 |
| Ant. anal ray below vertebra no | 15 | 15 | 4 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 21.0 | 21.0 (21.4) 21.5 | 4 |
| Depth orig. anal fin | 17.0 | 17.0 (17.7) 19.0 | 4 |
| Upper jaw length | 11.0 | 11.0 | 2 |
| Hor. eye window | 4.9 | 4.0 (4.4) 4.9 | 4 |
| Postorbital length | - | 13.0 | 1 |
| Preanal length | 36.5 | 36.5 (38.3) 40.0 | 4 |
| Predorsal length | 20.5 | 20.0 (20.4) 20.5 | 4 |
| Base of ventral fin to anal fin origin | 20.5 | 21.0 (24.6) 27.5 | 4 |
| Ventral fin length | 13.0 | 12.5 (12.9) 13.0 | 4 |
| Snout to 1st ocellus | 42.0 | 42.0 (43.8) 45.5 | 4 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 7.7 | 7.5 (8.1) 8.9 | 4 |

Description: The principal meristic and morphometric characters are shown in Table 18. Elongate fish with indistinct lateral line; rather pointed snout, slightly shorter than eye window; maxilla ends well behind posterior margin of eye; teeth in jaws needle-like; vomer triangular and anterior basibranchial tooth patch rather broad (Fig. 42A,B); anterior nostril with well developed tube and larger posterior nostril with low tube; hind margin of preopercle with or without a weak, flat spine; ventral fin reaches a little more than halfway from base to anal fin; anterior gill arch with 2-3 short and 3-4 long rakers on upper branch, one long raker in angle and lower branch with 8-9 long and 6-7 short rakers; 3-4 long pseudobranchial filaments.

Sagittal otolith (Fig. 42C) 1.5 times as long as high with smooth edge except for undulating dorsal part; ostium twice as long as cauda with incomplete separation between colliculi.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed except for blunt neural spines on vertebrae 3-6; first neural spine half length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebrae 5-10 enlarged; parapophyses on posterior 6-7 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs indistinct.

Coloration. A distinct ocellus on dorsal fin posterior to a line through anus, covering 11-12 rays placed between dorsal fin rays nos. 24-37; below ocellus a less distinct, black, vertical bar reaching anal fin; peritoneum brown and eyes blue.

Biology: Known from three females and one male, none of which is ripe. The only stomach contents are remains of crustaceans. Caught on the upper continental slope.

Distribution: Known from three localities (Fig. 1) on Saya de Malha Bank, north of Mauritius, at 235-250 m depth.

## *Neobythites marianaensis* n. sp.

Figs. 2, 43, 44

*Neobythites* sp. 14: Schwarzhans 1994: 74, figs. 15-18 (sagitta).

Material examined (8 specimens, SL 73-180): Holotype: USNM 309006, SL 180, female, off Saipan-Tinian, Mariana Is. (15º10'06"N, 145º39'54"E), R/V TOWNSEND CROMWELL cr. 53 st. 94, bottom trawl, 302 m, 30 Apr. 1971.

Paratypes: USNM 365707 (SL 73-170, 4 females and 2 males) and ZMUC P771327 (SL 148, female), same data as for holotype.

Diagnosis: Two spines on hind margin of preopercle; two large ocelli on dorsal fin both posterior to anus, anterior covering 8-11 and posterior 6-9 dorsal fin rays; dorsal fin rays 101-105; anal fin rays 86-91; pectoral fin rays 25-27; developed rakers on anterior gill arch 11; longest gill filament on anteri-

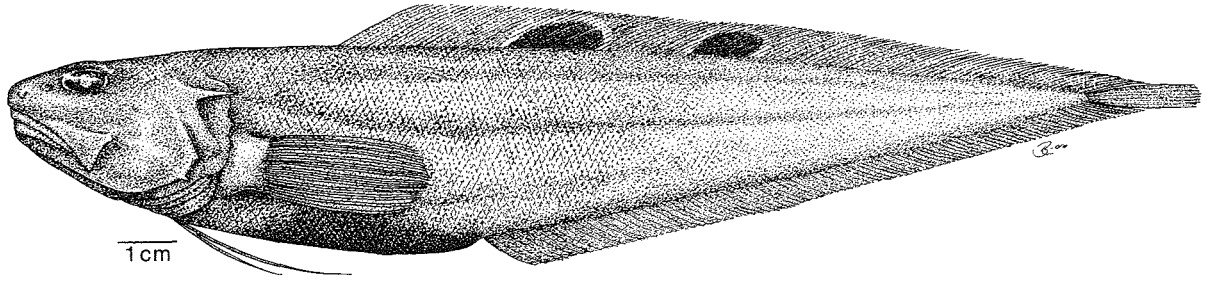


Fig. 43. *Neobythites marianaensis* n. sp. Holotype, USNM 309006, SL 180.

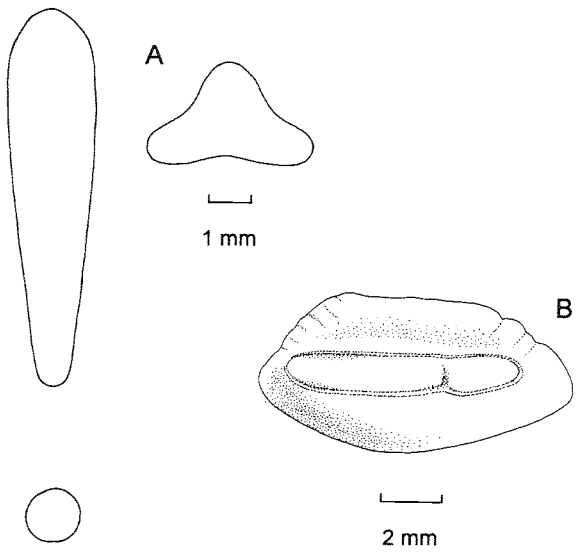


Fig. 44. *Neobythites marianaensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

or arch 5.1-6.8 % length of head; pseudobranchial filaments 3-4; vomer tooth patch subtriangular (Fig. 44A); precaudal vertebrae 14; total vertebrae 59-61.

Similarity: *N. marianaensis* seems most close to *N. macrocelli* (cf. p. 44).

Description: The principal meristic and morphometric characters are shown in Table 19.

Holotype (differences to paratypes in brackets). Elongate fish with lateral line visible to caudal base (in some paratypes only anterior part visible); snout pointed, slightly longer than eye window; maxilla ends well behind eye; teeth granular; vomer tooth patch subtriangular and anterior basibranchial tooth patch rather broad anteriorly (Fig.44A); anterior nostril tubular and larger posterior nostril a mere hole; hind margin of preopercle with two strong spines; ventral fin reaching about halfway from base to anal fin; anterior gill arch with 3 (2-4) short and two long rakers, one long raker in the angle and

Table 19. Meristic and morphometric characters of *N. marianaensis*

| | Holotype | HT + 7 paratypes | Nos |
|---|---|---|---|
| Standard length | 180 | 73-180 | 8 |
| Meristic characters | | | |
| Dorsal finrays | 105 | 101 (103) 105 | 7 |
| Caudal finrays | 8 | 8 | 6 |
| Anal finrays | 86 | 86 (87.3) 91 | 6 |
| Pectoral finrays | 27 | 25 (26.7) 27 | 7 |
| Pseudobr. filaments | 4 | 3 (3.7) 4 | 7 |
| Precaudal vertebrae | 14 | 14 | 8 |
| Total vertebrae | 61 | 59 (60.3) 61 | 8 |
| Long rakers on ant. gill arch | 11 | 11 | 8 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 8 |
| Ant. anal ray below dorsal ray no. | 20 | 20 (20.1) 21 | 8 |
| Ant. anal ray below vertebra no. | 15 | 15 | 8 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 22.0 | 21.5 (22.6) 23.5 | 8 |
| Depth orig. anal fin | 16.5 | 15.0 (15.9) 16.5 | 8 |
| Upper jaw length | 11.0 | 10.5 (11.3) 12.0 | 8 |
| Hor. eye window | 4.3 | 3.8 (4.3) 4.6 | 8 |
| Postorbital length | 12.5 | 12.5 (13.1) 1453 | 8 |
| Preanal length | 43.0 | 37.5 (42.3) 44.5 | 8 |
| Predorsal length | 22.5 | 21.5 (24.1) 26.0 | 8 |
| Base of ventral fin to anal fin origin | 25.0 | 21.5 (24.6) 27.5 | 8 |
| Ventral fin length | 14.0 | 12.5 (13.6) 14.5 | 7 |
| Snout to 1st ocellus | 43.5 | 41.0 (43.4) 44.5 | 8 |
| Snout to 2nd ocellus | 61 | 61 (62.1) 64 | 7 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 6.8 | 5.1 (6.2) 6.8 | 7 |

lower branch with eight long and five (4-6) short rakers; four (3-4) small pseudobranchial filaments.

Sagittal otolith (Fig. 44B) oval and twice as long as high; sulcus 3/4 the length of sagitta with almost completely separated colliculi; ostium almost twice as long as cauda.

Axial skeleton (from radiograph). Tips of neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebrae 4-11 enlarged; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-8.

Coloration. Two large ocelli on middle third of dorsal fin (a 158 mm paratype only with one ocellus, corresponding to anterior in other paratypes; this is not due to ontogenetic changes as five smaller and one larger paratype all have two ocelli); anterior ocellus covers 8-11 rays placed between dorsal fin rays nos. 22-32 and posterior ocellus covers 6-9 rays placed between dorsal fin rays nos. 44-53; peritoneum dark brown and eyes bluish; lower part of head and body with a few minute, black spots; lips and snout brownish.

Biology: Seven females and one male none of which is ripe. Except for a gastropod no identifiable stomach contents. Caught on the upper continental slope.

Distribution: Known from the type locality in the Mariana Is. Archipelago (Fig. 2) at a depth of 302 m.

Etymology: Named after the type locality, Mariana Is.

## *Neobythites marquesaensis* n. sp.

Figs. 45, 46

Material examined (6 specimens, SL 87-146): Holotype: MNHN 2000-0689, SL 146, male, off Hiva Oa, Marquesas Is. (9°51.3'S, 139°9.3'W), MUSORSTOM 9, R/V ALIS st. CP 1205, trawl, 420-450 m, 28 Aug. 1997.

Paratypes: MNHN 2001-1203, SL 116, female. Same data as for holotype; MNHN 2000-0688 (SL 87-104, 3 females) and ZMUC P771322 (SL 95, male), off Hiva Oa, Marquesas Is. (9°44.3'S, 138°51.2'W), MUSORSTOM 9, R/V ALIS st. CP 1229, trawl, 310-320 m, 30 Aug. 1997.

Diagnosis: Hind margin of preopercle with two sharp spines; two more or less distinct ocelli on middle part of dorsal fin; indistinct brown vertical bars on body; lateral line with dark brown pigment; dorsal fin rays 103-106; anal fin rays 85-87; pectoral fin rays 28-30; long rakers on anterior gill arch 12-13; longest gill filaments on anterior arch 5.2-6.5 % length of head; pseudobranchial filaments five; vomer tooth patch subtriangular (Fig. 46A); precaudal vertebrae 13; total vertebrae 60-61.

Similarity: *N. marquesaensis* seems most close to *N. sereti* with two spines on preopercle, 1-2 ocelli on dorsal and none on anal fin, ocelli placed on middle third of dorsal fin and ocelli larger than diameter of eye. They differ by *marquesaensis* having 4-6 indistinct bars on body (*vs* none), five pseudobranchial filaments (*vs* 2-4), dorsal and anal fins well pigmented (*vs* poorly pigmented), anterior nostril with distinct tube (*vs* a small flap) and

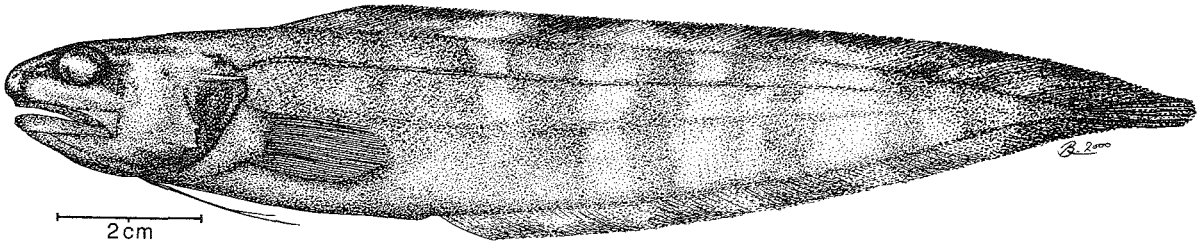


Fig. 45. *Neobythites marquesaensis* n. sp. Holotype, MNHN 2000-0689, SL 146.

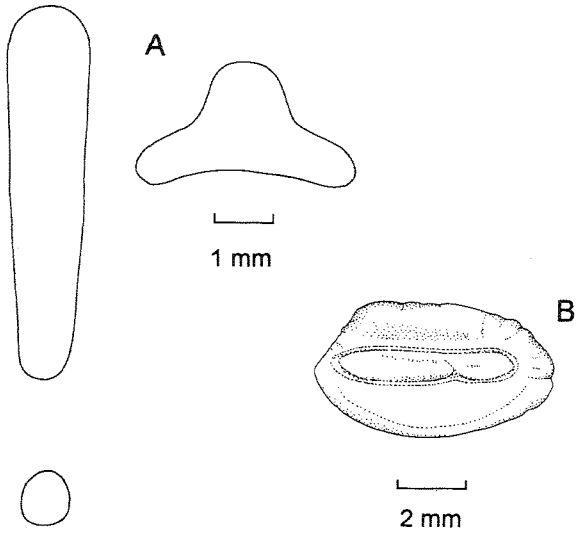


Fig. 46. *Neobythites marquesaensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

posterior margin of vomer concave (*vs* convex, Figs. 46A and 64A).

Description: The principal meristic and morphometric characters are shown in Table 20.

Holotype (differences with paratypes in brackets). Elongate fish with distinct lateral line; snout pointed, equal in length to eye window; maxilla ends well behind eye; teeth granular; vomer subtriangular and posterior basibranchial tooth patch small (Fig. 46A); anterior nostril with distinct tube and larger posterior nostril with low rim; hind margin of preopercle with two spines; ventral fin reaches about halfway from base to anal fin; anterior gill arch with two short and three (3-4) long rakers on upper branch, one long raker in angle and lower branch with nine (7-9) long and five (4-5) short rakers; five relatively short pseudobranchial filaments.

Sagittal otolith (Fig. 46B) oval, twice as long as high and highest in anterior end; sulcus almost with complete separation of colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed (depressed spines blunt in some); first neural spines half (2/3) length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 8-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs indistinct.

Coloration. Dorsal fin with two large ocelli, black part of anterior covers 11 (11-12) fin rays placed between dorsal fin rays nos. 23-33 (23-35) and black part of posterior covers eight (8-10) fin rays placed between dorsal fin rays nos. 46-53 (46-56); dorsal, caudal and anal fins with much brown pigment; lateral line dark brown; head and dorsal part of body brown (horizontal brown lines on head) and ventral part of body lighter (in most with many tiny, black spots); brown ring around eye; about five indistinct brown bars on body; peritoneum and eye bluish.

Biology: The material consists of four females and two males none of which is ripe. No identifiable

Table 20. Meristic and morphometric characters of *N. marquesaensis*.

| | Holotype | HT +5 paratypes* |
|---|---|---|
| Standard length | 146 | 87-116 |
| Meristic characters | | |
| Dorsal finrays | 103 | 103 (104.3) 106 |
| Caudal finrays | 8 | 8 |
| Anal finrays | 87 | 85 (86.5) 87 |
| Pectoral finrays | 29 | 28 (29) 30 |
| Pseudobr. filaments | 5 | 5 |
| Precaudal vertebrae | 13 | 13 |
| Total vertebrae | 60 | 60 (60.3) 61 |
| Long rakers on ant. gill arch | 13 | 12 (12.7) 13 |
| Ant. dorsal ray above vertebra no. | 5 | 5 |
| Ant. anal ray below dorsal ray no. | 19 | 20 (20.8) 22 |
| Ant. anal ray below vertebra no | 14 | 14 (14.8) 16 |
| Morphometric characters | | |
| In % of SL | | |
| Head length | 22.5 | 21.0 (21.8) 22.5 |
| Depth orig. anal fin | 17.0 | 15.0 (16.7) 19.0 |
| Upper jaw length | 11.5 | 9.7 (10.6) 11.5 |
| Hor. eye window | 4.7 | 4.3 (4.7) 5.1 |
| Postorbital length | 13.0 | 12.0 (12.7) 13.0 |
| Preanal length | 40.5 | 37.5 (39.4) 44.0 |
| Predorsal length | 25.0 | 23.0 (24.2) 25.0 |
| Base of ventral fin to anal fin origin | 25.5 | 21.0 (23.7) 26.5 |
| Ventral fin length | 13.0 | 11.5 (12.3) 13.5 |
| Snout to 1st ocellus | 45.0 | 41.0 (42.8) 45.0 |
| In % of head length | | |
| Longest filament on ant. gill arch | 5.8 | 5.2 (5.8) 6.5 |

* All six specimens represented in mean value.

stomach contents. Caught on upper continental slope.

Distribution: Known from two localities off the Marquesas Is. in the southeastern part of the West Pacific from a depth of 310-350 m.

Etymology: Named after the type locality, the Marquesas Is.

### *Neobythites meteori* Nielsen, 1995

Figs. 1, 2, 47, 48

*Neobythites meteori* Nielsen, 1995: 7, fig. 6 (type locality: off Socotra Is., 11º33.9'N, 52º54'E).

*Neobythites unimaculatus* (non Smith & Radcliffe): Kotthaus 1979: 13, fig. 462.

*Neobythites* sp. 2: Gloerfelt-Tarp & Kailola 1984: 89 (colour photo).

*Neobythites* sp. 12: Schwarzhans 1994: fig.40 (sagitta).

Material examined (2 specimens, SL 93-102): Holotype: ZMH 5621, SL 102, female, off Sokotra Is. (11º33.9'N, 52º54'E), R/V METEOR st. 102, Agassiz trawl, 175-337 m, 20 Dec. 1964.

Non-type: ZMUC P77744, SL 93, female, southeast of Lombok (ca. 9ºS, 117ºE), JETINDOFISH, st. TGT 1717, bottom trawl, 150-280 m, July 1981.

Diagnosis (based on holotype): Hind margin of preopercle with a flat process; a distinct ocellus on dorsal fin above anus; teeth needle-like; dorsal fin rays 91; anal fin rays 75; pectoral fin rays 27; developed rakers on anterior gill arch 6; longest gill filament on anterior arch 13.5 % length of head; pseudobranchial filaments 3; vomer tooth patch triangular (Fig. 48A); precaudal vertebrae 13; total vertebrae 53.

Similarity: *N. meteori* seems most close to *N. malhaensis* (cf. p. 51).

Description: (Data for non-type specimen in brackets). Meristic characters: Number of rays in dorsal fin 91 (91), caudal fin 7 (8), anal fin 75 (72)

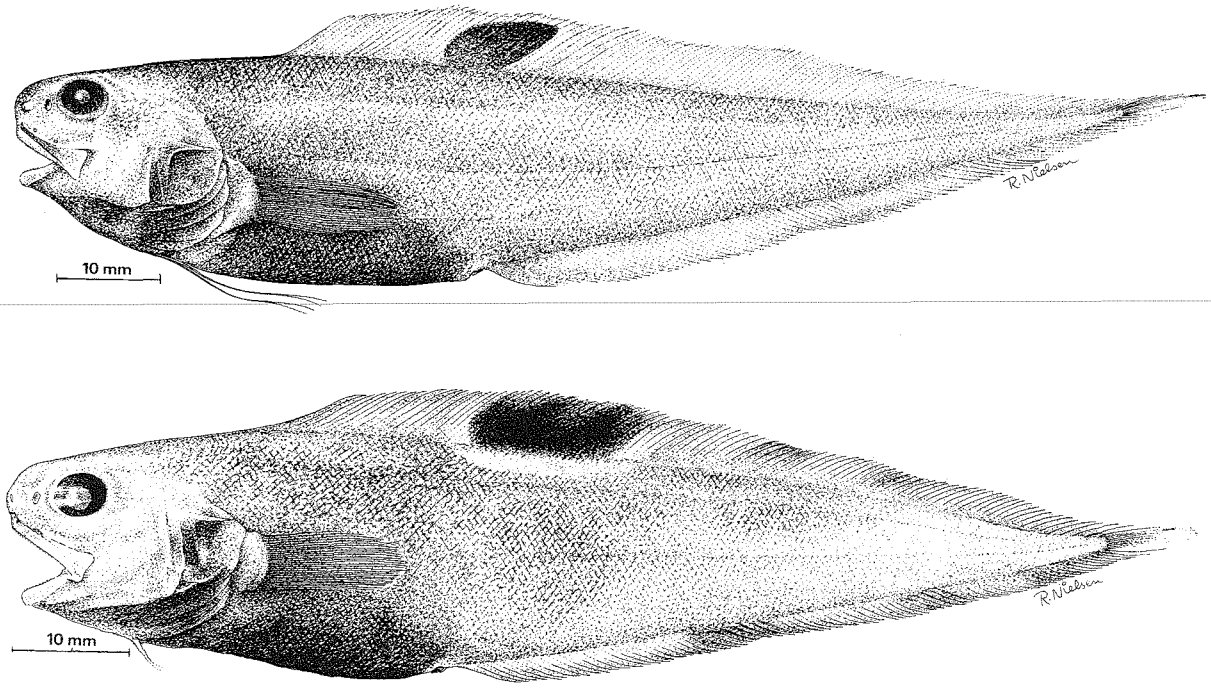


Fig. 47. *Neobythites meteori*. A, holotype, ZMH 5621, SL102; B, ZMUC P77744, SL 93.

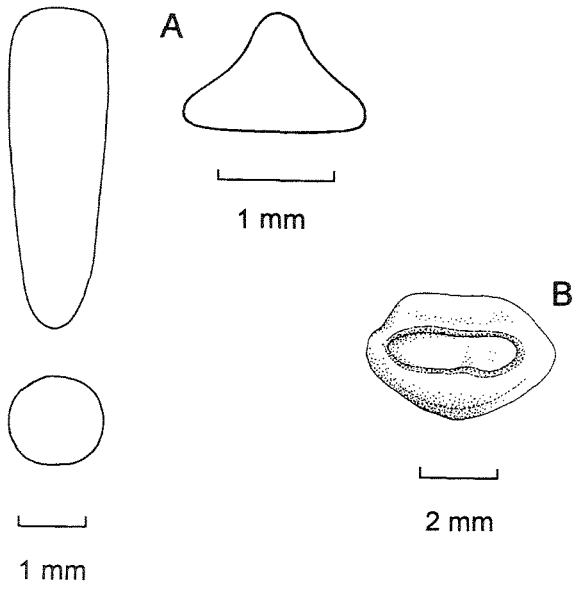


Fig. 48. *Neobythites meteori*. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of ZMUC P77744.

and pectoral fin 27 (29); anterior dorsal fin ray above vertebra no. 5 (5); anterior anal fin ray below vertebra no. 15 (16) and dorsal fin ray no. 20 (21); precaudal vertebrae 13 (13) and caudal vertebrae 40 (40); long rakers on anterior gill arch 6 (7); pseudobranchial filaments 3 (2); black part of ocellus on dorsal fin rays nos. 17-25 (18-31). Morphometric characters: In % of SL: Length of head 22.0 (23.0); depth at anterior anal fin 19.0 (19.0); upper jaw 9.8 (9.7); horizontal eye window 4.9 (5.2); postorbital 14.0 (14.0); preanal 45.0 (44.5); predorsal 24.5 (26.0); from base of ventral fins to anal fin 26.5 (30.0); ventral fin 11.0 (13.0); snout to ocellus 39.0 (43.0). In % of head length: Longest filament on anterior gill arch 13.5 (9.4).

General description: Rather elongate fish with anterior part of lateral line distinct; snout blunt equal in length to eye window; maxilla ends below posterior margin of eye; teeth needle-like, larger on palatines and the triangular vomer; posterior basibranchial tooth patch large (Fig.48A); anterior nostril with tube (low rim) and larger posterior nostril a mere hole; hind margin of preopercle with a flat process; opercular spine on right side bifurcated (spine straight); ventral fin reaches halfway from base to anal fin; anterior gill arch with 3-4 short rakers on upper branch, one long raker in angle and lower branch with five long and two short rakers; well developed pseudobranchial filaments.

Sagittal otolith of holotype in poor condition. The description and Fig. 48B is based on sagitta from non-type specimen. Rather thick, 1.5 times as long as high; sulcus large and distinct with unclear separation between cauda and ostium; cauda about half as long as ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spines half length of second spine; vertebrae 3-6 with slightly depressed neural spines; vertebrae 5-8 with enlarged bases; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on nos. 4-9.

Coloration. A conspicuous ocellus on dorsal fin with distinct whitish outer ring placed above anus (just behind anus) and covering fin rays 17-25 (18-31); Lombok specimen with a few darkish areas posterior to ocellus and on anal fin; abdomen and eye dark blue; inside of peritoneum with many black spots of various sizes.

Biology: Known from two females; eggs in holotype 0.5 mm in diameter. Caught on the lower shelf and upper continental slope.

Distribution: Known from two localities (Figs. 1 and 2), off Sokotra Is. and southeast of Lumbok Is., at 150 to 337 m depth.

Remarks on material: The present two specimens are much alike (Fig. 47), but still it is with some hesitation that the Lombok specimen is referred to *N. meteori*. They differ in the following characters: size of ocellus (covering dorsal fin rays 17-25 in holotype *vs* 18-31), position of ocellus (above anus in holotype *vs* slightly behind), caudal fin rays 7 (8), anterior gill arch with 5-6 small and six long rakers (8-9 small and seven long) and length of longest gill filaments on anterior arch (13.5 % of head in holotype *vs* 9.4 %). However, with only one specimen from each of the two far removed localities it seems premature to establish of a new species based on the Lombok specimen. Additional material from one or both localities could show whether one or two species is involved. Especially a specimen with well-preserved otoliths from the type locality would be welcome.

## *Neobythites multistriatus* Nielsen & Quéro, 1991

Figs. 1, 49, 50

*Neobythites multistriatus* Nielsen & Quéro, 1991: 194, fig. 1 (type locality: off Réunion, 20°57.9'S, 55°14.5'E),

*Neobythites fasciatus* (non Smith & Radcliffe): Shcherbachev *et al.* 1986: 203.

*Neobythites multistriatus*: Schwarzhans 1994: 74, figs. 23-24 (sagitta); Nielsen 1995: 8, fig. 7.

Material examined (5 specimens, SL 76-178): Holotype: MNHN 1988-1945 (SL 178), off Réunion.

Paratypes: MNHN 1988-1946 (2, SL 152-165) and ZMUC P77809 (1, SL 149+), off Réunion

Non-type: ZM MGU P-18914 (1, SL 76), off Rodrigues.

See Nielsen & Quéro (1991: 194) for station-data for types and Nielsen (1995: 8) for non-type.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with (4)7-9 and anal fin with 3-4 more or less distinct ocelli or dark blotches and corresponding vertical, dark bars on body; dorsal fin rays 106-111; anal fin rays 91-95; pectoral fin rays 28-30; long rakers on anterior gill arch 12-15; longest gill filaments on anterior arch 5.8-6.3 % length of head; 3-5 pseudobranchial filaments; form of vomer tooth patch changes with growth (Fig. 50B); precaudal vertebrae 13; total vertebrae 63.

Similarity: *N. multistriatus* seems closest to *N. fasciatus* (cf. p. 28).

Description: The principal meristic and morphometric characters are shown in Table 21. Elongate fish with indistinct lateral line; snout blunt or rounded, slightly longer than eye window; maxilla ends well behind eye; teeth granular; vomer tooth patch varies in shape apparently due to growth, anterior basibranchial tooth patch broad in front (Fig. 50A); anterior nostril with flap or low tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches halfway from its base to anal fin; anterior gill arch with 2-3 short and three long rakers on upper branch, one long raker in angle and lower branch with 8-10 long and 4-6 short rakers; 3-5 pseudobranchial filaments.

Sagittal otolith (Fig. 50C) oval and thick, 1.5 times as long as high, with smooth, rounded posterior and anterior edges and a flat dorsal rim; ostium

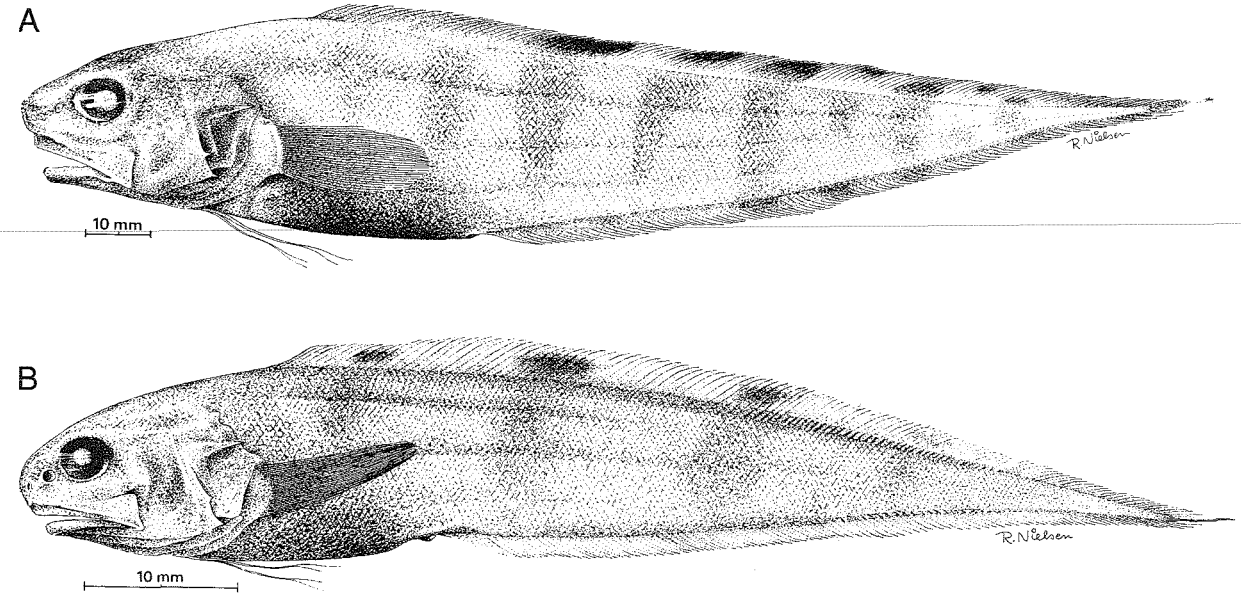


Fig. 49. *Neobythites multistriatus*. A, holotype, MNHN 1988-1945, SL 178; B, ZM MGU P-18914, SL 76.

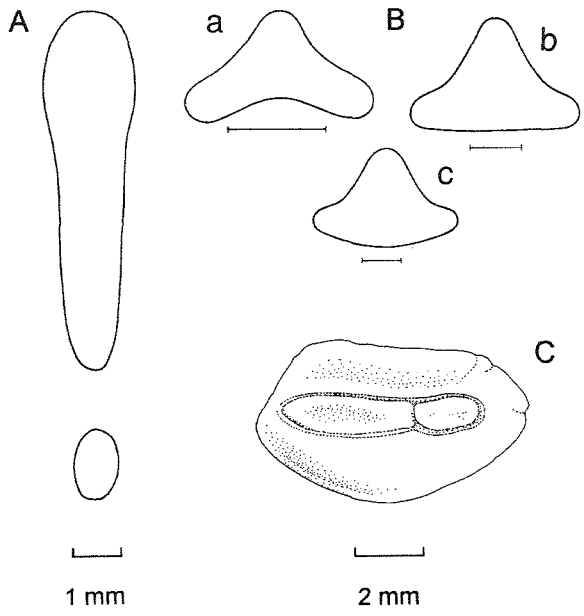


Fig. 50. *Neobythites multistriatus*. A, basibranchial tooth patches of paratype, ZMUC P77809, SL149+; B, vomer: a – ZM MGU P-18914, SL 76, b – MNHN 1988-1946, SL 165, c – MNHN 1988-1945, SL 178 (scale bar = 1 mm); C, median view of right sagitta of paratype, MNHN 1988-1946.

twice as long and only partly separated from cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-7 with depressed neural spines; bases of vertebrae 5-10 enlarged; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs indistinct.

Coloration. Generally light brown with somewhat darker indication of lateral line; dorsal fin with (4)7-9 and anal fin with 3-5 ocelli or dark blotches with corresponding vertical, dark brown bars; peritoneum black; eyes bluish.

Biology: All five specimens are non-ripe females. Stomach contents consist of remains of crustaceans and a few fish bones. Caught on the upper continental slope.

Distribution: Known from four localities (Fig. 1) off Reunion and Rodrigues Is. at 300-490 m depth.

Remarks on material: The Rodrigues specimen (Fig. 49B) differs from the type specimens in sever-

Table 21. Meristic and morphometric characters of *N. multistriatus*.

| | Holotype | HT + 3 paratypes | Nos | Non-type spm. |
|---|---|---|---|---|
| Standard length | 178 | 149+ -178 | 4 | 76 |
| Meristic characters | | | | |
| Dorsal finrays | 108 | 106 (107.7) 109 | 3 | 111 |
| Caudal finrays | 8 | 8 | 2 | 8 |
| Anal finrays | 91 | 91 (91.7) 93 | 3 | 95 |
| Pectoral finrays | 29/30 | 28 (29.0) 30 | 4 | 30 |
| Pseudobr. filaments | 5 | 5 | 3 | 3 |
| Precaudal vertebrae | 13 | 13 | 4 | 13 |
| Total vertebrae | 63 | 63 | 3 | 63 |
| Long rakers on ant. gill arch | 14 | 13 (13.0) 15 | 4 | 12 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.3) 6 | 4 | 5 |
| Ant. anal ray below dorsal ray no. | 21 | 19 (20.3) 21 | 4 | 18 |
| Ant. anal ray below vertebra no | 16 | 14 (15.3) 16 | 4 | 15 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 22.0 | 21.0 (21.7) 23.0 | 3 | 20.5 |
| Depth orig. anal fin | 16.5 | 15.0 (15.6) 16.5 | 3 | 14.0 |
| Upper jaw length | 10.5 | 9.7 (10.3) 10.5 | 2 | |
| Hor. eye window | 4.3 | 4.3 (4.4) 4.4 | 3 | 4.3 |
| Postorbital length | 12.5 | 11.0 (11.4) 12.5 | 3 | |
| Preanal length | 41.5 | 40.5 (41.7) 43.0 | 3 | 35.5 |
| Predorsal length | 24.0 | 24.0 (24.8) 25.5 | 3 | 23.0 |
| Base of ventral fin to anal fin origin | 23.0 | 23.0 (23.2) 23.5 | 2 | 20.5 |
| Ventral fin length | 11.5 | 11.5 (11.9) 12.5 | 3 | 12.0 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 5.8 | 5.8 (6.0) 6.3 | 4 | 5.8 |

al characters (Table 21). Differences in the morphometric characters could be explained by its small SL (76 *vs* 149+ - 178) and in the meristics as geographic variation. Additional material is needed to clarify this problem. It can be added that the Rodrigues specimen has four rather distinct ocelli on dorsal fin: Snout to first ocellus 30.5 % SL (ocellus on dorsal rays 8-12), snout to second ocellus 42.0 % SL (ocellus on dorsal rays 22-32), snout to third ocellus 61 % SL (ocellus on dorsal rays 44-52) and snout to fourth ocellus 78 % SL (ocellus on dorsal rays 68-78).

### *Neobythites musorstomi* n. sp.

Figs. 2, 51, 52

Material examined (4 specimens, SL 118-166): Holotype: MNHN 1995-712, SL 166, male, northeast of Fiji Is.(11°47.8'S, 178°19.1'W), MUSORSTOM 7, R/V ALIS st. CP 559, beam trawl, 547-552 m, 19 May 1992.

Paratypes: MNHN 2001-34 (SL 157, male) and ZMUC P771321 (SL 152, male) (same data as for holotype).

Tentatively referred specimen: MNHN 2001-34, SL 118, male (same data as for holotype).

Diagnosis (tentatively referred specimen excluded): Hind margin of preoperecle with 0-1 flat, weak process; no ocelli and bars; dorsal fin rays 101-103; anal fin rays 85-86; pectoral fin rays 27-29; long rakers on anterior gill arch 10-11; longest gill filaments on anterior arch 3.9-5.2 % length of head; pseudobranchial filaments two; vomer tooth patch subtriangular (Fig. 52A); precaudal vertebrae13; total vertebrae 59.

Similarity: The holo- and two paratypes of *N. musorstomi* seem most close to *N. sinensis* with no spines on preopercle and no ocelli or dark bands on dorsal and anal fins. They differ in number of dorsal fin rays (101-105 *vs* 92) and pseudobranchial filaments (2 *vs* 4). The tentatively referred specimen is the only known Indo-Pacific *Neobythites* specimen with the combination of four ocelli and no spines on preopercle.

Description: The principal meristic and morphometric characters are shown in Table 22.

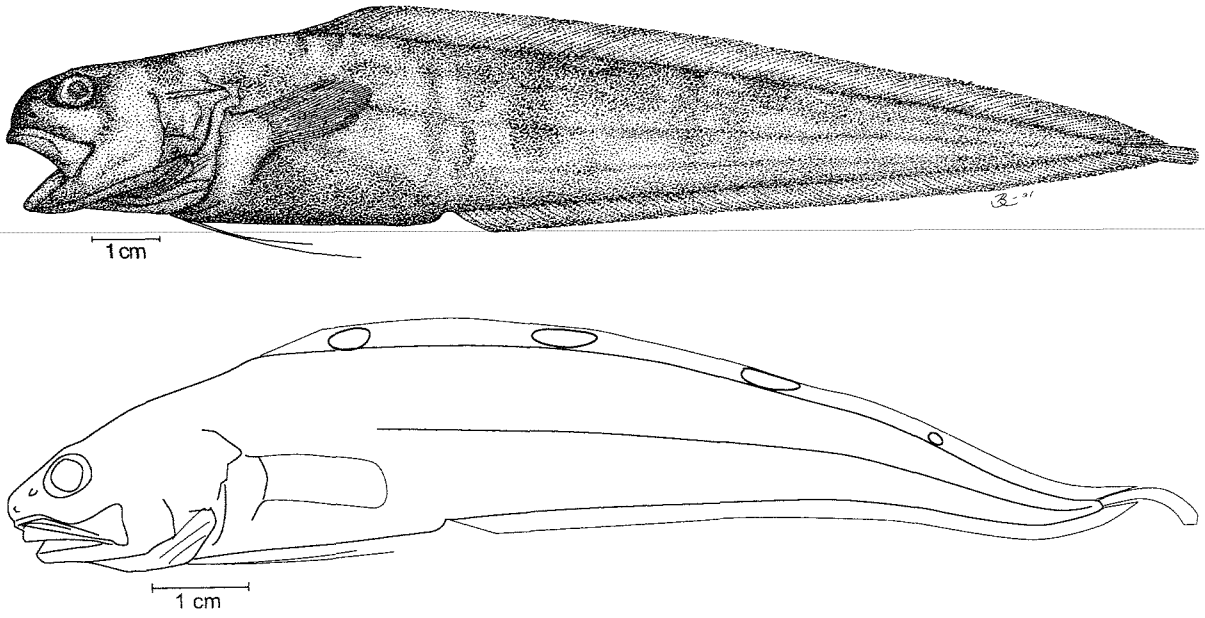


Fig. 51. *Neobythites musorstomi* n. sp. A, holotype, MNHN 1995-712, SL 166; B, MNHN 2001-34, SL 118.

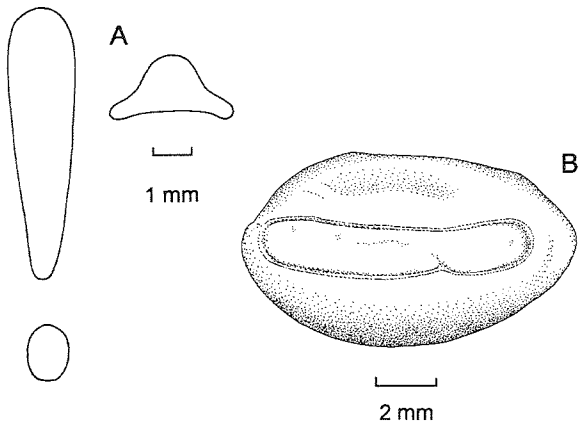


Fig. 52. *Neobythites musorstomi* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

Holotype (differences to paratypes in brackets). Elongate fish with indistinct lateral line; snout blunt (one paratype with pointed snout), equal in length to eye diameter; maxilla ends just posterior to eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch widest in front (Fig. 52A); anterior nostril with short tube and larger posterior nostril a mere hole; hind margin of preopercle with 0-1 flat process; ventral fin reaches 2/3 from base to anal fin; anterior gill arch with two short and two (three) long rakers on upper branch, one long raker in angle and lower branch with seven (7-8) long and eight short rakers; two large pseudobranchial filaments.

Sagittal otolith (Fig. 52B) oval almost twice as long as high with smooth edges, highest anteriorly and with anterior and posterior end pointed; sulcus closed with almost complete separation of colliculi; cauda half length of ostium.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior precaudal vertebrae 7-13; pleural ribs on vertebrae 3-13; epipleural ribs on 3-9.

Coloration. Snout, underside of head, posterior part of opercle, eye-ring and dorsal part of body brownish; remains of dark pigment on lateral line and fin rays; peritoneum and eyes bluish.

Biology: The material examined consists of four

Table 22. Meristic and morphometric characters of *N. musorstomi*.

| | Holotype | 2 paratypes | Non-type |
|---|---|---|---|
| Standard length | 166 | 152-157 | 118 |
| Meristic characters | | | |
| Dorsal finrays | 101 | 102-103 | 105 |
| Caudal finrays | 8 | 8 | 8 |
| Anal finrays | 86 | 85-86 | 88 |
| Pectoral finrays | 29 | 27 | 28 |
| Pseudobr. filaments | 2 | 2 | 2 |
| Precaudal vertebrae | 13 | 13 | 13 |
| Total vertebrae | 59 | 59 | 59 |
| Long rakers on ant. gill arch | 10 | 11 | 12 |
| Ant. dorsal ray above vertebra no. | 6 | 5-6 | 5 |
| Ant. anal ray below dorsal ray no. | 22 | 20-21 | 22 |
| Ant. anal ray below vertebra no | 16 | 15 | 16 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 22.0 | 20.0-21.5 | 21.5 |
| Depth orig. anal fin | 15.5 | 14.5-15.0 | 15.5 |
| Upper jaw length | 9.8 | 9.9-10.0 | 10.0 |
| Hor. eye window | 4.5 | 4.3-4.5 | 5.2 |
| Postorbital length | 13.5 | 12.5-13.0 | 12.5 |
| Preanal length | 41.5 | 38.0-41.5 | 38.5 |
| Predorsal length | 25.5 | 24.0-25.5 | 24.0 |
| Base of ventral fin to anal fin origin | 24.0 | 23.0-25.0 | 23.0 |
| Ventral fin length | 16.0 | 14.0-15.5 | 15.5 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 3.9 | 4.1-5.2 | 4.8 |

males none of which is ripe. Two specimens with gastropods and remains of crustaceans in the intestine. Caught on the upper continental slope.

Distribution: Known from the type locality off Fiji Is. (Fig. 2) at a depth of 547-552 m.

Etymology: Named after the French MUSORSTOM cruises, which have procured a very rich collection of fish from the West Pacific.

Remarks on material: The small specimen (SL 118) is tentatively referred to *N. musorstomi* because of slight differences in meristic characters (cf. Table 22) but mainly due to the presence of four ocelli in dorsal fin. The distance from the upper jaw symphysis to the black part of the four ocelli is; 30.5 %, 46.5 %, 63 % and 81 %, respectively. More material may show whether the ocelli disappear with increasing length.

## *Neobythites natalensis* Nielsen, 1995

Figs. 1, 53, 54

*Neobythites natalensis* Nielsen, 1995: 9, fig. 8 (type locality: off Natal, 25°20'S, 35°17'E).

Material examined (4 specimens, SL 53-69):
Holotype: ZMUC P77824 (SL 53), off Natal.
Paratypes: MNHN 1992-535 (3, SL 53-69), west of Madagascar.
See Nielsen (1995: 9) for station-data.

Diagnosis: Hind margin of preopercle with two spines; six more or less distinct ocelli or blotches on dorsal fin; dorsal fin rays 100-102; anal fin rays 84-86; pectoral fin rays 27-29; long rakers on anterior gill arch 8-9; longest gill filaments on anterior arch 3.3-4.5 % length of head; pseudobranchial filaments 2-4; vomer subtriangular (Fig. 54A); precaudal vertebrae 13; total vertebrae 58-60.

Similarity. *N. natalensis* seems most similar to *N. multistriatus* with two preopercular spines and many ocelli or blotches on dorsal fin. They differ in many meristic characters (Tables 21 *vs* 23) and by *natalensis* lacking bars on body and blotches on anal fin.

Description: The principal meristic and morphometric characters are shown in Table 23. Rather slender fish with indistinct lateral line; form of snout varies from blunt to pointed, equal in length to eye window; maxilla ends below hind margin of

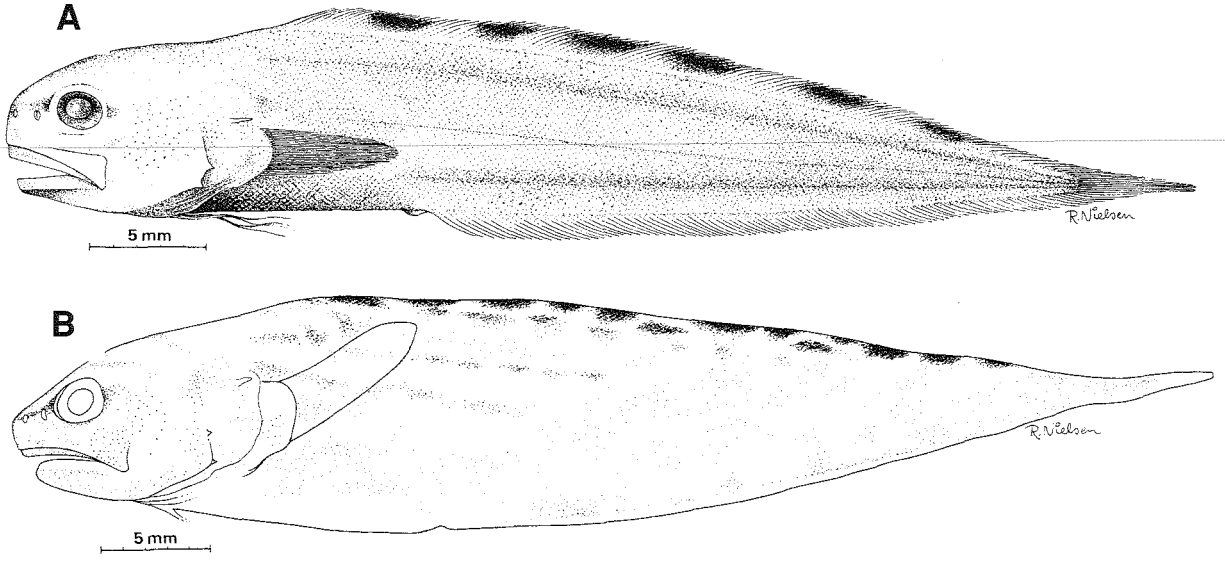


Fig. 53. *Neobythites natalensis*. A, holotype, ZMUC P77824, SL 53; B, paratype, MNHN 1992-535, SL 53.

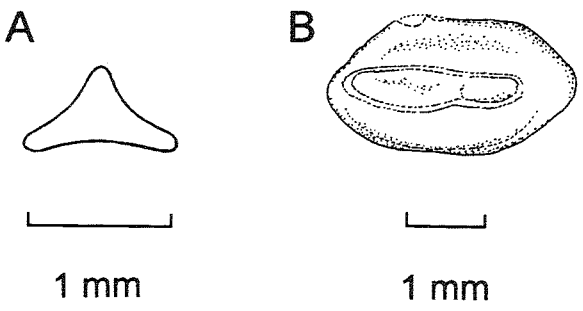


Fig. 54. *Neobythites natalensis*. A, vomer of holotype; B, median view of right sagitta of holotype.

eye or further back; teeth granular; vomer subtriangular (Fig. 54A); anterior nostril with low tube and posterior a mere hole; hind margin of preopercle with two more or less distinct spines; ventral fin reaches little more than halfway from base to anal fin; anterior gill arch with three short and one long raker on upper branch, one long raker in angle and lower branch with 6-7 long and 2-5 short rakers; 2-4 pseudobranchial filaments.

Sagittal otolith (Fig. 54B) oval, twice as long as high and with pointed ends; sulcus closed with almost complete separation of colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines thin and pointed; first neural spine half length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs indistinct.

Coloration. Body yellowish with many tiny black spots on abdomen and dorsal fin; holotype with six distinct ocelli on dorsal fin and paratypes with more diffuse blotches (Fig. 53B); head with diffuse brown stripe from snout through eye; peritoneum brown and eye blue.

Biology: All four specimens juveniles with poorly developed gonads. Caught on upper continental slope.

Distribution: Known from two localities (Fig. 1), off Natal and northwestern Madagascar at depths of 310-590 m.

Table 23. Meristic and morphometric characters of *N. natalensis*

| | Holotype | HT and 3 paratypes | Nos. |
|---|---|---|---|
| Standard length | 53 | 53-69 | 4 |
| Meristic characters | | | |
| Dorsal finrays | 101 | 100 (101) 102 | 4 |
| Caudal finrays | - | 8 | 3 |
| Anal finrays | 84 | 84 (85) 86 | 4 |
| Pectoral finrays | 28/29 | 27 (28.3) 29 | 4 |
| Pseudobr. filaments | 2 | 2 (3) 4 | 4 |
| Precaudal vertebrae | 13 | 13 | 4 |
| Total vertebrae | 58 | 58 (59) 60 | 4 |
| Long rakers on ant. gill arch | 8 | 8 (8.5) 9 | 4 |
| Ant. dorsal ray above vertebra no. | 5 | 4 (4.8) 5 | 4 |
| Ant. anal ray below dorsal ray no. | 18 | 18 (19.8) 21 | 4 |
| Ant. anal ray below vertebra no | 14 | 14 (14.5) 15 | 4 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 21.5 | 20.5 (21.5) 22.5 | 4 |
| Depth orig. anal fin | 15.0 | 15.0 (15.4) 16.0 | 4 |
| Upper jaw length | 10.5 | 10.0 (10.5) 11.0 | 4 |
| Hor. eye window | 4.7 | 4.6 (4.7) 4.7 | 2 |
| Postorbital length | 13.5 | 12.5 (12.8) 13.5 | 4 |
| Preanal length | 37.0 | 37.0 (38.8) 40.0 | 4 |
| Predorsal length | 23.5 | 23.5 | 4 |
| Base of ventral fin to anal fin origin | 23.0 | 22.5 (24.0) 25.5 | 4 |
| Ventral fin length | 14.0 | 13.5 (14.2) 15.0 | 3 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 3.5 | 3.5 (3.8) 4.5 | 4 |

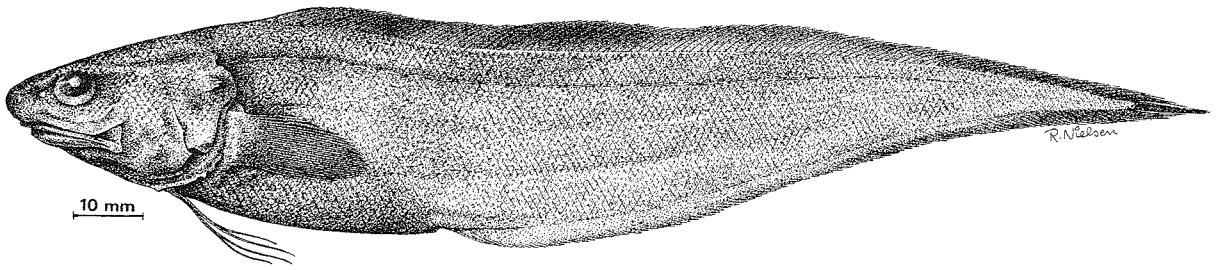


Fig. 55. *Neobythites neocaledoniensis*. Holotype, MNHN 1994-741, SL 169.

## *Neobythites neocaledoniensis* Nielsen, 1997

Figs. 2, 55, 56

*Neobythites neocaledoniensis* Nielsen, 1997: 67, fig.14 (type locality: New Caledonia, 18°52.8'S, 163°21.7'E).

*Neobythites* sp. 18: Schwarzhans 1994: 75, fig. 68 (sagitta).

Material examined (9 specimens, SL 124-245): Holotype: MNHN 1994-741 (SL 169), off New Caledonia.

Paratypes: MNHN 1994-742,743,744 (4, SL124-245), NMNZ-P.29201 (2, SL 125-132) and ZMUC P771156 (1, SL 145), New Caledonia and Norfolk Ridge.

See Nielsen (1997: 67) for station-data.

Additional material: ZMUC P77743, SL 166, male, Lombok Strait, Indonesia, JETINDOFISH, st. 1684, July 1981.

Diagnosis: Hind margin of preopercle with two spines; no ocelli or bars; dorsal fin rays 102-106; anal fin rays 87-90; pectoral fin rays 26-28; developed rakers on anterior gill arch 10-11; longest gill filaments on anterior arch 5.8-7.4 % length of head; pseudobranchial filaments 4-7; vomer tooth patch subtriangular (Fig. 56A); precaudal vertebrae 13; total vertebrae 59-61.

Similarity: *N. neocaledoniensis* seems most similar to *N. alcocki* (cf. p. 15).

Description: The principal meristic and morphometric characters are shown in Table 24.

Elongate fish with distinct lateral line; snout pointed, slightly longer than eye window; maxilla ends well behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch long (Fig. 56A); anterior nostril with small tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about halfway from base to anal fin; anterior gill arch with 2-4 short and two long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 3-6 short rakers; pseudobranchial filaments 3-4 except for one specimen with 7 filaments.

Sagittal otolith (Fig. 56B) oval, twice as long as high; long sulcus not quite separated into colliculi; ostium a little more than twice as long as cauda.

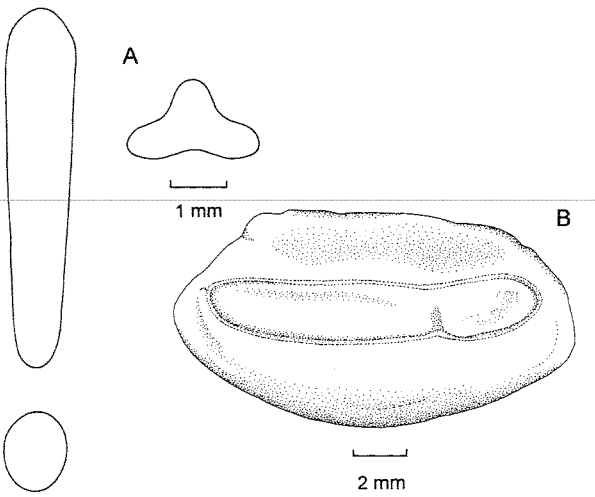


Fig. 56. *Neobythites neocaledoniensis*. A, basibranchial tooth patches and vomer of paratype, ZMUC P771156, SL 145; B, median view of right sagitta of paratype, MNHN 1994-742, SL 245.

Table 24. Meristic and morphometric characters of *N. neocaledoniensis*.

| | Holotype | HT, 7 paratypes + 1 spm | Nos |
|---|---|---|---|
| Standard length | 169 | 124-245 | 9 |
| Meristic characters | | | |
| Dorsal finrays | 106 | 102 (103.8) 106 | 9 |
| Caudal finrays | 8 | 8 | 7 |
| Anal finrays | 89 | 87 (88.2) 90 | 9 |
| Pectoral finrays | 28 | 26 (27.4) 28 | 9 |
| Pseudobr. filaments | 4 | 4 (4.3) 7 | 9 |
| Precaudal vertebrae | 13 | 13 | 9 |
| Total vertebrae | 59 | 59 (60.1) 61 | 9 |
| Long rakers on ant. gill arch | 11 | 10 (10.9) 11 | 9 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.2) 6 | 9 |
| Ant. anal ray below dorsal ray no. | 20 | 18 (19.8) 22 | 9 |
| Ant. anal ray below vertebra no | 15 | 14 (15.0) 16 | 9 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 25.0 | 22.5 (23.3) 25.0 | 9 |
| Depth orig. anal fin | 17.0 | 16.0 (17.0) 18.0 | 9 |
| Upper jaw length | 12.5 | 11.5 (11.9) 12.5 | 6 |
| Hor. eye window | 4.7 | 4.1 (4.4) 4.7 | 9 |
| Postorbital length | 14.0 | 13.0 (13.8) 14.5 | 6 |
| Preanal length | 42.5 | 39.5 (42.8) 47.0 | 9 |
| Predorsal length | 26.5 | 25.0 (26.0) 26.5 | 8 |
| Base of ventral fin to anal fin origin | 25.5 | 21.5 (24.7) 28.0 | 8 |
| Ventral fin length | 12.5 | 11.0 (12.9) 16.0 | 8 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 7.6 | 5.8 (6.6) 7.4 | 9 |

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine 1/2-2/3 length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-10.

Coloration. Dorsal part of head and body brown, ventrally lighter with many tiny black spots; brown ring around eye; no ocelli or bars; dorsal and posterior part of anal fin dark; eye and peritoneum bluish.

Biology: The material consists of six females and three males none of which is ripe. Remains of crustaceans in intestines of most specimens and in three up to 12 gastropods. Caught on the upper part of the continental slope.

Distribution: Known from five localities (Fig. 2) from off Bali to New Caledonia at 470-670 m depth.

## *Neobythites nigriventris* n. sp.

Figs. 2, 57, 58

*Neobythites* sp. 11: Schwarzhans 1994: figs. 61-64 (sagitta).

Material examined (59 specimens, SL 61-238): Holotype: CSIRO H 2310-03, SL 173, male, Marion Plateau, Queensland (22°53.3'S, 152°59.3'E), R/V SOELA st. SO 06/85/12, trawl, 325-338 m, 18 Nov. 1985.

Paratypes: AMS I. 15520-003, SL120, male, off Brisbane, Queensland (26°17'S, 153°52'E), CSIRO, NIMBUS st. 5, Agassiz trawl, 229 m, 26 July 1968; AMS I. 15530-001, SL 61, off Brisbane, Queensland (26°49'S, 153°35'E), CSIRO, NIMBUS st. 16, Agassiz trawl, 137 m, 27 July 1968; AMS I. 24090-003, SL 176, female, off Coffs Harbour, New South Wales (30°24'S, 153°22'E),

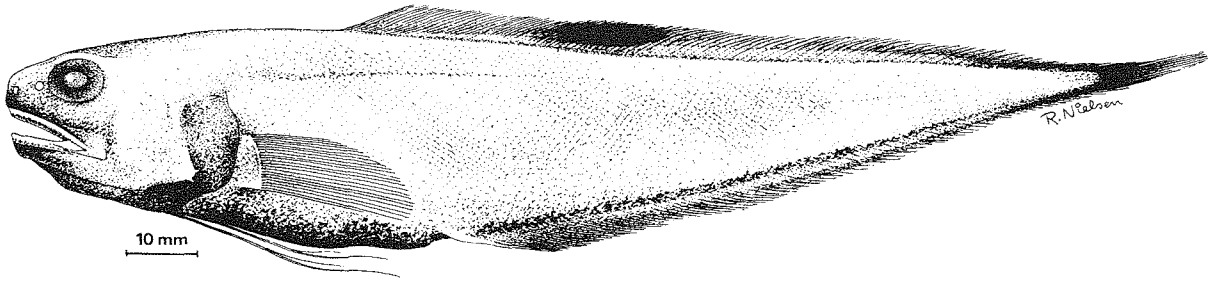


Fig. 57. *Neobythites nigriventris* n. sp. Holotype, CSIRO H 2310-03, SL 173.n. sp

R/V KAPALA st. K-78-09-18, bottom trawl, 130 m, 4 June 1978; AMS I. 23685-002, SL 118-160, 5 females, Coffs Harbour, NSW (30°43'S, 153°16'E), R/V KAPALA st. K-78-21-04, prawn trawl, 134-151 m, 10 Oct. 1978; AMS I. 20968-004, SL 150+-195+, 2 females + 1 male, off Hinchinbrook Is., Queensland (18°3'S, 147°10'E), AMS, AIMS st. FNQ 79-103, prawn trawl, 357 m, 27 Feb. 1979; CSIRO H 2309-01, SL 185, female, Great Barrier Reef, Queensland (19°37.6'S, 150°30.3'S), R/V SOELA st. SO 06/85/02, trawl, 312 m, 15 Nov. 1985; CSIRO H 2310-01,02,04,05, SL 190-238, 2 females + 2 males (same data as for holotype); CSIRO H 2346-01, SL 63-188, 1 female, 2 males + 3?, Townsville Trough, Queensland (17°57.4'S, 146°58.3'E), R/V SOELA st. SO 06/85/43, trawl, 208-212 m, 29 Nov. 1985; CSRIO H 2312-01, SL 178, male, Townsville Trough, Queensland (17°45.2S, 146°52.9'E), R/V SOELA st. SO 06/85/50, trawl, 296-300 m, 30 Nov.1985; CSIRO H 2311-01 and H 594-03, SL 143-190, 1 female + 1?, Townsville Trough, Queensland (18°10'S, 147°13.2'E), R/V SOELA st. SO 06/85/85, trawl, 240-248 m, 8 Dec. 1985; CSIRO H 594-3, SL 190, female, off Townsville, Queensland (18°10'S, 147°13'E), R/V SOELA st. SO 06/85/8, 240 m, 1985; NTM S.11746-025, SL 170-183, 2 females +1 male, and AMS I. 25800-010 (SL 88-184, 2 females, 1 male + 1?) and ZMUC P771330-1331 (SL 150-173, 2 females), east of Dunk Is., Queensland (17°57'S, 146°59'E), R/V SOELA st. HL 86-1, lobster trawl, 220 m, 8 Jan. 1986; NTM S. 11747-026, SL 133-182, 1 female + 2 males, east of Dunk Is., Queensland (17°58'S, 146°59'E), R/V SOELA st. HL 86-2, lobster trawl, 224-228 m, 9 Jan. 1986; NMV A 4593, SL 155-201, 1 female + 1 male, east of Dunk Is., Queensland (18°0.0'S, 147°2'E), R/V SOELA st. SO 01/86, lobster trawl, 220 m, 8 Jan. 1986; NMV A 4592, SL 129-187, 2 females +1 male, east of Dunk Is., Queensland (18°0.1'S, 147°1.3'E), R/V SOELA st. SO 01/86, lobster trawl, 224-228 m, 9 Jan. 1986; AMS I. 25803-018, SL 149-186, 4 specimens, off Townsville, Queensland (17°57'S, 146°58'E), R/V SOELA st. SO 01/86/06, bottom trawl, 220 m, 1986; AMS I. 25805-015, SL145+, off Townsville, Queensland (17°58'S, 147°1'E), R/V SOELA st. 01/86/11, bottom trawl, 264 m, 1986; AMS I. 31483-004, SL 138-155, 4 specimens, off Evans Head, New South Wales (29°3'S, 153°49'E), R/V KAPALA st. K 90-08-36, bottom trawl, 156 m, 1990; AMS I. 32121-002, SL 125, male, off Newcastle, New South Wales (32°53'S, 152°1'E), R/V KAPALA st. K- 90-10-25, prawn trawl, 73-79 m, 7 June 1990; AMS I. 34067-001, SL 191, female, off New South Wales (32°53'S, 152°00'), R/V KAPALA st. K-91-17-14, bottom trawl, 75-77 m, 25 Nov. 1991; AMS I. 37473-001, SL 130, 1 female, off Newcastle, New South Wales (32°53'S,152°1'E), R/V KAPALA, bottom trawl, 67-79 m, 29 Mar. 1995; AMS I. 37602-002, SL 160, Swains Reef, off Queensland (22°2'S, 153°7'E), R/V CAPRICORN st. QLD-1269, trap, 201 m, 1995; AMS I. 38089-002, SL 115, Swains Reef, off Queensland (22°55'S, 153°20'E), R/V SEADAR BAY st. QLD-1254, bottom trawl, 181 m, 1997.

Tentatively referred specimen: AMS I.15543-005, SL 97+, female, off Brisbane, Queensland (26°30'S, 153°44'E), CSIRO, NIMBUS st. 32, Agassiz trawl, 184 m, 29 July 1968.

Diagnosis: Two spines on hind margin of preopercle; one distinct ocellus on dorsal fin placed posterior to anus; ventral part, especially abdomen, covered with black speckled pigment; dorsal fin rays 90-95; anal fin rays 74-79; pectoral fin rays 23-26; long rakers on anterior gill arch 9-12; longest gill filament on anterior arch 6.4-8.7 % length of

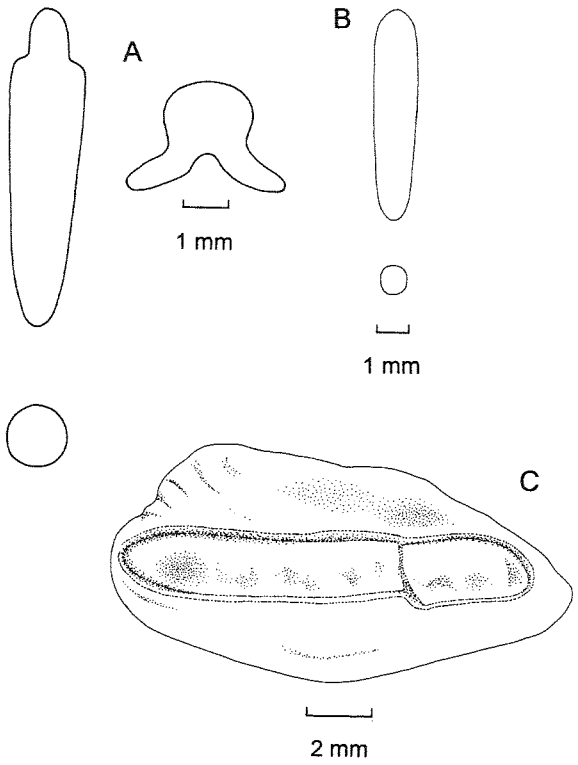


Fig. 58. *Neobythites nigriventris* n. sp. A, basibranchial tooth patches and vomer of holotype; B, basibranchial tooth patches of paratype, CSIRO H 2312-01, SL 178; C, median view of right sagitta of paratype, CSIRO H 2310.

head; pseudobranchial filaments 5-8; vomer tooth patch with large anterior part (Fig. 58A); precaudal vertebrae 12-13; total vertebrae 52-56.

Similarity: *N. nigriventris* seems most similar to *N. unimaculatus* with two preopercular spines, no bars on body, one ocellus in dorsal fin and 23-27 pectoral fin rays. They differ by *nigriventris* having abdomen speckled with black pigment (*vs* no pigment) and by ventral fin reaching 2/3–1/1 from base to anal fin (*vs* reaching halfway from base to anal fin). See also comparison to *N. sereti* on page 74.

Description: The principal meristic and morphometric characters are shown in Table 25.

Table 25. Meristic and morphometric characters of *N. nigriventris*

| | Holotype | HT + 46 paratypes | Nos |
|---|---|---|---|
| Standard length | 173 | 61-238 | 47 |
| Meristic characters | | | |
| Dorsal finrays | 93 | 90 (92.7) 95 | 37 |
| Caudal finrays | 8 | 8 | 29 |
| Anal finrays | 78 | 74 (76.4) 79 | 37 |
| Pectoral finrays | 25 | 23 (24.7) 26 | 26 |
| Pseudobr.filaments | 6 | 5 (5.7) 8 | 29 |
| Precaudal vertebrae | 13 | 12 (12.9) 13 | 37 |
| Total vertebrae | 55 | 52 (53.8) 56 | 37 |
| Long rakers on ant. gill arch | 12 | 9 (10.1) 12 | 38 |
| Ant. dorsal ray above vertebra no. | 5 | 4 (5.0) 6 | 37 |
| Ant. anal ray below dorsal ray no. | 20 | 18 (19.9) 21 | 37 |
| Ant. anal ray below vertebra no | 14 | 14 (14.8) 15 | 37 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 21.5 | 20.5 (22.3) 23.5 | 44 |
| Depth orig. anal fin | 17.5 | 16.0 (17.4) 20.0 | 37 |
| Upper jaw length | 11.0 | 11.0 (11.6) 12.0 | 25 |
| Hor. eye window | 4.6 | 4.0 (4.7) 5.5 | 24 |
| Postorbital length | 13.5 | 12.0 (13.4) 14.5 | 24 |
| Preanal length | 40.5 | 38.0 (42.2) 47.0 | 25 |
| Predorsal length | 24.0 | 24.0 (24.9) 29.5 | 26 |
| Base of ventral fin to anal fin origin | 23.5 | 22.5 (25.8) 29.5 | 37 |
| Ventral fin length | 21.0 | 15.5 (20.3) 24.0 | 36 |
| Snout to 1st ocellus | 45.0 | 41.5 (45.1) 47.0 | 44 |
| In % of head length | | | |
| Longest filament on ant. gill arch | 7.0 | 6.4 (7.3) 8.7 | 30 |

Holotype (differences to paratypes in brackets). Rather elongate fish with distinct lateral line; snout blunt, equal in length to eye window; maxilla ends well behind eye; teeth granular; vomer with large anterior part and first basibranchial tooth patch with indentations anteriorly (all paratypes without indentations) (Fig. 58A,B); anterior nostril with low rim and posteriorly placed flap (some specimens with flap only) and larger posterior nostril a mere hole; ventral fin reaches almost to anal fin (2/3 to anal fin or reaches anus); anterior gill arch with three (2-3) short and three (2-3) long rakers on upper branch, one long raker in angle and lower branch with eight (6-8) long and six (5-7) short rakers; six (5-8) short pseudobranchial filaments.

Sagittal otolith (Fig. 58C) elongate, more than twice as long as high, with pointed posterior end and highest anteriorly; sulcus large, 90 % the sagitta length, and with complete separation of colliculi; ostium 2.5 the length of cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for precaudal spines nos. 2-4 (3-9); first neural spine 2/3 (1/2-3/4) length of second spine; vertebrae 3-10 (3-12) with depressed neural spines; bases of vertebral spines 6-11 (5-11) enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-10 (3-12).

Coloration. Distinct black speckled pigmentation on abdomen continuing on both sides of anterior 2/3 of anal fin (almost to posterior end of anal fin); ocellus on dorsal fin placed behind a line through anus, covering dorsal fin rays 23-30 (20-29); two smallest specimens (SL 63-74) with no traces of ocellus on dorsal fin which can be due to bleaching or that it develops later; posteriormost rays of dorsal and anal fins dark; ventral half of body with many tiny black spots; lips and ventral part of head dark brown; eyes bluish.

Biology: The material consists of 26 females, 15 males and 18 unsexed none of which is ripe; the largest observed eggs were 0.4 mm in diameter. Most specimens with rest of crustaceans and a few with gastropods in the intestines. Caught on the continental shelf and uppermost slope.

Distribution: Known from 25 localities (Fig. 2) off Queensland and New South Wales from depths of 67-357 m.

Etymology: The specific name refers to the black speckled abdomen.

Remarks on material: The tentatively referred specimen is similar to *N. nigriventris* by having indications of pigmentation on abdomen. The caudal part is missing so dorsal and anal fin ray counts and morphometrics are inaccessible, but the precaudal vertebral count (14) and the position of the ocellus (on dorsal rays nos. 27-32) are outside the variation of *nigriventris*.

## *Neobythites pallidus* Nielsen, 1997

Figs. 2, 59, 60

*Neobythites pallidus* Nielsen, 1997: 68, fig. 15 (type locality: New Caledonia, 18°49.4'S, 163°18.8'E).
*Neobythites macrops* Günther, 1887: 102 (in part.).
*Neobythites* sp. 24: Schwarzhans 1994: 76, figs. 76-77 (sagitta).
*Neobythites* sp. 26: Schwarzhans 1994: 76, fig. 72 (sagitta).

Material examined (59 specimens, SL 88-148): Holotype: MNHN 1994-745 (SL 135), off New Caledonia.

Paratypes: MNHN 1994-746 to 749 (14, SL 102-143) and ZMUC P771157-1158 (2, SL 121-132), off New Caledonia.

See Nielsen (1997: 68) for station-data.

Additional material: BMNH 1887.7.12.42 (syntype of *N. macrops*), SL 145, 1 female, off Matuku, Fiji Is., R/V CHALLENGER, st. 173, trawl, 567 m, 24 July 1875; AMS I-23709-001, SL 91-112, 1 male and 2?, off Broken Bay, New South Wales (33°33'S, 152°2'E), R/V KAPALA, 438 m, 5 Dec. 1979; NMV A2559, SL 88-115, 5 females and 1 male, and LACM 42620-2, SL 92-101, 1 female, 1 male and 1?, off Sydney, New South Wales (33°46'S, 151°49'E), R/V KAPALA, 420 m, 9 Sep. 1981; NMV A19337, SL 122, 1 male, south of Point Hicks, Victoria (38°14.6'S, 149°22.2'E), R/V SOELA , trawl, 428-430 m, 5 May 1984; AMS I.

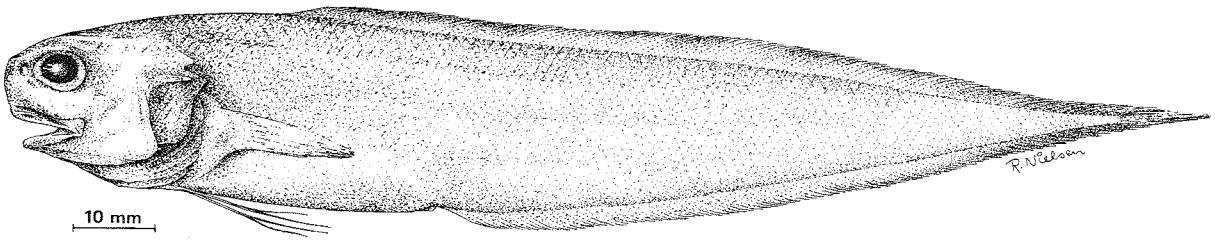


Fig. 59. *Neobythites pallidus*. Holotype, MNHN 1994-745, SL 135.

24852-011, SL 101+, female, off Broken Bay, New South Wales (33°32'S, 152°3'E), R/V KAPALA, bottom trawl, 512-530 m, 11 Sep. 1984; NMV A3826, SL 103, south of Point Hicks, Victoria (38°10'S, 149°52.6'E), R/V SOELA , bottom trawl, 430-440 m, 28 Nov. 1984; CSIRO H 600-09, SL 141, 1 female, NE of Fraser Is, Queensland (22°47'S,154°14'E), R/V SOELA st. SO 06/85/7, bottom trawl, 492 m, 17 Nov. 1985; CSIRO H 2345-5, SL 123-141, 3 females and 2 males, off Saumarez reef, Queensland (22°58'S, 154°26'E), R/V SOELA st. SO 06/85/9, bottom trawl, 695 m, 18 Nov. 1985; MNHN 1995-911, SL 143, female, off Vanuatu ( 17°53.05'S, 168°39.35'E), MUSORSTOM 8, CP 1027, beam trawl, 550-571 m, 28 Sep. 1994; MNHN 2001-35, SL 116, 1 female, off Vanuatu (16°32.37'S, 168°0.29'E), MUSORSTOM 8, CP 1052, beam trawl, 561-564 m, 1 Oct. 1994; MNHN 1995-907, SL 135, 1 male, off Vanuatu (16°27.95'S, 167°57.44'E), MUSORSTOM 8, CP 1054, beam trawl, 522-527 m, 1 Oct. 1994; MNHN 1995-917, SL 133-140+, 2 males, off Vanuatu (16°30.11'S, 167°55.13'E), MUSORSTOM 8, CP 1055, beam trawl, 572-580 m, 1 Oct. 1994; MNHN 1995-908, SL 113-137, 2 females and 1 male, off Vanuatu (15°45.7'S, 167°22.24'E), MUSORSTOM 8, CP 1073, beam trawl, 630-650 m, 4 Oct. 1994; MNHN 1995-906, SL 113-136, 3 females and 3 males, off Vanuatu ( 15°8.82'S, 167°17.23'E), MUSORSTOM 8, CP 1089, beam trawl, 494-516 m, 6 Oct. 1994; MNHN 1995-910, SL 118-123, 1 female and 1 male, off Vanuatu (15°8.46'S, 167°17.94'E), MUSORSTOM 8, CP 1090, beam trawl, 470-502 m, 6 Oct. 1994; MNHN 1995-912, SL 123-127, 2 females, off Vanuatu (15°1.72'S, 166°56.51'E), MUSORSTOM 8, CP 1124, beam trawl, 532-599 m, 9 Oct. 1994; MNHN 2000-0682, SL 148, 1 male, Somo-somo Strait, Fiji Is. (16°49'S, 179°57'W), Camp. Bordau 1, R/V ALIS st. CP 1396, beam trawl, 591 m, 24 Feb. 1999; MNHN 2000-0681, SL 139, female, off Lakeba, Fiji Is. (18°12'S, 178°48'W), Camp. Bordau 1, R/V ALIS st. CP1461, beam trawl, 560 m, 6 Mar. 1999.

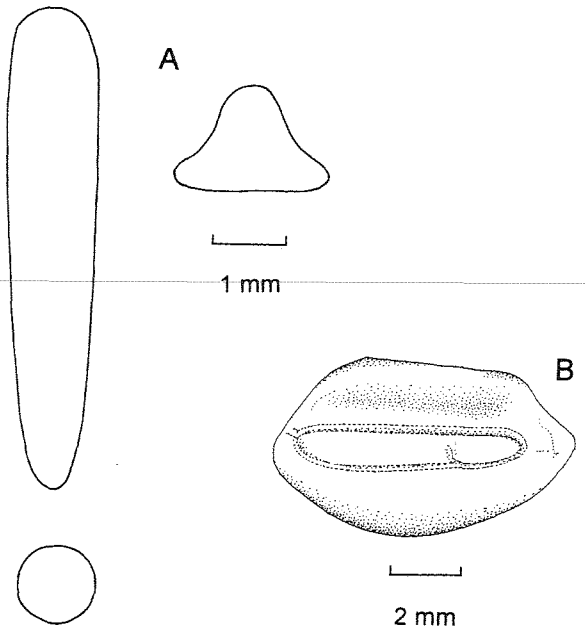


Fig. 60. *Neobythites pallidus*. A, basibranchial tooth patches and vomer of paratype, ZMUC P771157; B, median view of right sagitta of paratype, MNHN 1994-747, SL 132.

Diagnosis: Hind margin of preopercle with two spines; no ocelli and bars; dorsal fin rays 97-106, anal fin rays 82-92; pectoral fin rays 26-29; long rakers on anterior gill arch 13-17; longest gill filaments on anterior arch 2.7-5.9 % length of head; pseudobranchial filaments 3-7; vomer tooth patch subtriangular (Fig. 60A); precaudal vertebrae 13; total vertebrae 56-60.

Similarity: *N. pallidus* seems most similar to *N. alcocki* with two spines on preopercle, no ocelli,

Table 26. Meristic and morphometric characters of *N. pallidus*

| | Holotype | HT + 16 paratypes | HT, PT's + 41 spms | Nos |
|---|---|---|---|---|
| Standard length | 135 | 102-142 | 88-148 | 58 |
| Meristic characters | | | | |
| Dorsal finrays | 100 | 97 (100.0) 101 | 97 (100.5) 106 | 55 |
| Caudal finrays | 8 | 8 | 8 | 43 |
| Anal finrays | 85 | 82 (84.9) 86 | 82 (85.3) 92 | 54 |
| Pectoral finrays | 28 | 26 (27.7) 29 | 26 (27.4) 29 | 47 |
| Pseudobr. filaments | 4 | 4 (4.5) 6 | 3 (4.7) 7 | 51 |
| Precaudal vertebrae | 13 | 13 | 13 | 57 |
| Total vertebrae | 59 | 58 (58.9) 60 | 56 (58.7) 60 | 54 |
| Long rakers on ant. gill arch | 15 | 14 (15.0) 16 | 13 (14.9) 17 | 55 |
| Ant. dorsal ray above vertebra no. | 6 | 5 (5.9) 6 | 5 (5.8) 7 | 57 |
| Ant. anal ray below dorsal ray no. | 19 | 18 (19.2)20 | 16 (19.2) 21 | 57 |
| Ant. anal ray below vertebra no | 15 | 15 (15.1) 16 | 14 (15.0) 16 | 57 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 20.5 | 20.5 (21.4) 22.5 | 18.5 (21.1) 22.5 | 54 |
| Depth orig. anal fin | 14.5 | 14.0 (15.3) 16.5 | 14.0 (15.5) 17.5 | 54 |
| Upper jaw length | 9.3 | 9.3 (10.3) 11.0 | 9.3 (10.1) 11.0 | 53 |
| Hor. eye window | 5.0 | 4.3 (4.9) 5.5 | 4.3 (4.8) 5.5 | 51 |
| Postorbital length | 12.0 | 10.0 (11.7) 14.0 | 10.0 (12.3) 14.0 | 47 |
| Preanal length | 38.5 | 38.0 (39.3) 42.5 | 36.5 (40.2) 44.5 | 54 |
| Predorsal length | 24.0 | 23.0 (24.8) 26.5 | 19.5 (24.1) 26.5 | 54 |
| Base of ventral fin to anal fin origin | 24.5 | 23.0 (25.3) 28.0 | 23.0 (24.7) 28.0 | 54 |
| Ventral fin length | 13.5 | 13.0 (14.5) 16.5 | 11.5 (14.4) 17.0 | 47 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 3.0 | 2.8 (3.6) 4.8 | 2.7 (4.0) 5.9 | 53 |

bars or dark bands on dorsal and anal fins and posterior end of sagitta pointed. They differ by *pallidus* having more long rakers on anterior gill arch (13-17 *vs* 11-12), shorter gill filaments (2.7-5.9 *vs* 8.4-10.0 % head length) and a less elongate sagitta (Figs. 5B *vs* 60B).

Description: The principal meristic and morphometric characters are shown in Table 26.

Elongate fish with indistinct lateral line; form of snout varies from blunt to pointed, slightly shorter than eye window; maxilla short ending below posterior margin of eye or just behind; teeth granular; vomer subtriangular and anterior basibranchial tooth patch large and placed close to posterior patch (Fig. 60A); anterior nostril with tube or flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about halfway from base to anal fin; anterior gill arch with 1-3 short and 3-5 long rakers on upper branch, one long raker in angle and lower branch with 8-12 long and 4-7 short rakers; 3-7 small pseudobranchial filaments.

Sagittal otolith (Fig. 60B) elongate less than twice as long as high, posterior end pointed and highest anteriorly; sulcus small almost completely separated into colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed; first neural spines 1/3-1/2 length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-12 enlarged; parapophyses on posterior 8-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-11.

Coloration. No ocelli, bars or dark stripes on fins; dorsal part of body and head slightly brown with darker snout; brown ring around eye and lips; roof of mouth and branchial cavity brown; fins with faint brown pigmentation; eye and abdomen bluish. The 18 specimens from Vanuatu are all considerably darker than the type material so the specific name (meaning pale) does not fit well here.

Biology: The material consists of 36 females, 18 males and four unsexed specimens, none of which

is ripe; the largest eggs were 0.5 mm in diameter. Very little identifiable intestinal content was found, mainly remains of crustaceans and in three specimens gastropods. Caught on upper part of continental slope.

Distribution: Known from 22 localities (Fig. 2), four with 17 specimens from New Caledonia, eight with 18 specimens from Vanuatu, three with three specimens from Fiji and seven with 21 specimens from East Australia (Queensland to Victoria). They were trawled at depths of 420-695 m.

Remarks on material: The specimens from the four areas mentioned above was treated separately and a comparison showed no differences in meristic characters. Among the morphometric characters only the length of the gill filaments seemed to differ slightly with a mean of 4.7 % head length in Australian specimens *vs* 3.7 % in specimens from the islands. All specimens from Australia, New Caledonia and Fiji are light yellowish while the Vanuatu material is considerably darker. This cannot be explained by bleaching, as the Vanuatu specimens were collected in 1994 and the Fiji specimens in 1999.

## *Neobythites purus* Smith & Radcliffe, 1913

Figs. 3, 61, 62

*Neobythites purus* Smith & Radcliffe *in* Radcliffe, 1913: 141, pl. 7, fig. 3 (type locality: Philippines, 12º12'35"N, 124º2'48"E).

*Neobythites purus*: Gloerfelt-Tarp & Kailola 1984; Paxton *et al.* 1989: 313; Schwarzhans 1994: 76, figs. 65-66 (sagitta).

Material examined (15 specimens, SL 103-219): Holotype: USNM 74128, SL 146, female, off Masbate Is., Philippines (12°12'35"N, 124°2'48"E), R/V ALBATROSS st. 5392, beam trawl, 247 m, 13 Mar. 1909.

Paratype: USNM 308953, SL 126, 1 male, off Masbate Is., Philippines (12°3'30"N, 124°3'36"E), R/V ALBATROSS st. 5393, beam trawl, 249 m, 13 Mar. 1909.

Non-types: MNHN 2001-36, SL 142, 1 female, Manila Bay, Philippines, MUSORSTOM 2, R/V CORIOLIS st. 10, 176-180 m, Nov. 1980; ZMUC P77757, SL 219, female, Arafura Sea (9°9'S, 131°48'E), R/V SOELA st. 1302/81/114, 198-214 m, 3 July 1981; MNHN 2001-37, SL 131-180, 3 females and 1 male, off Luzon, Philippines (14°0.6'N, 120°19.6'E), MUSORSTOM 3, R/V CORIOLIS st. 87, beam trawl, 191-197 m, 31 May 1885; MNHN 2001-38, SL 134-180, 2 males, off Luzon, Philippines (14°0.7'N, 120°18.8'E), MUSORSTOM 3, R/V CORIOLIS st. 97, beam trawl, 189-194 m, 1 June 1985; MNHN 2001-39, SL 164-178, 1 female and 1 male, off Luzon, Philippines (14°1.1'N, 120°17.9'E), MUSORSTOM 3, R/V CORIOLIS st. 108, beam trawl, 188-195 m, 2 June 1986; MNHN 2001-40, SL 150, 1 female, off Mindora, Philippines (12°5.6'N, 121°15.6'E), MUSORSTOM 3, R/V CORIOLIS st. 120, beam trawl, 219-220 m, 3 June 1985; MNHN 2001-41, SL 103-140, 2 females, off Mindora, Philippines (12°10.6'N, 121°45'E), MUSORSTOM 3, R/V CORIOLIS st. 123, beam trawl, 700-702 m, 4 June, 1985.

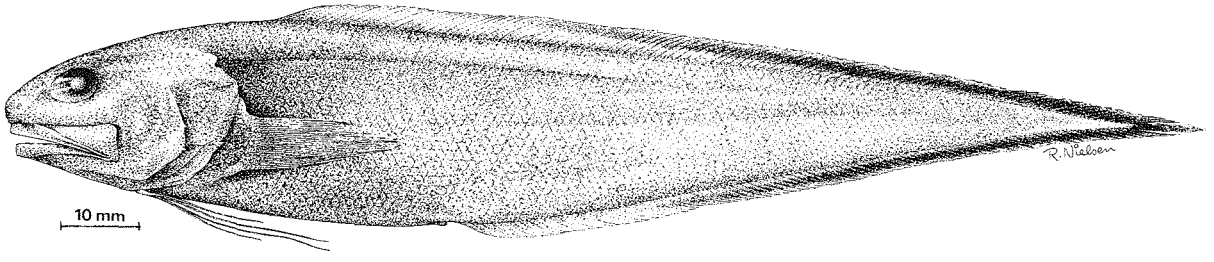


Fig. 61. *Neobythites purus*. MNHN 2001-41, SL 140.

Diagnosis: Hind margin of preopercle with two spines; no ocelli or bars; dorsal fin rays 90-94; anal fin rays 74-78; pectoral fin rays 26-28; long rakers on anterior gill arch 9-10; longest gill filaments on anterior arch 7.7-12.0 % length of head; pseudobranchial filaments 5-7; vomer tooth patch boomerang shaped (Fig. 62A); precaudal vertebrae12-13; total vertebrae 53-55.

Similarity: *N. purus* seems most similar to *N. franzi* by having two preopercle spines, no dark markings, 9-12 long gill rakers and relatively few dorsal and anal fin rays. They differ by *purus* having less total rakers on anterior gill arch (10-16 *vs* 17-20), longer head (23.0-25.5 *vs* 20.0-21.5 % SL) and different shape of vomer (Figs. 23A *vs* 62A). Fig. 24 illustrates the differences between the two species (see also p. 33).

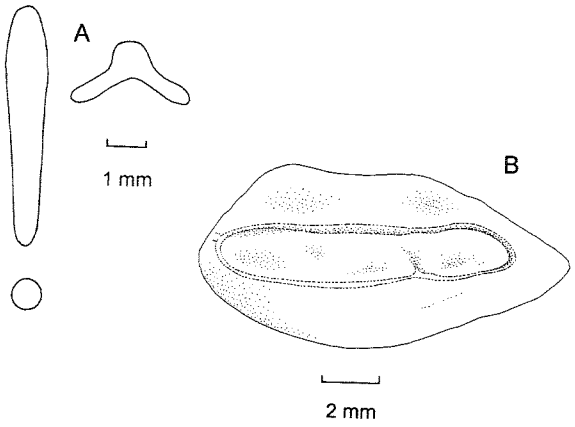


Fig. 62. *Neobythites purus*. A, basibranchial tooth patches and vomer of paratype; USNM 308953, SL 126; B, median view of right sagitta of ZMUC P77757, SL 219.

Description: The principal meristic and morphometric characters are shown in Table 27.

Elongate fish with indistinct lateral line; snout pointed to blunt, equal in length to eye window; maxilla ends well behind eye; teeth granular; vomer boomerang shaped and anterior basibranchial tooth patch long and narrow (Fig. 62A); anterior nostril with tube and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches a little more than halfway from base to

Table 27. Meristic and morphometric characters of *N. purus*.

| | Holotype | Paratype | HT, PT + 12 spms* |
|---|---|---|---|
| Standard length | 146 | 126 | 103-219 |
| Meristic characters | | | |
| Dorsal finrays | 92 | 90 | 90 (92.3) 94 |
| Caudal finrays | 8 | 8 | 8 |
| Anal finrays | 75 | 74 | 74 (75.6) 78 |
| Pectoral finrays | 26 | 28 | 26 (27.1) 28 |
| Pseudobr. filaments | 6 | 5 | 5 (5.7) 7 |
| Precaudal vertebrae | 13 | 13 | 12 (12.9) 13 |
| Total vertebrae | 53 | 54 | 53 (53.6) 55 |
| Long rakers on ant gill arch | 9 | 10 | 9 (9.3) 10 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 5 (5.3) 6 |
| Ant. anal ray below dorsal ray no. | 19 | 20 | 18 (19.5) 21 |
| Ant. anal ray below vertebra no | 15 | 15 | 14 (14.9) 15 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.5 | 24.0 | 23.0 (23.9) 25.5 |
| Depth orig. anal fin | 17.0 | 18.0 | 15.5 (16.9) 18.5 |
| Upper jaw length | 12.0 | 12.0 | 11.5 (11.8) 13.0 |
| Hor. eye window | 4.3 | 4.4 | 4.1 (4.5) 5.0 |
| Postorbital length | 13.5 | 14.5 | 13.5 (14.5) 15.5 |
| Preanal length | 40.0 | 43.5 | 39.0 (41.9) 45.0 |
| Predorsal length | 26.5 | | 23.5 (26.5) 29.0 |
| Base of ventral fin to anal fin origin | 24.0 | 23.0 | 23.0 (25.1) 28.5 |
| Ventral fin length | 16.5 | 16.0 | 14.0 (17.0) 18.5 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 10.0 | 12.0 | 7,7 (8.7 ) 12.0 |

* All 14 specimens represented in mean value.

anal fin; anterior gill arch with 0-2 short and 2-3 long rakers on upper branch, one long raker in angle and lower branch with 5-7 long and 0-4 short rakers (all short rakers are flat knobs); 5-7 long pseudobranchial filaments.

Sagittal otolith (Fig. 62B) oval, more than twice as long as high, with posterior end pointed; sulcus large with almost completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for blunt, depressed spines on vertebrae 3-8; first neural spine 1/2 -2/3 length of second spine; bases of vertebral spines 5-12 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-10.

Coloration. No ocelli or bars; caudal and posterior part of dorsal and anal fins dusky grey; one specimen (SL 131) with faint dark spot on dorsal fin covering seven rays placed behind a line through anus; body brownish dorsally and lighter ventrally; many tiny black spots on ventral part of body and on head; lips dark and indication of horizontal brown line through eye; abdomen silvery; eye bluish.

Biology: The material consists of ten females and five males, none of which is ripe. Many specimens with remains of crustaceans in the intestines and six with gastropods. Caught on the upper part of the continental slope.

Distribution: Known from nine localities (Fig. 3), eight in Philippine waters from 176-249 m depth

## *Neobythites sereti* n. sp.

Figs. 3, 63, 64

Material examined (9 specimens, SL 88-165):
Holotype: MNHN 1995-713, SL 165, female, northeast of Fiji Is. (12°13.8'S, 177°28'W), MUSORSTOM 7, R/V ALIS st. CC 554, bottom trawl, 795-820 m, 18 May 1992.

Paratypes: MNHN 2001-42 (SL 88-153, 4 females and 2 males) and ZMUC P771319 ( SL 135, female) (same data as for holotype); MNHN 1995-716, SL 153, 1 female, northeast of Fiji Is. (12°31'S, 174°19.9'W), MUSORSTOM 7, R/V ALIS st. DW 594, Waren dredge, 495-505 m, 24 May 1992.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with 1-2 ocelli both behind line through anus; dorsal fin rays 103-110; anal fin rays 85-91; pectoral fin rays 29-31; long rakers on anterior gill arch 12-14; longest gill filaments on anterior arch 3.2-6.6 % length of head; pseudobranchial filaments 2-4; vomer tooth patch subtriangular (Fig. 64A); precaudal vertebrae 13; total vertebrae 60-62.

Similarity: *N. sereti* specimens with one dorsal ocellus seems most similar to *N. nigriventris* with two preopercular spines, no distinct vertical bars and no ocelli on anal fin. They differ by *sereti* having no abdominal black speckled pattern and more pectoral fin rays (29-31 *vs* 23-26). *N. sereti* specimens with two ocelli seems most similar to *N. macrocelli* with two preopercular spines, no bars on

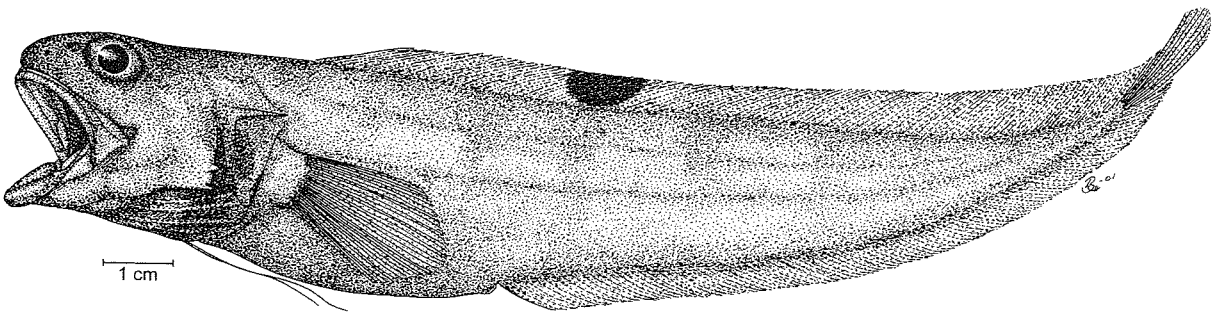


Fig. 63. *Neobythites sereti* n. sp. Holotype, MNHN 1995-713, SL 165.

body and ocelli placed on middle part of dorsal fin. They differ by *sereti* having more long gill rakers (12-14 *vs* 11), more pectoral fin rays (29-31 *vs* 24-27) and smaller ocelli (Figs. 35 *vs* 63).

Description: The principal meristic and morphometric characters are shown in Table 28.
Holotype (differences to paratypes in brackets). Rather elongate fish with indistinct lateral line; snout pointed to blunt, slightly longer than eye window; maxilla ends behind eye; teeth granular; vomer subtriangular and posterior basibranchial tooth patch rather large (Fig. 64A); anterior nostril with low tube and posterior flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches slightly more than halfway from base to anal fin; anterior gill arch with two small and three long rakers on upper branch, one long raker in angle and lower branch with nine (8-9) long and five (5-7) short rakers; three (2-4) small pseudobranchial filaments.

Sagittal otolith (Fig. 64B) oval, twice as long as high, with even rim and highest anteriorly; sulcus

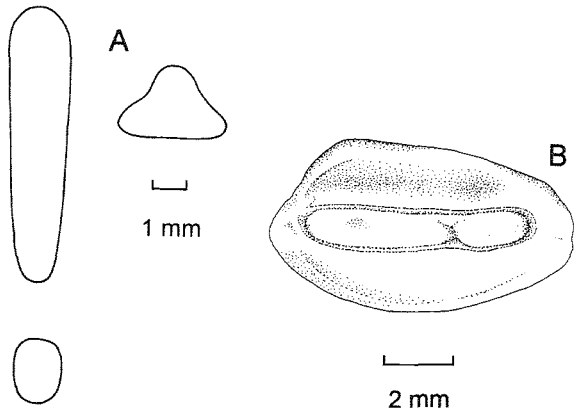


Fig. 64. *Neobythites sereti* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of paratype, MNHN 1995-716.

with almost completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed; first neural spine 1/2-2/3 length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebral spines 4-

Table 28. Meristic and morphometric characters of *N. sereti*.

| | Holotype | HT + 8 paratypes | Nos |
|---|---|---|---|
| Standard length | 165 | 88-165 | 9 |
| Meristic characters | | | |
| Dorsal finrays | 108 | 103 (106.3) 110 | 8 |
| Caudal finrays | 8 | 8 | 9 |
| Anal finrays | 91 | 85 (89.1) 91 | 8 |
| Pectoral finrays | 30 | 29 (29.6) 31 | 9 |
| Pseudobr. filaments | 3 | 2 (3.2) 4 | 9 |
| Precaudal vertebrae | 13 | 13 | 9 |
| Total vertebrae | 62 | 60 (61.2) 62 | 9 |
| Long rakers on ant. gill arch | 13 | 12 (12.9) 14 | 9 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.4) 6 | 9 |
| Ant. anal ray below dorsal ray no. | 22 | 20 (21.4) 22 | 9 |
| Ant. anal ray below vertebra no | 15 | 15 (15.1) 16 | 9 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.5 | 21.5 (22.9) 23.5 | 9 |
| Depth orig. anal fin | 16.0 | 15.5 (16.2) 17.5 | 9 |
| Upper jaw length | 11.5 | 11.0 (11.3) 12.5 | 9 |
| Hor. eye window | 4.7 | 4.4 (4.7) 5.5 | 9 |
| Postorbital length | 14.0 | 13.0 (13.6) 14.0 | 9 |
| Preanal length | 44.5 | 40.0 (43.9) 47.5 | 9 |
| Predorsal length | 25.5 | 24.0 (24.5) 27.5 | 9 |
| Base of ventral fin to anal fin origin | 26.5 | 23.0 (25.0) 27.0 | 9 |
| Ventral fin length | 14.0 | 12.0 (13.8) 16.0 | 9 |
| Snout to 1st ocellus | 43.5 | 43.0 (44.5) 46.0 | 9 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 4.9 | 3.2 (4.5) 6.6 | 8 |

13 enlarged; parapophyses on posterior 8-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-11.

Coloration. Ocellus covers ten dorsal fin rays. Among the paratypes three specimens have two ocelli (distance from upper jaw symphysis to anterior part of black centre in second ocellus 64-66 % SL) and four have one ocellus; body and head brownish dorsally and lighter ventrally; anterior half of lateral line brownish; many tiny black spots on fins; dorsal, caudal and anal fins dusky grey; holotype with about five faint bars on body; snout darker brown; brown eye ring; eye and peritoneum bluish.

Biology: The material consists of seven females and two males, none of which is ripe. Many specimens with remains of crustaceans in the intestines, one with a gastropod. Caught on the upper part of the continental slope.

Distribution: Known from two localities (Fig. 3), Wallis and Futuna northeast of Fiji Is. from 495-820 m depth.

Etymology: Named after Bernard Séret, Laboratoire d'Ichthyologie, MNHN, in appreciation of making his valuable collections available to me.

## *Neobythites sinensis* n. sp.

Figs. 3, 65, 66

*Neobythites* sp. 16: Schwarzhans 1994: 74, fig. 22 (sagitta).

Material examined:
Holotype: USNM 309002, SL 150, female, South China Sea (16º 20'N, 114º 39'E), R/V CAPE ST. MARY cr. 3/64, st. 57, 392-395 m, 20 June 1964.

Diagnosis: Hind margin of preopercle without spines, but with one broad process; opercular spine curved downwards; no ocelli or bars; dorsal fin rays 92; anal fin rays 75; pectoral fin rays 27; long rakers on anterior arch 12-13; longest gill filaments on anterior arch 6.8 % length of head; pseudobranchial filaments 4; vomer tooth patch boomerang shaped (Fig. 66A); precaudal vertebrae 13; total vertebrae 53.

Similarity: The most similar species seems to be *N. musorstomi* (cf. p. 61).

Description of holotype: Meristic characters: Number of rays in dorsal fin 92, caudal fin 8, anal fin 75 and pectoral fin 27; anterior dorsal fin ray above vertebra 5, anterior anal fin ray below vertebra no. 15 and dorsal ray no. 22; precaudal vertebrae 13 and caudal vertebrae 40; developed rakers on anterior gill arch 12-13; pseudobranchial filaments 4.

Morphometric characters: In % of SL: Length of head 25.0; depth at anterior anal fin 16.0; upper jaw 13.0; horizontal eye window 4.7; postorbital 15.0; preanal 47.0; predorsal 26.0; from base of ventral fins to anal fin 30.0; ventral fin 18.0. In % of head length: Longest gill filament on anterior arch 6.8.

General description: Elongate fish with indistinct lateral line; snout pointed, equal in length to eye window; maxilla ends well behind eye; teeth granular; vomer subtriangular and anterior basibranchial tooth patch long and slender (Fig. 66A); anterior nostril with small flap and larger posterior nostril a

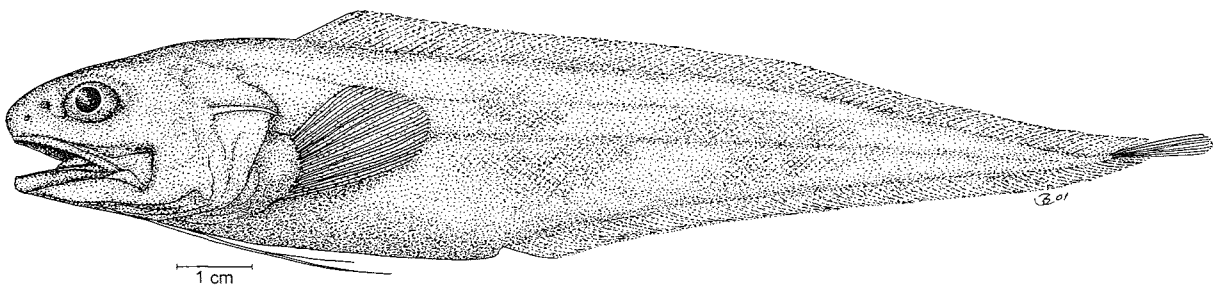


Fig. 65. *Neobythites sinensis* n. sp. Holotype, USNM 309002, SL 150.

mere hole; hind margin of preopercle with one flat process; opercular spine bend slightly downwards; ventral fin reaching about 2/3 from base to anal fin; anterior gill arch with 3-4 small and three long rakers on upper branch, one long raker in angle and lower branch with 8-9 long and six short rakers; four well developed pseudobranchial filaments.

Sagittal otolith (Fig. 66B) twice as long as high; anterior and posterior ends slightly pointed; sulcus long, 85% of sagittal length, and almost completely separated in colliculi; cauda half as long as ostium.

Axial skeleton (from radiograph). Tips of most neural and haemal spines pointed, neural spines nos. 4-13 blunt; first neural spine long, about 2/3 of second spine; vertebrae 3-10 with depressed neural spines; bases of vertebrae 4-11 enlarged; parapophyses on posterior seven precaudal vertebrae; pleural ribs on vertebrae 3-12 and epipleural ribs on 3-10.

Coloration. Except for blue eyes, black pigmented, brown peritoneum and many tiny black spots ventrally the specimen is light brown.

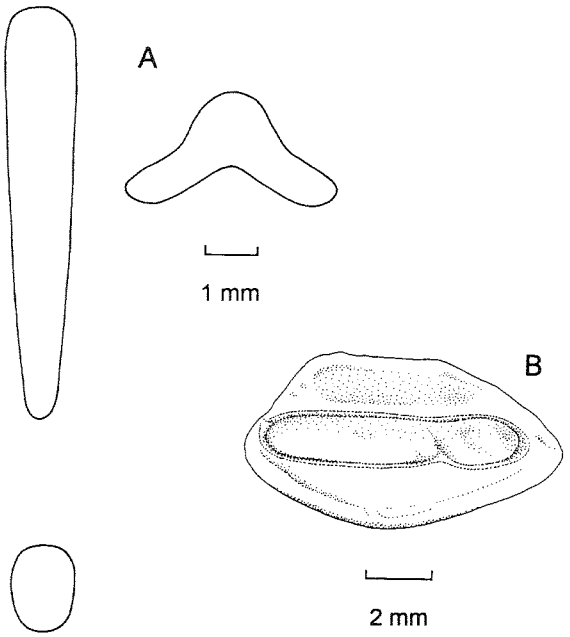


Fig. 66. *Neobythites sinensis* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

Biology: The only specimen known is a semi-ripe female with eggs 0.5 mm in diameter. Intestinal content is two gastropods and remains of crustaceans. Caught on the upper continental slope

Distribution: Known from the type locality (Fig. 3) in the South China Sea from a depth of 392-395 m.

Etymology: Named after the type locality, the South China Sea.

Remarks on material: The lack of colour may be due to bleaching. However, it is very unlikely that the specimen has ever had ocelli as these are very persistent judging from bleached material of other species of *Neobythites*.

## *Neobythites sivicola* (Jordan & Snyder, 1901)

Figs. 2, 67, 68

*Watasea sivicola* Jordan & Snyder, 1901: 765, pl. XXXVII (type locality: Misaki, Sagami, Japan).
*Neobythites sivicola*: Böhlke 1953: 102; Lindberg & Krasyokova 1975: 239 (fig.); Machida 1984a: 254 (colour photo); Machida 1984b: 100, pl. 85 H; Shen 1984: 186-4; Machida 1988: 49 (nerve pattern); Chen & Shao 1991: 13 (Taiwan material); Schwarzhans 1994: 76, figs. 59-60 (sagitta); Shinohara & Matsuura 1997: 289 (Suruga Bay).
*Watasea sivicola*: Jordan & Fowler 1902: 759.

Material examined (54 specimens; SL 80-217): Holotype: SU 6375, SL 217, Misaki, Sagami, Japan, 1883-1885.

Paratype: USNM 49707, SL 205, female, Yokohama, Japan, Jouy coll.

Non-types: ZISP 22880, SL 167-198, 2 females, Nagasaki, 18 Feb. to 9 Mar. 1901; ZISP 22881, SL 178, Korea Strait, 26 Mar. 1901; USNM 150291, SL 177, Suruga Gulf, Japan (35°3'10"N, 138°49'50"E), R/V ALBATROSS st. 5071, beam trawl, 104 m, 10 Oct. 1906; ZMUC P77673, SL 182, Nagasaki, Japan, ca. 1910; ZM MGU P-20789, SL 98-185, 2 females and 1 male, East China Sea

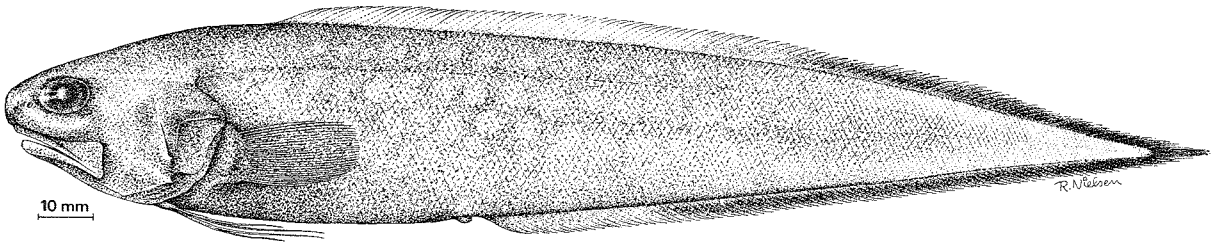


Fig. 67. *Neobythites sivicola*. ZMUC P771299, SL 210.

(31°14.6'N, 126°25.2'E), R/V VITYAZ cr. 22 st. 3543, Galathea trawl, 93 m, 2 Nov. 1955; CAS 15936, SL 122-152, 1 female and 1?, Taiwan Strait, Steiner coll., trawl, 90 m, 16 June 1971; CAS 20768, SL 108-148, 2 males, Taiwan Strait (27°18'N, 121°18'E), Steiner coll., trawl, 80-100 m, 17 June 1971; ZM MGU uncat., SL 199, 1 male, Yellow Sea (31°48'N, 126°49'E), bottom trawl, 100 m, 23 Nov. 1971; CAS 27738, SL 150+, 1 male, East China Sea (26°N, 121°E), Steiner coll., trawl, 73-110 m, 15 Oct. 1972; ASIZP 57605 (SL 147-168, 2 males and 1?) and 59591 (SL 80-173, 1 female, 2 males and 1?), Tashi, Taiwan, bottom trawl, 80-200 m, 2 May 1988; ZMUC P771299-1305, SL 130-213, 6 females and 1 male, Mimase fish market, Kochi, Japan, collected from 31 Mar. 1988 to 30 Oct. 1989; AZISP 59541, SL 120-171, 6 females and 2 males, Tashi, Taiwan, bottom trawl, 80-200 m, 7 Nov. 1989; ZMUC P771306, SL 142, 1 male, Tashi, North Taiwan, 17 Sep. 1990; ZMUC P771307-1315, SL 98-175, 4 females and 5 males, Tashi, Taiwan, 7 May 1993; ASIZP 58642 (SL 132, female) and 58643 (SL 140, male), Tashi, Taiwan, bottom trawl, 80-200 m, 15 Sep. 1997; ASIZP 60090, SL 138, 1 male, Tashi, Taiwan, bottom trawl, 80-200 m, 27 Jan. 1999; NTM S.12102-001, SL 166-185, 3?, Maizuru fish market, Kyoto, Japan.

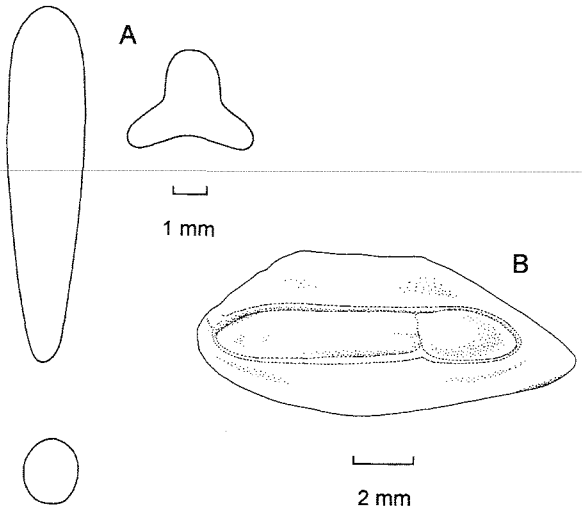


Fig. 68. *Neobythites sivicola*. A, basibranchial tooth patches and vomer of paratype, USNM 49707, SL 205; B, median view of right sagitta of SU 23473.

Diagnosis: Two spines on hind margin of preopercle; no ocelli or bars; body with a number of faint light spots the size of eye; dorsal fin rays 92-98; anal fin rays 74-81; pectoral fin rays 26-29; long rakers on anterior gill arch 9-11; longest gill filaments on anterior arch 8.1-13.0 % length of head; pseudobranchial filaments 7-11; vomer tooth patch subtriangular (Fig. 68A); precaudal vertebrae 13-14; total vertebrae 54-58.

Similarity: *N. sivicola* seems most similar to *N. purus* and *franzi* with two preopercular spines, no ocelli, bars or dark bands on fins and relatively few long gill rakers and rays in dorsal and anal fins. *N. sivicola* differs from the other two species by having series of white spots on sides of body (*vs* no spots) and many pseudobranchial filaments (7-11 *vs* 3-7). Fig. 24 illustrates the difference between the three species (see also p. 33).

Description: The principal meristic and morphometric characters are shown in Table 29. Elongate fish with lateral line distinct anteriorly; snout pointed, length varies between little longer to a little shorter than eye window; maxilla ends well behind eye; teeth granular, one specimen with median-directed, hook-like prolongation on anterior end of palatines; vomer subtriangular and first basibranchial tooth patch rather broad anteriorly (Fig. 68A); anterior nostril with low rim and flap posteriorly and larger posterior nostril a mere hole; hind margin of preopercle with two spines (rather broad in a few specimens); ventral fin falls short of

halfway from base to anal fin; anterior gill arch with 2-5 short and 2-3 long rakers on upper branch, one long raker in angle and lower branch with 5-7 long and 2-7 short rakers; 7-11 long pseudobranchial filaments.

Sagittal otolith (Fig. 68B) elongate, 2.5 times as long as high, with even rim and strongly pointed posterior end; sulcus large, with completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of most neural and haemal spines pointed, blunt spines on precaudal vertebrae 3-8; first spine 1/2–2/3 length of second spine; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 7-14 precaudal vertebrae; pleural ribs on vertebrae 3-14; epipleural ribs on vertebrae 3-11.

Coloration. No ocelli, bars or distinct bands on vertical fins, which all normally withstand bleaching well. The material has been collected between 1901 and 1999 and there is hardly any pigmentation left on the older specimens. The description of the coloration is based on the most recently caught specimens: body with series of light spots size of eye, body brownish dorsally and lighter ventrally; many tiny, black spots on head and ventrally on body; head darker brown with dark lips and bluish eyes; peritoneum dark-brown; dorsal and anal fins dusky grey.

Three specimens, two males and one female, from off Taiwan are very dark. They were trawled together with normally coloured specimens of same length and do not differ in any meristic or morphometric characters from typical material.

Biology: The material consists of 24 females (ten with eggs 0.5 mm in diameter), 20 males and ten unsexed. Many specimens with remains of crustaceans in the intestines; one specimen (SL 152) with an about 70 mm *Bregmaceros* sp. in the stomach. Trawled on the continental shelf.

Distribution: Caught on 19 localities (Fig. 2) from Japan to Taiwan at depths of 73-200 m. Occurs frequently on fish markets in Japan.

Table 29. Meristic and morphometric characters of *N. sivicola*.

| | Holotype* | Paratype | HT, PT + 46 spms | Nos |
|---|---|---|---|---|
| Standard length | 217 | 205 | 80-213 | 48 |
| Meristic characters | | | | |
| Dorsal finrays | 93 | 94 | 92 (95.1) 98 | 46 |
| Caudal finrays | | 8 | 8 | 43 |
| Anal finrays | 74 | 79 | 74 (77.4) 81 | 47 |
| Pectoral finrays | 26 | 26 | 26 (27.1) 29 | 35 |
| Pseudobr. filaments | | 7 | 7 (7.9) 11 | 43 |
| Precaudal vertebrae | 14 | 14 | 13 (13.9) 14 | 48 |
| Total vertebrae | 56 | 58 | 54 (55.5) 58 | 48 |
| Long rakers on ant. gill arch | 10 | 11 | 9 (10.4) 11 | 48 |
| Ant. dorsal ray above vertebra no. | 6 | 6 | 5 (5.4) 6 | 48 |
| Ant. anal ray below dorsal ray no. | 21 | 23 | 18 (21.6) 23 | 48 |
| Ant. anal ray below vertebra no | 16 | 17 | 15 (16.1) 17 | 48 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 21 | 20.5 | 19.0 (20.8) 22.0 | 48 |
| Depth orig. anal fin | 17.5 | 16.5 | 15.0 (16.9) 19.5 | 45 |
| Upper jaw length | 10 | 10.5 | 9.9 (10.6) 11.0 | 48 |
| Hor. eye window | 4.3 | 4.3 | 3.7 (4.5) 5.1 | 48 |
| Postorbital length | | 11.5 | 10.0 (12.4) 15.0 | 47 |
| Preanal length | 44 | 44.5 | 38.5 (42.3) 45.0 | 48 |
| Predorsal length | 26 | 23.0 | 22.0 (24.2) 26.5 | 48 |
| Base of ventral fin to anal fin origin | | 31.0 | 24.5 (28.2) 31.0 | 48 |
| Ventral fin length | 14 | 12.0 | 12.0 (15.5) 19.5 | 48 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | | 4.3 | 8.1 (10.3) 13.0 | 48 |

• From original description and a radiograph.

## *Neobythites soelae* n. sp.

Figs. 3, 69, 70

Material examined (3 specimens, SL 71-126): Holotype: CSIRO CA 3573, SL 126, female, off Port Hedland, Western Australia (17° 35'S, 118° 37'E), R/V SOELA st. SO 1/83/71, bottom trawl, 496-504 m, 5 Feb. 1983.

Paratypes: CSIRO B 3303, SL 82, female, sw of Imperieuse Reef, Western Australia (18° 7'S, 118° 9'E), R/V SOELA st. SO 1/83/68, bottom trawl, 400-404 m, 5 Feb. 1983; CSIRO B 4010, SL 71, male, off Western Australia (14° 37.2'S, 121° 47.4'E), R/V SOELA st. 1/84/82, bottom trawl, 300-304 m, 16 Feb. 1984.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with three ocelli, anal fin with two ocelli in smaller and no ocelli in larger specimens; dorsal fin rays 98-103; anal fin rays 84-87; pectoral fin rays 27-28; long rakers on anterior gill arch 12-13; longest gill filaments on anterior arch 5.8-6.8 % length of head; pseudobranchial filaments 3-4; vomer tooth patch subtriangular (Fig. 70A); precaudal vertebrae 13; total vertebrae 58-60.

Similarity: Smaller specimens of *N. soelae* seem most similar to *fijiensis* with two preopercular spines, three ocelli in dorsal and two in anal fin; they differ by *soelae* having less pseudobranchial filaments (3-4 *vs* 5-7) and no vertical bars on body. The larger specimen of *soelae* seem most similar to *macrops* with two preopercular spines, 3-4 ocelli in dorsal and none in anal fin; they differ by *soelae* having an unpigmented anal fin *vs* posterior third of anal fin black.

Description: The principal meristic and morphometric characters are shown in Table 30.

Holotype (differences to paratypes in brackets). Elongate fish with indistinct lateral line; snout rather blunt (pointed), slightly shorter than eye window; maxilla ends well behind eye; teeth granular to needle formed; vomer subtriangular and posterior basibranchial tooth patch small (Fig. 70A); anterior nostril on left side almost as wide as posterior, former with small flap latter a mere hole and right side with extremely small anterior nostril (anterior nostril with small flap and opening much smaller than that of posterior nostril); ventral fin reaches about halfway from base to anal fin (2/3 to anal fin in small paratype); anterior gill arch with one (two) short and three long rakers on upper branch, one

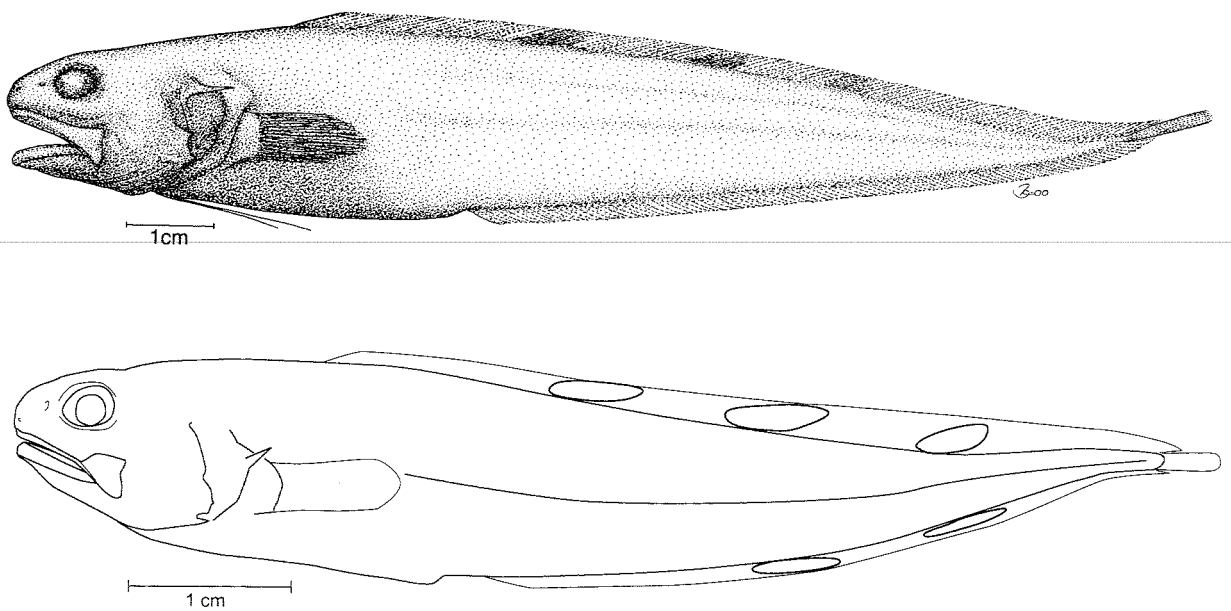


Fig. 69. *Neobythites soelae* n. sp. A, holotype, CSIRO CA 3573, SL 126; B, paratype, CSIRO B 4010, SL 71.

long raker in angle and lower branch with nine (8-9) long and five short rakers; three (3-4) short pseudobranchial filaments.

Sagittal otolith (Fig. 70B) oval, about twice as long as high with an even rim; rather small sulcus with completely separated colliculi; ostium 1.5 times the length of cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-9.

Coloration. For number, size and placement of ocelli see Table 31. Scattered brown pigment on snout and lips and a few tiny, black spots ventrally on body; eye and peritoneum bluish (many tiny, black spots all over head and body).

Biology: The material consists of two females and one male; *N. soelae* seems a species of small adult size as a 126 mm female has eggs 0.5 mm in diameter. No identifiable stomach contents. Trawled on upper continental slope.

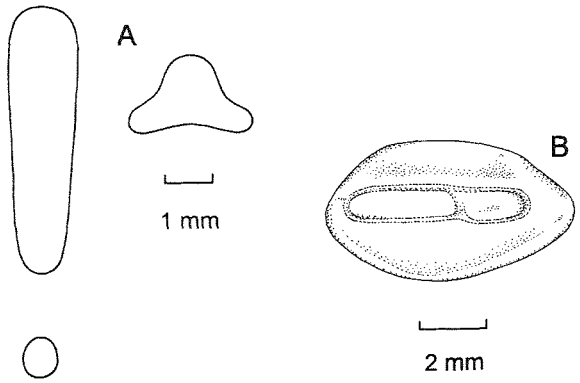


Fig. 70. *Neobythites soelae* n. sp. A, basibranchial tooth patches and vomer of holotype; B, median view of right sagitta of holotype.

Distribution: Known from three localities (Fig. 3) off northwestern Australia from 300-504 m depth.

Etymology: Named after the research vessel SOELA from which the major part of the Australian *Neobythites* material is caught.

Remarks on material: All three specimens

Table 30. Meristic and morphometric characters of *N. soelae*.

| | Holotype | Paratype | Paratype |
|---|---|---|---|
| Standard length | 126 | 82 | 71 |
| Meristic characters | | | |
| Dorsal finrays | 103 | 98 | 102 |
| Caudal finrays | 8 | 8 | |
| Anal finrays | 86 | 84 | 87 |
| Pectoral finrays | 27 | 27 | 28 |
| Pseudobr. filaments | 3 | 3 | 4 |
| Precaudal vertebrae | 13 | 13 | 13 |
| Total vertebrae | 60 | 58 | 59 |
| Long rakers on ant. gill arch | 13 | 13 | 12 |
| Ant. dorsal ray above vertebra no. | 6 | 5 | 6 |
| Ant. anal ray below dorsal ray no. | 19 | 19 | 18 |
| Ant. anal ray below vertebra no | 15 | 15 | 15 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 21.5 | 22.0 | 23.0 |
| Depth orig. anal fin | 16.0 | 15.5 | 16.5 |
| Upper jaw length | 10.0 | 11.0 | 11.5 |
| Hor. eye window | 5.1 | 5.9 | 5.6 |
| Postorbital length | 12.5 | 13.5 | 13.5 |
| Preanal length | 41.5 | 41.5 | 40.5 |
| Predorsal length | 24.0 | 24.0 | 25.0 |
| Base of ventral fin to anal fin origin | 27.5 | 27.5 | 25.5 |
| Ventral fin length | 15.0 | 14.5 | 17.5 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 5.8 | 6.6 | 6.8 |

Table 31. Arrangement of ocelli in *N. soelae*. *

| Standard length | 71 | 82 | 126 |
|---|---|---|---|
| Snout to 1st ocellus in D | 46.5 % SL | 45.0 % SL | 47.0 % SL |
| 1st ocellus covers D-rays | 24-32 | 24-32 | 23-30 |
| Snout to 2nd ocellus in D | 61 % SL | 63 % SL | 63 % SL |
| 2nd ocellus covers D-rays | 50-59 | 44-51 | 43-49 |
| Snout to 3rd ocellus in D | 77 % SL | 79 % SL | 76 % SL |
| 3rd ocellus covers D-rays | 76-83 | 66-73 | 67-71 |
| Snout to 1st ocellus in A | 64 % SL | 68 % SL | - |
| 1st ocellus covers A-rays | 30-39 | 36-44 | - |
| Snout to 2nd ocellus in A | 78 % SL | 81 % SL | - |
| 2nd ocellus covers A-rays | 52-60 | 55-62 | - |

* All measurements are taken from upper jaw symphysis to anterior edge of black centre of ocellus.

known have three ocelli in dorsal fin; they are most conspicuous in the two smaller specimens and in the larger the posterior ocellus is indistinct. The smaller specimens have two distinct ocelli in the anal fin while they have disappeared in the larger specimen. As they have been preserved for almost the same period the variation is most probably due to ontogenetic change.

## *Neobythites somaliaensis* Nielsen, 1995

Figs. 1, 71, 72

*Neobythites somaliaensis* Nielsen, 1995: 10, fig. 9 (type locality: off Socotra Is., 12°16.6'N, 53°8.2'E).

*Neobythites* sp. 5: Schwarzhans 1994: 76, figs.73-75 (sagitta).

Material examined (14 specimens, SL 123-205):

Holotype: ZM MGU P-18905 (SL 205), between Somalia and South Yemen.

Paratypes: ZM MGU P-18906-12 (9, SL123-198) and ZMUC P77836-39 (4, SL 139-173), between Somalia and South Yemen.

See Nielsen (1995: 10) for station-data.

Remarks on material: Nielsen (1995) listed a 74 mm SL specimen as a non-type of *N. somaliaensis* as it differed slightly from the type material in many characters. With the present knowledge of the variation within *Neobythites* this specimen most certainly does not belong to *somaliaensis* but to an undescribed species. However, with only one juvenile specimen available it seems premature to establish a new species (cf. p. 101).

Diagnosis: Hind margin of preopercle with two spines one of which can be flat; no ocelli or bars, distal part of vertical fins dark; dorsal fin rays 103-109; anal fin rays 87-91; pectoral fin rays 28-29; long rakers on anterior gill arch 9-11; longest gill filaments on anterior arch 11.0-14.0 % length of head; pseudobranchial filaments 5-8; vomer tooth

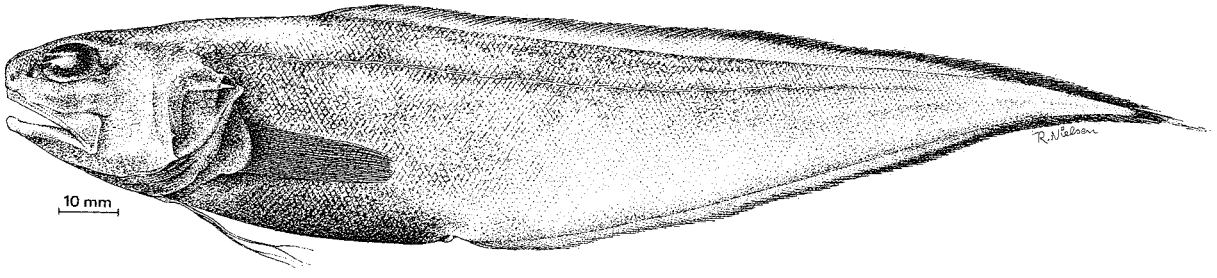


Fig. 71. *Neobythites somaliaensis*. Holotype, ZM MGU P-18905, SL 205.

patch varying, subtriangular to boomerang formed (Fig. 72B); precaudal vertebrae 13-14; total vertebrae 61-64.

Similarity: *N. somaliaensis* seems most similar to *N. analis* (cf. p. 17).

Description: The principal meristic and morphometric characters are shown in Table 32.

Rather elongate fish with distinct lateral line; snout blunt, equal to or shorter than eye window; maxilla ends just behind eye; teeth granular to slightly needle formed; vomer subtriangular to boomerang formed and anterior basibranchial tooth patch narrow (Fig. 72A,B); anterior nostril with low rim and small flap and larger posterior nostril a mere hole; hind margin of preopercle with two pointed spines, one pointed and a more broad spine or two broad spines; ventral fin reaches little more than halfway from base to anal fin; anterior gill arch with 1-3 short and 2-3 long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 6-8 short rakers; 5-8 rather long pseudobranchial filaments.

Sagittal otolith (Fig. 72C) oval, almost twice as long as high, an even rim and highest anteriorly; sulcus with partly separated colliculi; ostium almost twice as long as cauda.

Axial skeleton (from radiographs). Tips of all

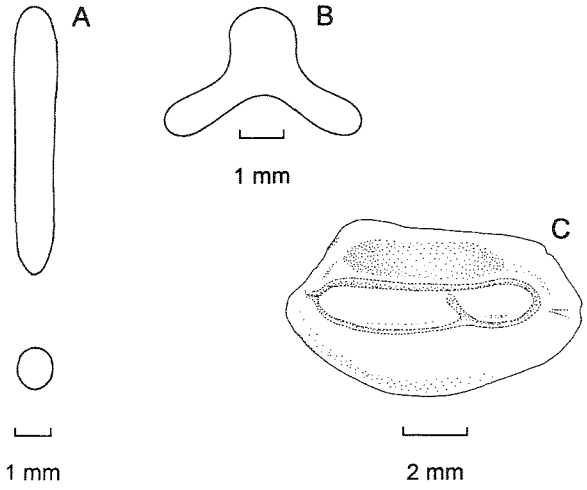


Fig. 72. *Neobythites somaliaensis*. A, basibranchial tooth patches of paratype, ZMUC P77836, SL 173; B, vomer of holotype; C, median view of right sagitta of paratype, ZM MGU P-18911, SL 172.

Table 32. Meristic and morphometric characters of *N. somaliaensis*.

| | Holotype | HT + 13 paratypes | Nos |
|---|---|---|---|
| Standard length | 205 | 123-205 | 14 |
| Meristic characters | | | |
| Dorsal finrays | 104 | 103 (105.9) 109 | 14 |
| Caudal finrays | 8 | 8 | 14 |
| Anal finrays | 87 | 87 (87.7) 91 | 14 |
| Pectoral finrays | 28 | 28 (28.4) 29 | 14 |
| Pseudobr. filaments | 5 | 5 (5.8) 8 | 14 |
| Precaudal vertebrae | 13 | 13 (13.9) 14 | 14 |
| Total vertebrae | 62 | 61 (62.2) 64 | 14 |
| Long rakers on ant. gill arch | 10 | 9 (10.1) 11 | 14 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.3) 6 | 14 |
| Ant. anal ray below dorsal ray no. | 21 | 20 (20.9) 22 | 13 |
| Ant. anal ray below vertebra no | 16 | 15 (15.9) 16 | 14 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.5 | 23.0 (23.4) 24.0 | 14 |
| Depth orig. anal fin | 18.0 | 14.5 (16.1) 18.0 | 14 |
| Upper jaw length | 11.0 | 10.0 (11.9) 11.5 | 8 |
| Hor. eye window | 5.1 | 5.0 (5.6) 6.1 | 14 |
| Postorbital length | | 13.0 (13.8) 14.0 | 4 |
| Preanal length | 43.5 | 39.5 (41.7) 44.0 | 14 |
| Predorsal length | 28.0 | 24.5 (25.8) 28.0 | 14 |
| Base of ventral fin toanal fin origin | 28.0 | 24.0 (26.3) 29.0 | 14 |
| Ventral fin length | 15.0 | 14.5 (15.7) 17.5 | 14 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 11.5 | 11.0 (12.2) 14.0 | 14 |

neural and haemal spines pointed except for blunt, depressed spines on vertebrae 3-9; first neural spine half length of second spine; bases of vertebral spines 5-13 enlarged; parapophyses on posterior 8-14 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-11.

Coloration. Body brownish, most dark dorsally; brown lateral line; a few tiny, black spots all over; distal part of dorsal and anal fins black; diffuse brown line from snout through eye to operculum; lips and eyes surrounded with brown pigment; eye lens green; oral and branchial cavities brown, abdomen bluish.

Biology: The material consists of nine females, three males and two unsexed specimens, none of which is ripe. Many specimens with remains of crustaceans in the intestines, five with gastropods. Trawled on the upper continental slope.

Distribution: Known from seven localities (Fig. 1) between Somalia and Yemen from 300-490 m depth.

## *Neobythites steatiticus* Alcock, 1893

Figs. 1, 73, 74

*Neobythites steatiticus* Alcock, 1893: 181. Pl. IX, fig. 3 (type locality: east coast of India, 15°4.7'N, 80°25.7'E).

*Neobythites steatiticus*: Alcock 1898: pl. 21, fig. 2; Alcock 1899: 82; Norman 1939: 76 (in part); de Beaufort & Chapman 1951: 417, fig. 67 (description based on syntypes of *N. malayanus* Weber, 1913); Menon & Yazdani 1968: 149; Shcherbachev 1980: 162; Schwarzhans 1994: 76, fig. 41 (sagitta); Nielsen 1995:11, fig. 10.

Material examined (11 specimens, SL 113-150):
Holotype: ZSI 13435 (SL 129), Bay of Bengal.

Non-types: BMNH 1895.1.3.3-4 (2, SL 114-143), BMNH 1904.5.25.1 (1, SL 150), BMNH 1910.1.31.7-10, 23 (5, SL 130-145) and USNM 46756 and 287241 (2, SL 113-127), Bay of Bengal, Gulf of Oman and Arabian Gulf.
See Nielsen (1995: 11) for station-data.

Diagnosis: Hind margin of preopercle without spines; distinct ocellus on dorsal fin and middle part of anal fin black; dorsal fin rays 88-93; anal fin rays 72-76; pectoral fin rays 24-27; long rakers on anterior gill arch 11-14; longest gill filaments on anterior arch 15.0-19.0 % length of head; vomer tooth patch boomerang shaped (Fig. 74B); precaudal vertebrae 12; total vertebrae 53-57.

Similarity: *N. steatiticus* seems most similar to *N. malayanus* with no spines on preopercle, one ocellus in dorsal fin, no black bars on body and only posterior part of dorsal fin black. They differ by *steatiticus* having middle part of all anal fin rays black (*vs* distal part of anal fin rays black), more long gill rakers (11-14 *vs* 8-11) and longer gill filaments (15.0-19.0 *vs* 5.2-13.5 % head length).

Description: The principal meristic and morphometric characters are shown in Table 33.

Rather robust fish with indistinct lateral line; snout slightly pointed, equal in length to eye win-

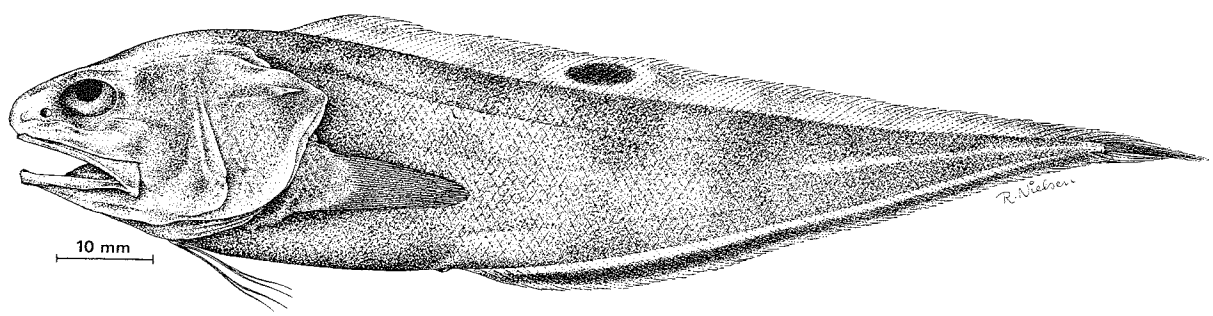


Fig. 73. *Neobythites steatiticus*. USNM 46756, SL 113.

dow; maxilla ends well behind eye; teeth mostly granular, a few specimens with needle-like teeth on premaxilla; vomer boomerang shaped and anterior basibranchial tooth patch narrow (Fig.74A,B); anterior nostril with low tube and larger posterior nostril a mere hole; hind margin of preopercle without spines; ventral fin reaches little more than halfway from base to anal fin; anterior gill arch with 1-3 short and 2-4 long rakers on upper branch, one long raker in angle and lower branch with 7-9 long and 6-9 short rakers; 2-4 long pseudobranchial filaments.

Sagittal otolith (Fig. 74C) short and high, length only 1.5 times height; sulcus prominent with almost completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Neural and haemal spines pointed except for spines on vertebrae 3-4 being blunt in a few specimens; first neural spine 1/2- 2/3 length of second spine; vertebrae 4-9 with depressed neural spines; bases of vertebral spines 4-9 enlarged; parapophyses on posterior 7-12 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-8.

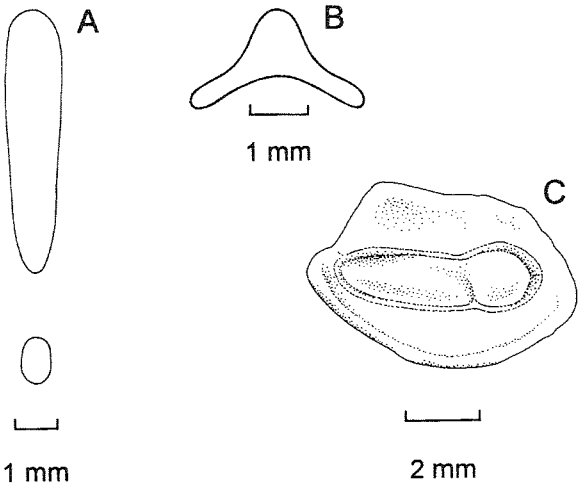


Fig. 74. *Neobythites steatiticus*. A, basibranchial tooth patches of BMNH 1910.1.31, SL 133; B, vomer of USNM 46756, SL113; C, median view of right sagitta of USNM 256238, SL127.

Coloration. Distinct ocellus on dorsal fin well behind vertical through anus; black part of ocellus covers 6-8 dorsal fin rays (rays nos. 24-37); middle part of anal fin black with a pale band both proxi-

Table 33. Meristic and morphometric characters of *N. steatiticus*

| | Holotype | HT + 10 spms | Nos |
|---|---|---|---|
| Standard length | 129 | 113-150 | 11 |
| Meristic characters | | | |
| Dorsal finrays | 88 | 88 (90.8) 93 | 11 |
| Caudal finrays | 8 | 8 | 7 |
| Anal finrays | 75 | 72 (74.6) 76 | 11 |
| Pectoral finrays | 24 | 24 (25.9) 27 | 11 |
| Pseudobr. filaments | 2/3 | 2 (2.9) 4 | 11 |
| Precaudal vertebrae | | 12 | 10 |
| Total vertebrae | | 53 (54.3) 57 | 10 |
| Long rakers on ant. gill arch | 12 | 11 (12.4) 14 | 11 |
| Ant. dorsal ray above vertebra no. | | 4 (4.5) 5 | 10 |
| Ant. anal ray below dorsal ray no. | | 18 (19.7) 21 | 10 |
| Ant. anal ray below vertebra no | | 14 (14.9) 15 | 10 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 28.0 | 25.5 (27.8) 31.0 | 11 |
| Depth orig. anal fin | 20.5 | 17.5 (18.5) 20.5 | 11 |
| Upper jaw length | 12.0 | 11.5 (12.2) 13.5 | 10 |
| Hor. eye window | 5.1 | 4.8 (5.3) 5.9 | 11 |
| Postorbital length | | 15.0 (16.2) 17.0 | 4 |
| Preanal length | 40.0 | 40.0 (42.3) 46.0 | 10 |
| Predorsal length | 24.5 | 24.5 (25.8) 28.0 | 10 |
| Base of ventral fin to anal fin origin | | 22.5 (25.8) 29.2 | 10 |
| Ventral fin length | 14.0 | 13.5 (15.0) 17.0 | 10 |
| Snout to ocellus | | 46.0 (49.6) 51.5 | 10 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | | 15.0 (17.3) 19.0 | 10 |

mally and distally; body with 3-4 broad, indistinct vertical bars; many tiny, black spots ventrally on body and on head; the most newly caught specimen was taken almost 100 years ago and all are much bleached.

Biology: The material consists of eight females, two males and one unsexed specimen; a 127 mm specimen has eggs 0.5 mm in diameter. No identifiable stomach contents. Trawled on the upper part of the continental slope.

Distribution: Known from seven localities (Fig. 1) from Bay of Bengal to Gulf of Oman and Arabian Gulf from 196-458 m depth. The gap in the distribution is most probably due to lack of fishing on the continental slope in the Arabian Sea.

Remarks: de Beaufort & Chapman (1951) considered *steatiticus* a senior synonym of *malayanus* and *unimaculatus* a point of view not followed here, where they are treated as three separate species.
A comparison between the five specimens of *steatiticus* from the Bay of Bengal and the six from the more western localities only showed variation in length of head, being 28.0-31.0 *vs* 25.5-27.0 % SL, respectively.

## *Neobythites stefanovi* Nielsen & Uiblein, 1993

Figs. 1, 75, 76, 77

*Neobythites stefanovi* Nielsen & Uiblein, 1993: 110, fig. 1 (type locality: Gulf of Aden, 14°48.8'N, 51°16.1'E).
*Neobythites stefanovi*: Uiblein *et al.* 1994: 16; Nielsen 1995: 12, fig. 11; Uiblein 1995: 23.
*Neobythites* sp. 10: Schwarzhans 1994; 76, fig. 43-45 (sagitta).

Material examined (51 specimens, SL 27-198): Holotype: ZM MGU P-18923 (SL 166), Gulf of Aden.

Paratypes: BMNH 1939.5.24.1437 (1, SL 195), SMF 26427-9 (8, 42-122), USNM 309008 and 302930 (4, 131-179), ZM MGU P-18924 to 931 (11, SL 130-190) and ZMUC P77841-844 (4, SL 163-198), Gulf of Aden (25 spms.) and Gulf of Oman (3 spms.).

Non-types: BMNH 1939.5.24.1438 (1, SL 27) and SMF 26430-42 (21, SL 29-122), Gulf of Aden (1 spm.) and Red Sea (21 spms.).
See Nielsen & Uiblein (1993:110) for station-data.

Remarks on material: Nielsen & Uiblein (1993) found slight differences both in meristic and morphometric characters between specimens from the Red Sea and the Gulf of Aden. Consequently, the Red Sea material was not included in the type material. Still, the present material does not indicate even subspecific differences.

Diagnosis: Hind margin of preopercle without spines; one ocellus on dorsal fin (distinct in specimens more than about 50 mm) and outer part of vertical fins black in larger specimens; dorsal fin rays 89-94; anal fin rays 73-78; pectoral fin rays 24-27; long rakers on anterior gill arch 10-13; longest gill

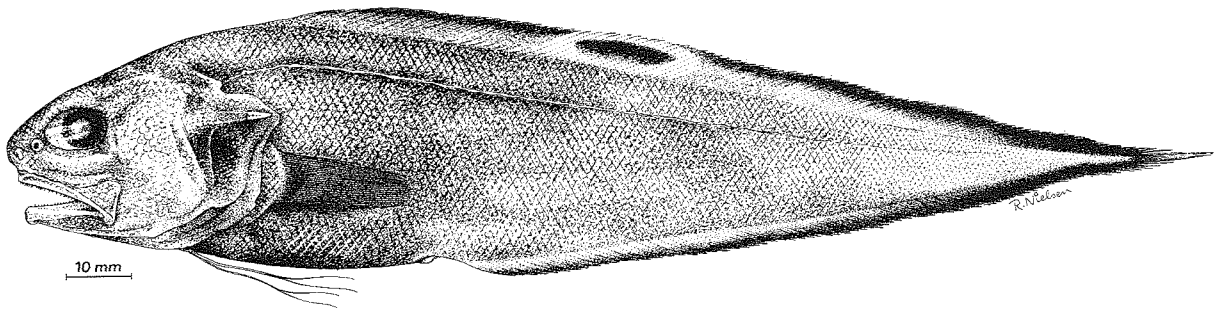


Fig. 75. *Neobythites stefanovi*. Holotype ZM MGU P-18923, SL 166.

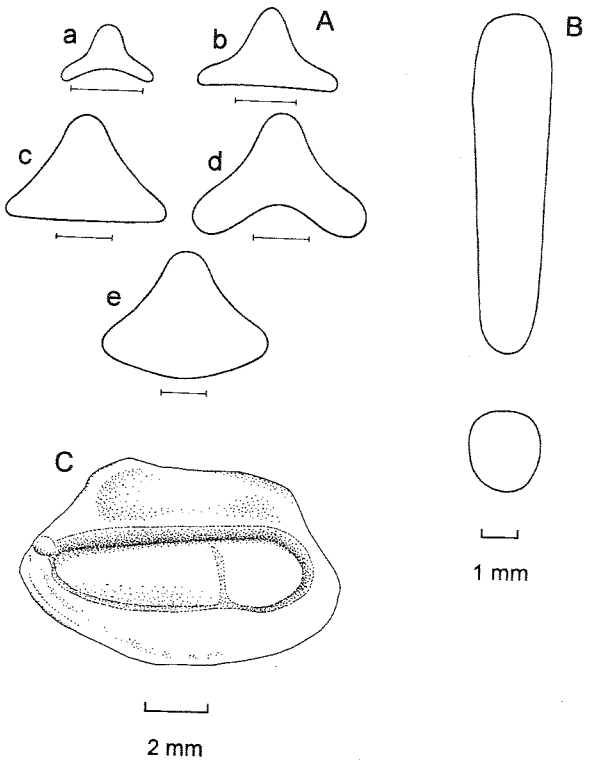


Fig. 76. *Neobythites stefanovi*. A, vomer: a – paratype SMF 26429, SL 61, b – paratype SMF 26427, SL 94 , c – paratype USMN 309008, SL 158, d – paratype ZMUC P77843, SL163, e – holotype, SL 166 (scale bar = 1 mm); B, basibranchial tooth patches of paratype, ZMUC P77841, SL 198; C, median view of right sagitta of paratype, ZM MGU P-18928, SL180.

filaments on anterior arch 6.6-16.0 % of length of head; pseudobranchial filaments 2-6; vomer tooth patch variable (Fig. 76A); precaudal vertebrae 12; total vertebrae 52-56.

Similarity: *N. stefanovi* seems most similar to *N. malayanus* and *steatiticus* with no spines on preopercle, one ocellus and part of anal fin black. They differ by *stefanovi* having distal part of entire dorsal fin black (*vs* posterior part of dorsal fin black).

Description: The principal meristic and morphometric characters are shown in Table 34. Rather

Table 34. Meristic and morphometric characters of *N. stefanovi*

| | Holotype | HT + 41 spms | Nos |
|---|---|---|---|
| Standard length | 166 | 42-198 | 42 |
| Meristic characters | | | |
| Dorsal finrays | 90 | 89 (91.6) 94 | 38 |
| Caudal finrays | 8 | 8 | 30 |
| Anal finrays | 74 | 73 (74.9) 78 | 39 |
| Pectoral finrays | 25 | 24 (25.0) 27 | 34 |
| Pseudobr. filaments | 5/4 | 2 (4.1) 6 | 32 |
| Precaudal vertebrae | 12 | 12 | 42 |
| Total vertebrae | 54 | 52 (54.0) 56 | 40 |
| Long rakers on ant. gill arch | 13 | 10 (11.9) 13 | 41 |
| Ant. dorsal ray above vertebra no. | 5 | 4 (4.3) 5 | 42 |
| Ant. anal ray below dorsal ray no. | 21 | 17 (19.4) 21 | 42 |
| Ant. anal ray below vertebra no | 16 | 14 (14.6) 16 | 42 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 26.0 | 23.0 (25.4) 28.0 | 39 |
| Depth orig. anal fin | 21.0 | 16.2 (19.4) 22.0 | 39 |
| Upper jaw length | | 11.0 (11.8) 13.0 | 21 |
| Hor. eye window | 6.2 | 5.5 (6.2) 6.9 | 31 |
| Postorbital length | | 14.5 (15.2) 15.5 | 4 |
| Preanal length | 42.5 | 37.5 (41.0) 45.0 | 38 |
| Predorsal length | 28.0 | 24.0 (26.2) 28.5 | 37 |
| Base of ventral fin to anal fin origin | | 21.0 (24.1) 26.0 | 5 |
| Ventral fin length | | 15.0 (17.0) 18.5 | 40 |
| Snout to ocellus | 55 | 46.0 (51.0) 56 | 39 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 14.0 | 6.6 (11.5) 16.0 | 40 |

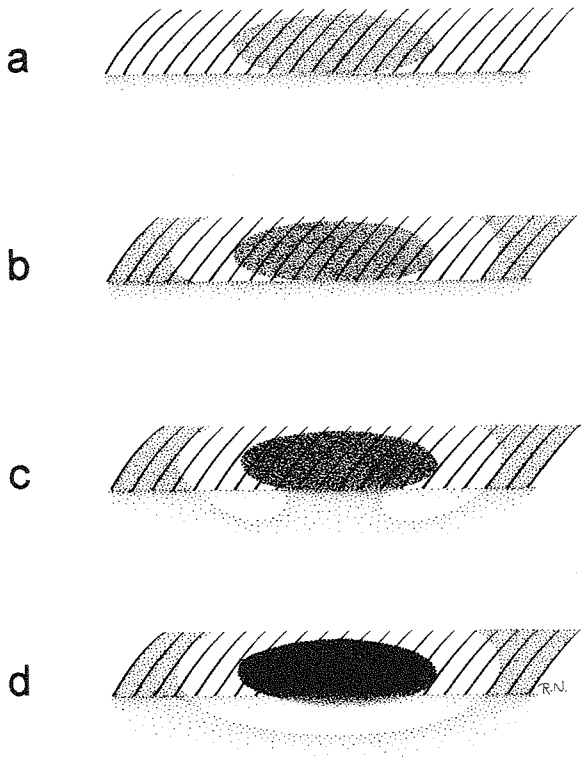


Fig. 77. Development of dorsal ocellus in *Neobythites stefanovi* . SL increases from stages a-d (from Uiblein et al. 1994).

robust fish with distinct lateral line; snout blunt, shorter than eye window; maxilla ends just behind eye; teeth needle-like, rarely granular; form of vomer vary much (Fig. 76A) not related to size, sex or locality; posterior basibranchial tooth patch large (Fig. 76B); anterior nostril with small flap and larger posterior nostril with or without low rim; hind margin of preopercle without spines; ventral fin reaches 3/4 from base to anal fin; anterior gill arch with 1-4 short and 2-4 long rakers on upper branch, one long raker in angle and upper branch with 7-9 long and 5-8 short rakers; 2-6 long pseudobranchial filaments.

Sagittal otolith (Fig. 76C) short and high, length less than 1.5 times height; sulcus dominant with colliculi completely separated; ostium less than twice length of cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed except for a few specimens with 3rd-5th spines blunt; first neural spine half length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-12 precaudal vertebrae; pleural ribs on vertebrae 3-12; epipleural ribs on vertebrae 3-10.

Coloration. Adult specimens with distinct ocellus in dorsal fin placed well behind line through anus, smaller specimens with less developed ocellus (Figs. 75, 77); black part of ocellus covers 8-12 dorsal fin rays (rays nos. 22-39); distal part of dorsal and anal fin black; lateral line pale; body mottled brown with many tiny, black spots ventrally; eye, abdomen and gill cover bluish; oral and branchial cavities and eye-ring brown.

Biology: The material consists of 14 females, 14 males and 23 small, unsexed specimens.

Intestinal contents consisted of remains of crustaceans and gastropods. Trawled on the continental shelf and upper slope.

Distribution: Known from 12 localities in the Gulf of Aden and the Gulf of Oman from depths of 80-549 m, and from nine localities in the Red Sea (Fig. 1) from depths of 434-804 m.

## *Neobythites stelliferoides* Gilbert, 1890

Figs. 78, 79

*Neobythites stelliferoides* Gilbert, 1890: 113 (type locality: Gulf of California, 24°30'15''N, 110°29'W).

*Bassogigas stelliferoides*: Norman 1939: 86.

*Neobythites stelliferoides*: Jordan & Evermann 1898: 2516; Schwarzhans 1994: 76, fig. 42 (sagitta).

Material examined (51 specimens, SL 38-168): Lectotype (here selected): USNM 44383, SL 154, female, Gulf of California (24°30'15''N, 110°29'W), R/V ALBATROSS st. 2996, trawl, 205 m, 16 Mar.1889.

Paralectotypes: USNM 125557, SL 143-158, female and male, same data as for lectotype.

Non-types: SU 21203, SL 150-152 (4 spms.), Gulf of California (24°39.5'N, 110°34'W), R/V ALBATROSS st. 2997, beam trawl, 516 m, 16 Mar.

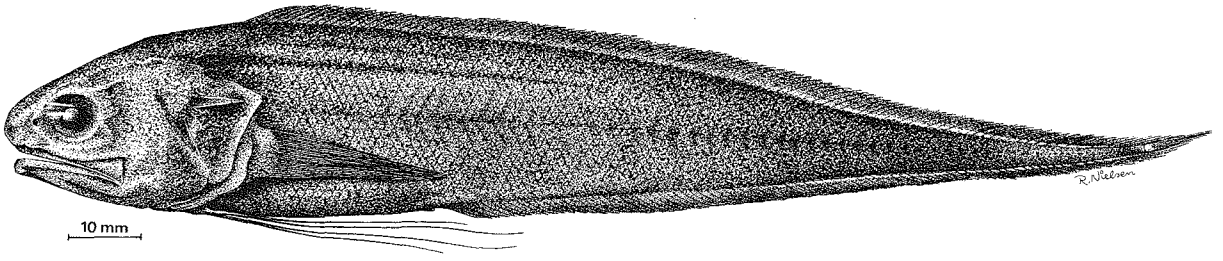


Fig. 78. *Neobythites stelliferoides*. USNM 308999, SL 155.

1889; MCZ 28643, SL 108-140, 2 females and 2 males, Gulf of Panama (7°16.8'N, 79°56.5'W), R/V ALBATROSS st. 3389, trawl, 384 m, 9 Mar. 1891; MCZ 28644 and ZMUC P77684, SL 128-147, 3 females, Gulf of Panama (7°33.3'N, 79°43.3'W), R/V ALBATROSS st. 3391, trawl, 280 m, 9 Mar. 1891; SIO60-119, SL 66-88 (4 spms.), Gulf of California (29°54.3'N,113°3.2'W), R. Parker coll., 30 Mar. 1960; SIO62-701, SL 38, NW of Marquis Pt., Mexico, B6212-1, 1962; SIO65-293, SL 45-57 (3 spms.), NW of Isla Monserrate, Gulf of California, Rosenblatt coll. st. RR 65-39 coll. 1965; SIO65-275-61A, SL 158-168, 3 females and 2 males, Gulf of California (24°58.2'N, 110°42'W), Rosenblatt and party, 8 July 1965; CAS 58422 , SL 120, female, off Bahiade Sechura, Peru (5°1'S, 81°25'W), R/V ANTON BRUUN st. 267A, otter trawl, 200-311 m, 3 June 1966; SIO70-253, SL 89-109 (10 spms.), Gulf of California (29°59'N, 112°52'1W), MB6904-6, 1970; LACM 33827-22, SL 87-158 (5 spms.), Gulf of Nicoya, Costa Rica, CCS73-52-55, 29 June 1973; SIO84-70, SL 98, Gulf of California, Rosenblatt & Walker coll., Oct. 1984; ZISP 48388, SL 90-137, 3 females, Gulf of Panama (24°52'5"N, 108°44'W), R/V ADLER tr. 80, 150-200 m, 8 June 1965; USNM 308999, SL 155-166, 1 female and 1 male, Gulf of California (24°58'12"N, 110°42'W), Rosenblatt coll. st. RR 65-21, bottom trawl, 210 m, 8 July 1965; USNM 340895, SL 78, male, Gulf of Panama (8°11'N, 79°8'W), Puerto Rican AEC lab. st. 71, 92 m, 4 Apr. 1967; ISH 699-1975, SL 137, female, Gulf of California (29°10'N, 112°5'W), R/V WESER, Mexal Exp. st. 503, 400 m, 21 May 1975.

Remarks on material: Gilbert (1890) wrote "Many specimens from Station 2996, in 112 fathoms. Length 7 inches". He did not directly select a type specimen. However, even though there are several specimens he gave the length as 7 inches and except for length of head and depth of body there is no variation given for any characters in his description, indicating that he had one specimen in mind. One of the specimens catalogued USNM 44383 is very close to 7 inches in length. This specimen was named "type" by Jordan & Evermann (1898: 2516), which cannot be correct as all specimens in the original description came from the same station. Eschmeyer (1998: 1608) correctly named the original specimens "syntypes". In the present paper USNM 44383 is selected as lectotype and all remaining syntypes are now paralectotypes: UMMZ 162264 (2 spms.) and USMN 125557 (4 spms.).

Besides the specimens mentioned in "Material examined" I have superficially examined 14 specimens from six localities at the USNM and 48 specimens from 18 localities at the LACM.

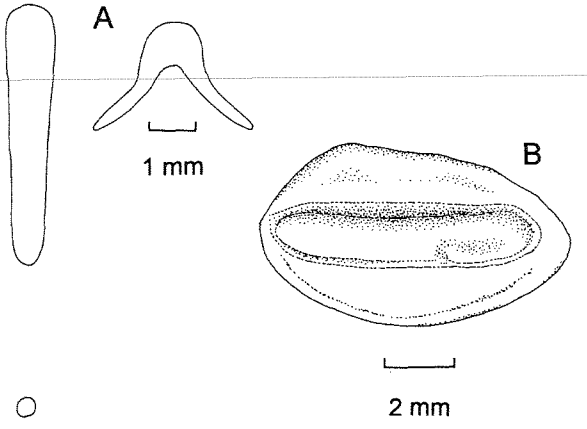


Fig. 79. *Neobythites stelliferoides*. A, basibranchial tooth patches and vomer of paralectotype, USNM 125557, SL 158; B, median view of right sagitta of USNM 308999, SL 155.

Diagnosis: Hind margin of preopercle without spines; no ocelli or bars; ventral fin rays reach well beyond origin of anal fin; dorsal fin rays 97-101; anal fin rays 80-86; pectoral fin rays 26-29; long rakers on anterior gill arch 18-22; longest gill filaments on anterior arch 13.0-18.5 % length of head; pseudobranchial filaments 4-7; vomer tooth patch boomerang shaped (Fig. 79A); anterior basibranchial tooth patch very narrow and posterior patch small and far behind (Fig. 79A); precaudal vertebrae 11-12; total vertebrae 54-57.

Similarity: *N. stelliferoides* seems most similar to *N. longipes* with ventral fin reaching far behind origin of anal fin and no spines on preopercle. They differ by *stelliferoides* having 18-22 long gill rakers (*vs* 8-10) and no ocellus in dorsal fin (*vs* ocellus present).

Description: The principal meristic and morphometric characters are shown in Table 35.

Elongate fish with indistinct lateral line; snout in adults blunt and more pointed in juveniles, almost equal in length to eye window; maxilla ends well behind eye; teeth granular; vomer boomerang shaped, anterior basibranchial tooth patch long and narrow with the very small posterior patch placed far behind (Fig.79A), one specimen with small patch between two median patches placed little off midline as if remains of pair; anterior nostril with low rim and flap and larger posterior nostril a mere hole; ventral fin reaches far behind origin of anal fin; anterior gill arch with 0-2 short and 6-7 long rakers on upper branch, one long raker in angle and lower branch with 11-14 long and 3-7 short rakers; 4-7 long pseudobranchial filaments.

Sagittal otolith (Fig. 79B) oval, about 1.5 times as long as high, with an even rim; sulcus large with incomplete separation of colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines pointed, except for some of depressed precaudal vertebral spines being blunt; first spine 1/2-2/3 length of second spine; vertebrae 3-8 with depressed neural spines; bases of vertebral spines 5-10 enlarged; parapophyses on posterior 7-11 precaudal vertebrae; pleural ribs on vertebrae 3-11; epipleural ribs on vertebrae 3-9.

Table 35. Meristic and morphometric characters of *N. stelliferoides*.

| | Lectotype | 2 paralectotypes | LT, PLT's + 14 spms* |
|---|---|---|---|
| Standard length | 154 | 143-158 | 90-166 |
| Meristic characters | | | |
| Dorsal finrays | 97 | 100 | 97 (99.3) 101 |
| Caudal finrays | 8 | 8 | 8 |
| Anal finrays | 80 | 82-83 | 80 (83.6) 86 |
| Pectoral finrays | 28 | 26 | 26 (27.3) 29 |
| Pseudobr. filaments | 4/5 | 4-5 | 4 (5.5) 7 |
| Precaudal vertebrae | 11 | 11-12 | 11 (11.1) 12 |
| Total vertebrae | 56 | 57 | 54 (56.0) 57 |
| Long rakers on ant. gill arch | 19/20 | 20-22 | 18 (19.9) 22 |
| Ant. dorsal ray above vertebra no. | 4 | 4 | 3 (4.1) 5 |
| Ant. anal ray below dorsal ray no. | 20 | 19-20 | 18 (19.4) 21 |
| Ant. anal ray below vertebra no | 14 | 14-15 | 14 (14.1) 15 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 26.0 | 24.0-25.5 | 22.0 (24.1) 26.0 |
| Depth orig. anal fin | | 16.0-17.0 | 16.0 (17.0) 18.5 |
| Upper jaw length | 12.5 | 11.0-12.5 | 11.0 (12.0) 12.5 |
| Hor. eye window | 5.5 | 4.9-5.2 | 4.5 (5.2) 6.2 |
| Postorbital length | | 15.5-16.0 | 12.5 (14.6) 16.0 |
| Preanal length | 39.5 | 38.5-39.0 | 37.5 (40.3) 45.6 |
| Predorsal length | 23.5 | 22.5-25.0 | 20.5 (22.9) 25.0 |
| Base of ventral fin to anal fin origin | 22.5 | 20.5-22.0 | 19.5 (22.3) 25.5 |
| Ventral fin length | 28.5 | 34.0-35.5 | 25.0 (31.7) 40.5 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 14.5 | 17.5-18.8 | 13.0 (15.9) 18.5 |

* All 17 specimens represented in all mean values.

Coloration. All ALBATROSS material is much bleached with silvery abdomen. However, Ross Robertson (Smithsonian Tropical Research Institute, Panama) most kindly sent me a photo of a *ca.* 100 mm specimen taken immediately after its capture in Gulf of Chiriqui, Panama. It shows a generally brown fish with abdomen, gill cover and anterior part of body silvery; dorsal and anal fin rays light distally, brown proximally and dark brown posteriorly; ventral part of head and body with many small black spots; head darker brown than body; black area around anus.

Biology: The material consists of 16 females, seven males and 28 unsexed specimens, none of which is ripe. No identifiable contents in stomach and intestines. Trawled on the continental shelf and upper slope.

Distribution: Here reported from *ca.* 40 localities along the west coast of America from the northern end of the Gulf of California (*ca.* 30° N) to off northern Peru (*ca.* 6° S), trawled at depths of 90-516 m.

## *Neobythites stigmosus* Machida, 1984

Figs. 3, 80, 81

*Neobythites stigmosus* Machida, 1984a: 174, figs. A-D (type locality off Owase, Mie Pref., Japan).

*Neobythites fasciatus* (non Smith & Radcliffe): Kamohara 1952: 92 and 1954: 13-14; Okamura 1982: 354 (fig.).

*Neobythites stigmosus*: Machida 1984b: 100, pl. 85-I; Shen *et al.* 1986 (colour photo); Chen & Shao 1991: 14 (Taiwan material); Schwarzhans 1994: 76, fig. 69 (sagitta).

Material examined (19 specimens, SL 94-160): Non-types: USNM 51438, SL 126, male, off Honshu, Japan, R/V ALBATROSS st. 3695, dredge, 201-474 m, 4 May 1900; USNM 51405, SL 134, female, Suruga Gulf, R/V ALBATROSS st. 3738, dredge, 306 m, 17 May 1900; USNM 150290 and 117942, SL 112-151, 1 female and 1?, Suruga Gulf, Japan (35°6'N, 138°40'10"E), R/V ALBATROSS st. 5060, dredge, 361 m, 12 Oct. 1906; USNM 150284, SL 96-147, 1 female, 1 male and 1?, Suruga Gulf, Japan (35°5'40"N, 138°39'30"E), R/V ALBATROSS st. 5065, dredge, 386-428 m, 15 Oct. 1906; USNM 150292, SL 143, Uraga Strait, Japan (35°4'10"N, 139°38'12"E), R/V ALBATROSS st. 5091, dredge, 361 m, 26 Oct. 1906; USNM 150293, SL 110, Uraga Strait, Japan (35°4'42"N, 139°38'20"E), R/V ALBATROSS st. 5094, dredge, 161 m, 26 Oct. 1906; ZISP 41428, SL 149, female, off Japan (36°58'N, 141°29'E), trawl, 325 m, 9 Apr. 1973; ZMUC P77811-814, SL 117-160, 4 females, Tosa Bay, Japan, bottom trawl, 200-250 m, 1988; AZISP 56352, SL 94, off Tashi, Taiwan, 2 May 1988; AZISP 57632, SL 94-147, 2 males and 1?, off Tashi, Taiwan, 2 May 1988; ZMUCP 771291, SL 120, male, off Tungkang, Taiwan, 15 Apr. 1993.

Remarks on material: The holotype and 21 paratypes are kept in the collection at Kochi University, Japan.

Diagnosis: Hind margin of preopercle with two spines; small head (less than 20 % SL); dorsal fin with 3-7 and anal fin with 2-4 ocelli or blotches; dorsal fin rays 101-107; anal fin rays 86-91; pectoral fin rays 24-27; long rakers on anterior gill arch

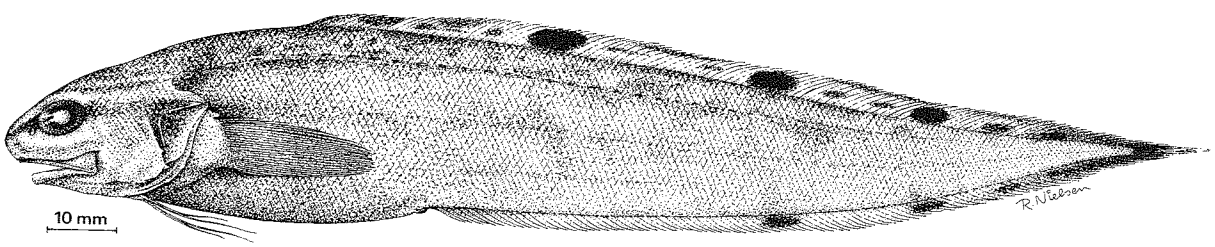


Fig. 80. *Neobythites stigmosus*. ZMUC P77813, SL 160.

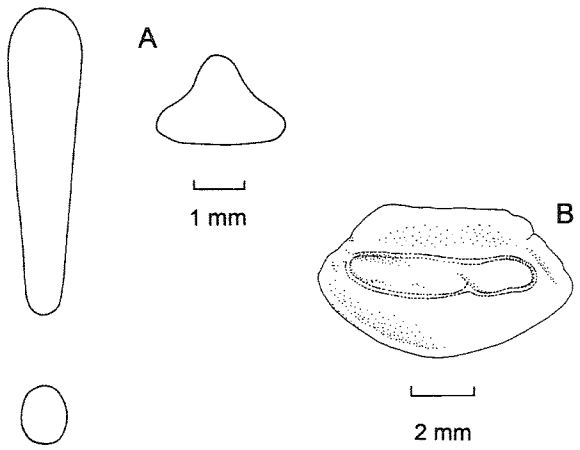


Fig. 81. *Neobythites stigmosus*. A, basibranchial tooth patches and vomer of ZMUC P77814, SL 153; B, median view of right sagitta of ZMUC P77812, SL 140.

11-12; longest gill filaments on anterior arch 4.4-7.3 % length of head; pseudobranchial filaments 4-7; vomer tooth patch subtriangular (Fig. 81A); precaudal vertebrae 13-14 and total vertebrae 60-62.

Similarity: The most similar species seems to be *N. fijiensis* (cf. p. 31).

Description: The principal meristic and morphometric characters are shown in Table 36. Slender fish with distinct lateral line; head small; snout pointed, shorter than eye window; mouth inferior; maxilla ends well behind eye; teeth granular to needle-like; vomer subtriangular and anterior basibranchial tooth patch most broad anteriorly (Fig. 81A); anterior nostril with low rim and flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about 1/3 length from base to anal fin; anterior gill arch with 1-3 short and three long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 4-7 (one specimen with only one) short rakers; 4-7 short pseudobranchial filaments. Sagittal otolith (Fig. 81B) oval, almost twice as long as high and with pointed ends; sulcus small with incompletely separated colliculi.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine

Table 36. Meristic and morphometric characters of *N. stigmosus*.

| | Holotype* | HT + 15 spms | Nos |
|---|---|---|---|
| Standard length | 160 | 94-160 | 16 |
| Meristic characters | | | |
| Dorsal finrays | 102 | 101 (103.4) 107 | 15 |
| Caudal finrays | 8 | 8 | 14 |
| Anal finrays | 87 | 86 (87.6) 91 | 14 |
| Pectoral finrays | 27 | 24 (24.9) 27 | 12 |
| Pseudobr. filaments | 5 | 4 (5.0) 7 | 15 |
| Precaudal vertebrae | 14 | 13 (13.8) 14 | 16 |
| Total vertebrae | 61 | 60 (60.5) 62 | 16 |
| Long rakers on ant. gill arch | 13 | 11 (11.6) 12 | 15 |
| Ant. dorsal ray above vertebra no. | 6 | 6 | 16 |
| Ant. anal ray below dorsal ray no. | 20 | 17 (18.8) 20 | 16 |
| Ant. anal ray below vertebra no | 15 | 15 (15.1) 16 | 16 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 19.5 | 17.5 (18.8) 20.0 | 16 |
| Depth orig. anal fin | 15.0 | 13.0 (14.4) 16.0 | 16 |
| Upper jaw length | 8.8 | 8.2 (9.0) 9.4 | 16 |
| Hor. eye window | 4.3 | 4.3 (4.5) 5.2 | 14 |
| Postorbital length | - | 10.5 (10.9) 12.0 | 14 |
| Preanal length | 38.5 | 36.5 (38.0) 40.0 | 16 |
| Predorsal length | 22.5 | 21.5 (23.0) 26.0 | 16 |
| Base of ventral fin to anal fin origin | - | 23.0 (25.3) 28.0 | 16 |
| Ventral fin length | 8.8 | 8.8 (10.7) 11.5 | 16 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | - | 4.4 (6.1) 7.3 | 10 |

* From original description and radiograph

half length of second spine; vertebrae 3-8 with depressed spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 7-14 precaudal vertebrae; pleural ribs on vertebrae 3-14; epipleural ribs on vertebrae 3-10.

Coloration. Dorsal fin with up to seven and anal fin with four ocelli or blotches; distance from upper jaw symphysis to anterior edge of black part of ocelli or to dark blotch is in dorsal fin: 1st 26-30 %, 2nd 37 %, 3rd 42-45 %, 4th 57-65 %, 5th 76-81 %, 6th 82-86 % and 7th 92 % SL. In anal fin: 1st 63-67 %, 2nd 77-80 %, 3rd 85-88 % and 4th 93 % SL. Ocelli rather distinct even in longest preserved material; most distinct ocelli nos. 3, 4 and 5 in dorsal fin and nos. 1 and 2 in anal fin.

Body brown dorsally, lighter ventrally with many tiny, black spots and often a reddish line along midline; head darker with brown line across snout, two lines from tip of snout to end of gill cover and brown ring around eye; eye, gill cover and abdomen bluish.

Biology: The material consists of eight females, five males and six unsexed specimens, none of which is ripe. No identifiable contents in stomachs and intestines. Caught on the lower continental shelf and upper slope.

Distribution: Here reported from 11 localities (Fig. 3) from Japan to Taiwan, trawled at depths of 161-474 m. Machida (1984) reported *N. stigmosus* from the Okinawa Trough, Tosa Bay, off Owase and from Mimase fish market.

Remarks: According to Machida (1984) *N. stigmosus* has been identified as *N. fasciatus* in most previous Japanese fish literature.

## *Neobythites trifilis* Kotthaus, 1979

Figs. 1, 82, 83

*Neobythites trifilis* Kotthaus, 1979: 11, fig. 461 (type locality: off Socotra Is., 11°33.9'N, 52°54'E).

*Neobythites trifilis*: Shcherbachev *et al.* 1986: 203; Schwarzhans 1994, figs. 48-50 (sagitta); Nielsen 1995:13, fig. 12.

Material examined (70 specimens, SL 117-190):

Holotype: ZMH 5620 (SL 157), southeast of Socotra Is., off Somalia.

Non-types: USNM 308998 (10, SL 143-176), ZM MGU P-18900-903 (51, SL 125-190) and ZMUC P77825-832 (8, SL 117-181), southeast of Sokotra Is., off Somalia.

See Nielsen (1995: 14) for station-data.

Diagnosis: Hind margin of preopercle with two spines; no ocelli or bars; dorsal fin rays 99-105; anal fin rays 83-89; pectoral fin rays 28-30; long gill rakers on anterior arch 7-10; longest gill filaments on anterior arch 9.7-14.0 % length of head; pseudo-

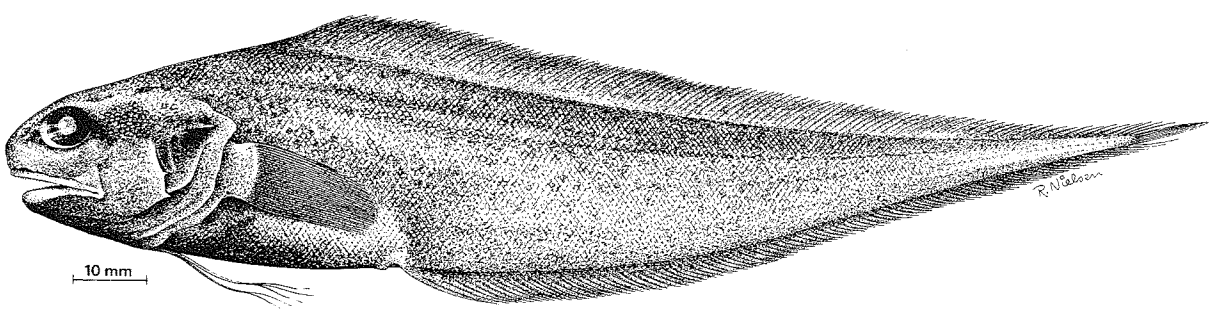


Fig. 82. *Neobythites trifilis*. Holotype, ZMH 5620, SL 157.

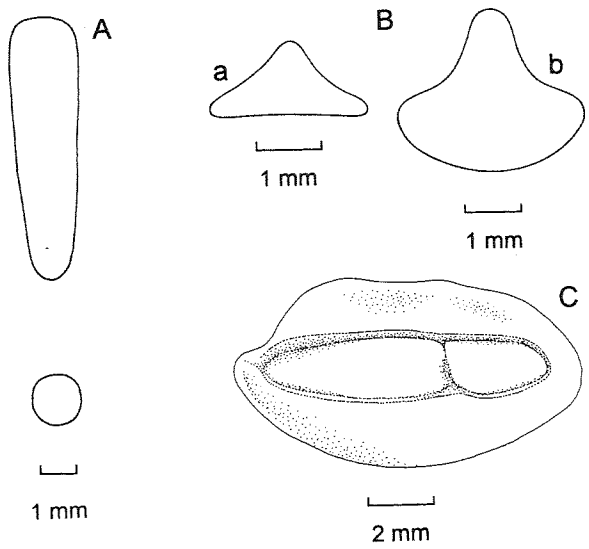


Fig. 83. *Neobythites trifilis*. A, basibranchial tooth patches of ZMUC P77830, SL 173; B, vomer: a – ZMUC P77826, SL117, b – holotype, SL 157; C, median view of right sagitta of ZM MGU P-18900.

branchial filaments 3-7; vomer tooth patch variable (Fig. 83B); precaudal vertebrae 12-13; total vertebrae 58-61.

Similarity: *N. trifilis* seems most similar to *N. vityazi* with two spines on preopercle, no ocelli and bars and no distinct dark bands on dorsal and anal fins. They differ by *trifilis* having needle-formed teeth (*vs* granular) and longer gill filaments (9.7-14.0 *vs* 4.4-6.7 % head length).

Description: The principal meristic and morphometric characters are shown in Table 37.

Rather robust fish, with distinct lateral line; snout blunt, slightly shorter than eye window; maxilla ends just behind eye; teeth needle-formed; vomer changing from triangular in small to subtriangular in larger specimens, anterior basibranchial tooth patch rather short (Fig. 83A); anterior nostril with low rim and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches halfway or less from base to anal fin; anterior gill arch with 2-4 short and 1-2 long rakers on upper branch, one long raker in angle and lower branch with 5-6 long and 6-9 short rakers.

Table 37. Meristic and morphometric characters of *N. trifilis*.

| | Holotype | HT + 53 spms | Nos |
|---|---|---|---|
| Standard length | 157 | 117-190 | 54 |
| Meristic characters | | | |
| Dorsal finrays | 102 | 99 (102.0) 105 | 53 |
| Caudal finrays | 8 | 8 | 49 |
| Anal finrays | 88 | 83 (86.6) 89 | 52 |
| Pectoral finrays | 28 | 28 (28.6) 30 | 28 |
| Pseudobr. filaments | 4 | 3 (4.8) 7 | 52 |
| Precaudal vertebrae | 13 | 12 (12.9) 13 | 54 |
| Total vertebrae | 60 | 58 (59.6) 61 | 54 |
| Long rakers on ant. gill arch | 8 | 7 (8.2) 10 | 53 |
| Ant. dorsal ray above vertebra no. | 5 | 4 (4.9) 5 | 54 |
| Ant. anal ray below dorsal ray no. | 19 | 17 (19.2) 21 | 54 |
| Ant. anal ray below vertebra no | 14 | 14 (14.6) 16 | 54 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.0 | 21.0 (22.6) 24.5 | 54 |
| Depth orig. anal fin | 19.0 | 14.5 (17.2) 19.0 | 48 |
| Upper jaw length | | 9.4 (10.0) 10.5 | 8 |
| Hor. eye window | 5.1 | 5.1 (5.8) 6.4 | 48 |
| Postorbital length | | 12.5 (13.1) 13.5 | 8 |
| Preanal length | 38.0 | 35.0 (39.1) 42.0 | 36 |
| Predorsal length | 27.5 | 23.0 (25.2) 28.0 | 36 |
| Base of ventral fin to anal fin origin | | 26.0 (27.0) 28.5 | 6 |
| Ventral fin length | | 9.8 ( 11.3) 13.0 | 8 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 10.5 | 9.7 ( 11.5) 14.0 | 54 |

Sagittal otolith (Fig. 83C) oval, pointed anterior end, twice as long as high and with an even rim; dominating sulcus with completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine 1/2-2/3 length of second spine; vertebrae 3-11 with depressed spines; bases of vertebral spines 5-11 enlarged; parapophyses on precaudal vertebrae 7-13; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-9.

Coloration. No ocelli or bars, body mottled brown dorsally, lighter ventrally; dusky band distally on dorsal and anal fins; indistinct brown band from snout to gill cover; ventral part of head dark brown; eye and gill cover bluish; abdomen light.

Biology: The material consists of 37 females, 18 males and 15 unsexed specimens; the most ripe female with 0.5 mm eggs. The intestines contain a great variety of food items such as polychaets, gastropods, bivalves, crustaceans and fish (for details see Nielsen 1995: 14). Trawled on the lower continental shelf and upper slope.

Distribution: Known from five localities (Fig. 1) southeast of Sokotra Is., off Somalia from 175-420 m depth.

Remarks: Ventral fin rays thick and flattened distally in 17 specimens which cannot be related either to sex or size. The specific name, *trifilis*, refers to the left ventral fin of the holotype with three thread-like rays. The right ventral fin of the holotype and the ventral fins of the additional 69 specimens all have only two rays in each ventral fin.

## *Neobythites unimaculatus* Smith & Radcliffe, 1913

Figs. 3, 84, 85

*Neobythites unimaculatus* Smith & Radcliffe, 1913: 140, pl. 7, fig. 2 (type locality: off Borneo, 4°10'50"N, 118° 39'35"E).

*Neobythites unimaculatus*: Nielsen 1997: 71, fig. 16.

*Neobythites unimaculatus* (not Smith & Radcliffe): Kotthaus 1979 (=*N. meteori*).

*Neobythites nigromaculatus* Kamohara, 1938: 67, fig. 37 (type locality: Mimase market, Japan).

*Neobythites nigromaculatus*: Kamohara 1952: 92, fig. 90; Kamohara 1954: 11, fig. 9; Kamohara 1961a: 67 (colour photo); Kamohara 1961b: 9 (designation of neotype); Machida 1984b: 100, pl. 85-G; Shen & Shao 1991: 13 (Taiwan material); Schwarzhans 1994: 76, figs. 55-56 (sagitta).

*Neobythites steatiticus*: de Beaufort & Chapman 1951: 417 (in part).

Material examined (58 specimens, SL 97-218): Holotype: USNM 74127, SL 151, female, off Borneo (4°10'50"N, 118°39'35"E), R/V ALBATROSS st. 5590, trawl, 567 m, 29 Sep. 1909.

Paratype: USNM 76678, SL 136, female, off Mindanao, Philippines (8°41'15"N, 123°18'30"E), R/V ALBATROSS st. 5520, trawl, 187 m, 10 Aug. 1909.

Non-types: BSKU 3574, 37006, 37542, 39948, 39998, 44500, SL 177-218, 4 females and 2 males, Mimase fish market, Japan, 1950-1988; CAS 30439, SL 186-200, female and male, South China Sea (19°6.5'N, 112°38'E), R/V ALISTER HARDY st. HK 95, shrimp trawl, 203-218 m, 22 July 1958; ZM MGU P-20790, SL 179, male, Arafura Sea (9°12'S, 133°29.5'E), R/V AKADEMIK BERG, 197 m, 11 July 1967; NMV A 847, SL 97-114, 3 specimens, Philippines (9°30.5'N, 123°50.5'E), trawl, 146 m, 22 Nov. 1979; MNHN 1984-597, SL 165+, female, Philippines, MUSORSTOM 2, st. 2; NTM S.11351-014, SL 148, off Lombok, Indonesia, trawl, 180 m, 21 Aug. 1984; NTM S.12905-002, SL 120-202, 15 specimens, Arafura Sea (9°6'S, 133°42'E), trawl, 173 m; Inst. Zool., Taipei, Taiwan, SL 208+, female, off Tashi, Taiwan, 5 Feb. 1985; NTM S.13577-011, SL 127-184, 2 females and 4 males, Arafura Sea (9°5.1'S, 133°39.7'E), st. RW 92-65, 165-176 m, 20 Oct. 1992; NTM S.13580-026, SL 162-201, 7 specimens, Arafura Sea (9°4.7'S, 133°4.5'E), trawl, 179-205 m; MNHN 1994-750, SL 115-149+, 1 female and 1 male, off New Caledonia (21°30.71'S, 166°21.72'E), MUSORSTOM 4, R/V JEAN CHARCOT st. CP 105, trawl, 335 m, 8 Sep. 1985; MNHN 1994-751, SL 102, female, off New Caledonia (22°2.55'S, 167°5.68'E), MUSORSTOM 8, R/V JEAN CHARCOT st. CP 108, trawl, 335 m, 9 Sep. 1985; MNHN 1995-920, SL 131-

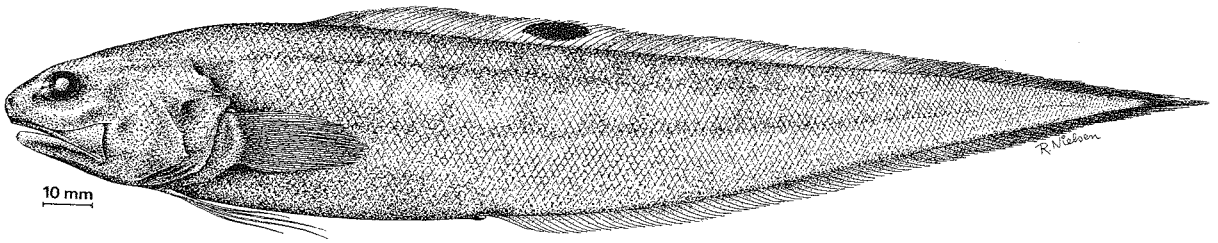


Fig. 84. *Neobythites unimaculatus*. BSKU 44500, SL 218.

189, 2 females, off Vanuatu (15°8.32'S, 166°53.35'E), MUSORSTOM 8, st. CP 1119, trawl, 254-300 m, 9 Oct. 1994; MNHN 1995-921, SL 200, female, off Vanuatu (15°6.97'S, 166° 53.42'E), MUSORSTOM 8, st. CP 1121, trawl, 315-360 m, 9 Oct. 1994; MNHN 2000-1563, SL 147 +, male, off Vanuatu (15°7.19'S, 166°55.2'E), MUSORSTOM 8, st. CP 1123, trawl, 262-352 m, 9 Oct. 1994; CSIRO H-4031-16, SL 167, male, off Cape Lambert, Western Australia (18°57'S, 117°14'E), R/V SOELA st. SO 0895/59, 248 m, 30 Aug. 1995; CSIRO H-4070-53, SL 224, female, NNW of Port Hedland, Western Australia (18°12'S, 118°14'E), R/V SOELA st. SO 0895/123, 269 m, 8 Sep. 1995; MNHN 2000-687 (SL 95-168, 3 females) and ZMUC P771323 (SL 153, female), Yangasa Cluster, Fiji Is.(18°43'S, 178°23'W), Camp. Bordau 1, R/V ALIS st. DW 1492, Waren dredge, 430-450 m, 11 Mar. 1999.

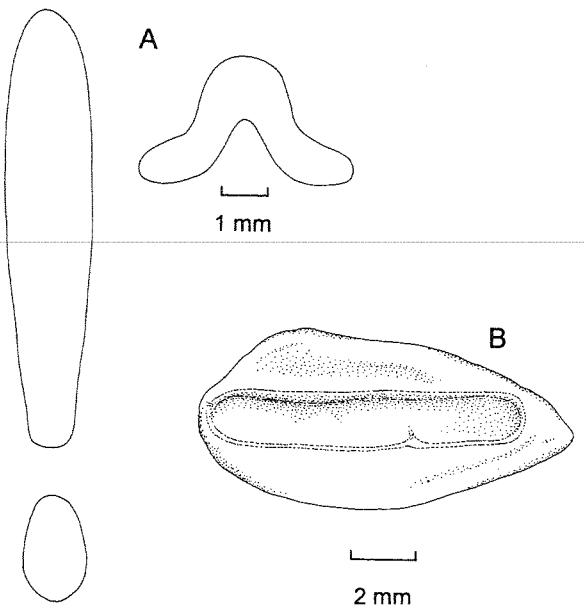


Fig. 85. *Neobythites unimaculatus*. A, basibranchial tooth patches and vomer of CAS 30439-004, SL 186; B, median view of right sagitta of CAS 30439, SL 186.

Diagnosis: Hind margin of preopercle with two spines; one ocellus on dorsal fin; dorsal fin rays 90-96; anal fin rays 74-79; pectoral fin rays 27-29; long rakers on anterior gill arch 8-11; longest gill filaments on anterior arch 5.0-9.7 % length of head; pseudobranchial filaments 4-8; vomer tooth patch boomerang formed (Fig. 85A); precaudal vertebrae 12-13; total vertebrae 53-56.

Similarity: *N. unimaculatus* seems most similar to *N. australiensis* with two preopercular spines, one ocellus in dorsal fin, 8-11 long rakers on anterior gill arch and boomerang-formed vomer. They differ by *unimaculatus* having dorsal part of body uniformly brownish (*vs* mottled brown) and anterior basibranchial tooth patch long and rather narrow (*vs* short and broad).

Description: The principal meristic and morphometric characters are shown in Table 38.

Elongate fish with distinct lateral line; snout more or less pointed equal in length to eye window; maxilla ends well behind eye; teeth granular to needle formed; vomer boomerang- formed and anterior basibranchial tooth patch long and rather narrow (Fig. 85A); anterior nostril with low rim and large flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches little more than halfway from base to anal fin; anterior gill arch with three short and two long rakers on upper branch, one long raker in angle and lower branch with 5-7 long and 5-8 short rakers; 4-8 long pseudobranchial filaments.

Sagittal otolith (Fig. 85B) long and slender, little more than twice as long as high, with pointed posterior end and highest anteriorly; dominant sulcus with incompletely separated colliculi, ostium about twice length of cauda.

Axial skeleton (from radiographs). Tips of neural and haemal spines normally pointed, some specimens with blunt depressed spines; first neural spine

2/3 length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-10.

Coloration. Distinct ocellus on dorsal fin covering 6-11 rays and placed on fin rays nos. 18-32; in one specimen ocellus placed above anus, in all others well behind vertical through anus; dorsal and anal fin dusky grey; many tiny, black spots ventrally on head and body; lateral line with brown pigmentation; snout and underside of head darker brown; two brown lines from tip of snout to end of gill cover; lips and eye ring dark brown; eye blue; abdomen silvery.

Biology: The material consists of 21 females, 11 males and 36 unsexed specimens, largest eggs 0.5 mm. Many specimens with unidentifiable remains of crustaceans and a few with gastropods in the intestines. Trawled on the lower continental shelf and upper slope.

Distribution: Known from 19 localities (Fig. 3) covering a vast area from Japan to Borneo and northwestern Australia and eastward to Fiji Is. from depths of 146 to 567 m. Marketed in Japan and Taiwan.

Remarks: Kamohara (1938) compared his material to the description of *N. unimaculatus* and not to the type itself, which explains why he considered his material forming an undescribed species, *N. nigromaculatus*. Kamohara based his new species on differences in number of dorsal fin rays and position of ocellus, but a radiograph of the holotype of *N. unimaculatus* shows that these two characters were not correctly given in the original description. Number of dorsal fin rays 83, 93, and *ca.* 97 and ocellus covering dorsal fin rays nos. 14-24, 20-29 and 20-27 are from Smith & Radcliffe (1913), the radiograph and Kamohara (1938), respectively.

Kamohara (1961) designed a neotype (BSKU 3573) for *N. nigromaculatus* as the type was destroyed. However, this act was not legal as it was not done in a revisional work (Eschmeyer 1998: 1185).

Table 38. Meristic and morphometric characters of *N. unimaculatus*.

| | Holotype | Paratype | HT, PT + 22 spms | Nos |
|---|---|---|---|---|
| Standard length | 151 | 136 | 102-235 | 24 |
| Meristic characters | | | | |
| Dorsal finrays | 93 | 91 | 90 (93.2) 96 | 23 |
| Caudal finrays | 8 | 8 | 8 | 22 |
| Anal finrays | 75 | 75 | 74 (76.5) 79 | 22 |
| Pectoral finrays | 27 | 27 | 27 (27.6) 29 | 17 |
| Pseudobr. filaments | 6 | 6 | 4 (6.2) 8 | 22 |
| Precaudal vertebrae | 13 | 12 | 12 (12.9) 13 | 24 |
| Total vertebrae | 53 | 54 | 53 (54.5) 56 | 24 |
| Long rakers on ant. gill arch | 8/9 | 9 | 8 (9.3) 11 | 24 |
| Ant. dorsal ray above vertebra no. | 5 | 5 | 5 (5.2) 6 | 20 |
| Ant. anal ray below dorsal ray no. | 20 | 18 | 17 (19.9) 22 | 24 |
| Ant. anal ray below vertebra no | 15 | 15 | 15 (15.3) 16 | 24 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 24.5 | 24.5 | 21.5 (22.9) 24.5 | 24 |
| Depth orig. anal fin | - | 18.0 | 15.5 (17.4) 19.4 | 23 |
| Upper jaw length | 12.0 | 11.5 | 10.5 (11.7) 12.9 | 21 |
| Hor. eye window | 4.8 | 4.6 | 4.0 (4.7) 5.3 | 24 |
| Postorbital length | - | 14.5 | 12.5 (13.9) 15.0 | 19 |
| Preanal length | 42.5 | 42.5 | 40.0 (43.9) 48.0 | 22 |
| Predorsal length | 25.5 | 27.0 | 24.0 (25.8) 27.5 | 23 |
| Base of ventral fin to anal fin origin | 25.0 | 24.5 | 23.0 (27.0) 31.5 | 22 |
| Ventral fin length | 20.0 | 17.0 | 13.0 (17.5) 20.0 | 23 |
| Snout to 1st ocellus | 45.5 | 43.5 | 42.5 (46.1) 50 | 23 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 8.6 | 9.0 | 5.0 (7.9) 9.7 | 23 |

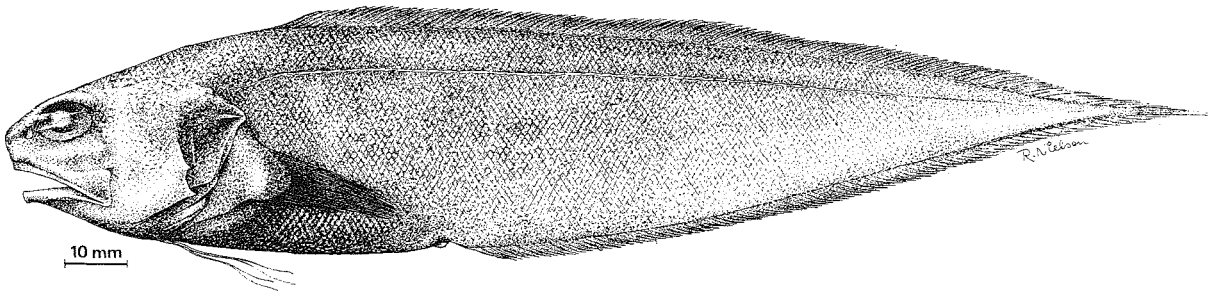


Fig. 86. *Neobythites vityazi*. Holotype ZM MGU P-18918, SL 170.

## *Neobythites vityazi* Nielsen, 1995

Figs. 1, 86, 87

*Neobythites vityazi* Nielsen, 1995:14, fig. 13 (type locality: off Madagascar, 22°19.1'S, 43°6.1'E).

*Neobythites analis* (non Barnard, in part): Shcherbachev 1980: 159, fig. 15c.

*Neobythites* sp. 2: Schwarzhans 1994: 74, figs. 6-11 (sagitta).

Material examined (20 specimens, SL 107-201):

Holotype: ZM MGU P-18918 (SL 170), off SE Madagascar.

Paratypes (19 specimens): MNHN 1992-526 to 531 and 534 (9, 107-182), ZM MGU P-18919-922 (7, 110-201) and ZMUC P77833-835 (3, 133-177), Mozambique Channel.

See Nielsen (1995: 14) for station-data.

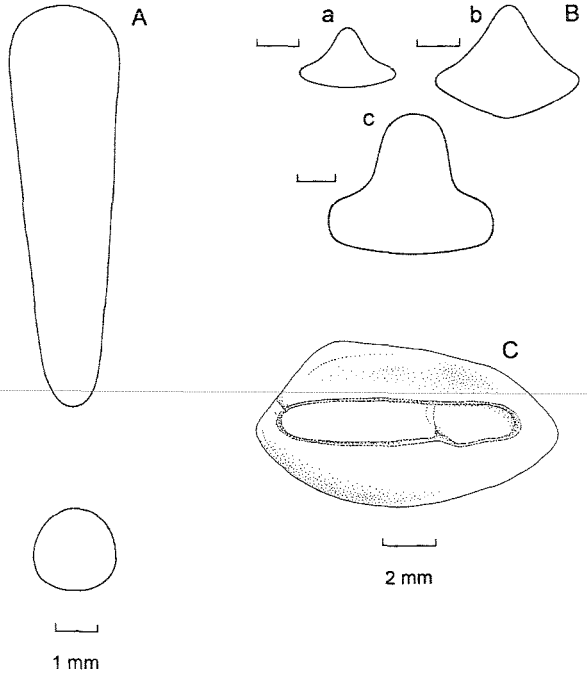


Fig. 87. *Neobythites vityazi*. A, basibranchial tooth patches of paratype, ZMUC P77835, SL 173; B, vomer: a – paratype MNHN 1992-526, SL107, b – holotype, SL 170, c – paratype ZM MGU P-18919, SL 201 (scale bar = 1 mm); C, median view of right sagitta of holotype.

Diagnosis: Hind margin of preopercle with two spines; no ocelli or bars; dorsal fin rays 99-105; anal fin rays 81-87; pectoral fin rays 25-28; long rakers on anterior gill arch 9-10; longest gill filaments on anterior arch 4.4-6.9 % length of head; pseudobranchial filaments 3-6; vomer tooth patch subtriangular with convex hind margin (Fig. 87B); precaudal vertebrae 13; total vertebrae 57-60.

Similarity: *N. vityazi* seems most similar to *N. trifilis* (cf. p. 93).

Description: The principal meristic and morphometric characters are shown in Table 39.

Robust fish with distinct lateral line; snout rather blunt, slightly shorter than or equal to eye window; teeth granular; vomer subtriangular, slightly changing with growth and posterior basibranchial tooth patch large (Figs. 87A,B); anterior nostril with large posterior flap and low rim and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches about halfway from base to anal fin; anterior gill arch with 1-4 short and 1-2 long rakers on upper branch, one long raker in angle and lower branch with 6-8 long and 5-8 short rakers; 3-6 rather long pseudobranchial filaments.

Sagittal otolith (Fig. 87C) oval, twice as long as high, with even rim and highest anteriorly; sulcus

Table 39. Meristic and morphometric characters of *N. vityazi*.

| | Holotype | HT + 19 paratypes | Nos |
|---|---|---|---|
| Standard length | 170 | 107-201 | 20 |
| Meristic characters | | | |
| Dorsal finrays | 103 | 99 (101.3) 105 | 18 |
| Caudal finrays | 8 | 8 | 17 |
| Anal finrays | 83 | 81 (83.7) 87 | 18 |
| Pectoral finrays | 26 | 25 (26.9) 28 | 19 |
| Pseudobr. filaments | 6 | 3 (5.0) 6 | 19 |
| Precaudal vertebrae | 13 | 13 | 20 |
| Total vertebrae | 58 | 57 (58.5) 60 | 19 |
| Long rakers on ant. gill arch | 9 | 9 (9.3) 10 | 20 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.2) 6 | 20 |
| Ant. anal ray below dorsal ray no. | 20 | 19 (19.6) 21 | 20 |
| Ant. anal ray below vertebra no | 15 | 14 (14.6) 16 | 20 |
| Morphometric characters | | | |
| In % of SL | | | |
| Head length | 23.0 | 20.0 (21.8) 23.0 | 19 |
| Depth orig. anal fin | 19.5 | 16.0 (18.2) 20.5 | 19 |
| Upper jaw length | 10.0 | 9.5 (10.3) 11.0 | 12 |
| Hor. eye window | 5.3 | 4.3 (4.7) 5.3 | 19 |
| Postorbital length | 13.0 | 11.5 (12.3) 13.0 | 11 |
| Preanal length | 41.0 | 38.0 (41.5) 44.0 | 19 |
| Predorsal length | 25.5 | 23.0 (24.3) 26.0 | 19 |
| Base of ventral fin to anal fin origin | 23.5 | 23.0 (25.2) 27.5 | 17 |
| Ventral fin length | 13.5 | 12.0 (13.5) 15.5 | 19 |
| In % of head length | | | |
| Longest filaments on ant. gill arch | 6.4 | 4.4 (5.5) 6.9 | 19 |

with completely separated colliculi; ostium twice as long as cauda.

Axial skeleton (from radiograph). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-7 with depressed neural spines; bases of verebral spines 5-11 enlarged; parapophyses on posterior 7-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-10.

Coloration. No ocelli and bars; dorsal and anal fin dusky grey; body brownish dorsally, ventral part more light and with many tiny black spots; peritoneum, oral and branchial cavities brown; lips and eye ring darker brown; horizontal brown lines on snout.

Biology: The material consists of seven females, seven males and six unsexed specimens, none of which is ripe. Large foraminiferans, crustaceans such as *Diastylis* and gastropods (Pyramidellidae and Turridae) were found in the intestines. Trawled on the upper continental slope.

Distribution: Known from 12 localities (Fig. 1) in the Mozambique Channel from depths of 280-760 m.

## *Neobythites zonatus* Nielsen, 1997

Figs. 3, 88, 89

*Neobythites zonatus* Nielsen, 1997: 72, fig. 17 (type locality: Norfolk Ridge, 24°55.48'S, 168°21.29'E).

*Neobythites* sp. 19: Schwarzhans 1994: 74, fig. 21 (sagitta).

Material examined (13 specimens, SL 79-174): Holotype: MNHN 1994-752 (SL 139), south of New Caledonia.

Paratypes: MNHN 1994-753 to 758 (7, 79-174), NMNZ P.29019, 29200, 29329 (3, 118-141) and ZMUC P771159-1160 (2, 114-128), off New Caledonia and neighbouring islands.

See Nielsen (1997) for station-data.

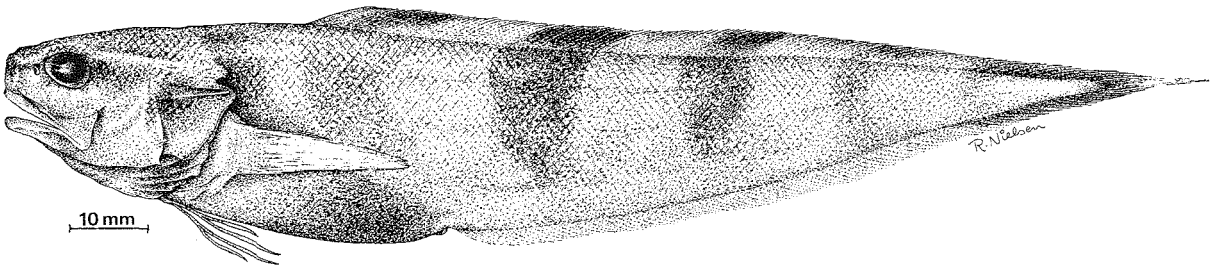


Fig. 88. *Neobythites zonatus*. Holotype, MNHN 1994-752, SL 139.

Tentatively referred specimen: LACM 44992-1, SL 179, male, Caroline Is. (8°8.5'N, 147°57'E), R/V TOWNEND CROMWELL cr. 57 st. TC 57, shrimp trawl, 274 m, 24 Mar. 1972.

Diagnosis: Hind margin of preopercle with two spines; dorsal fin with 4-5 dark blotches or ocelli continuing into vertical, dark bars on body; dorsal fin rays 100-105; anal fin rays 85-91; pectoral fin rays 27-28; long rakers on anterior gill arch 11-13; longest gill filaments on anterior arch 3.8-6.4 % length of head; pseudobranchial filaments 3-5; vomer tooth patch subtriangular (Fig. 89A); precaudal vertebrae 12-13; total vertebrae 59-62.

Similarity: *N. zonatus* seems most similar to *N. andamanensis* with two preopercular spines, dark bars on body and no ocelli or blotches on anal fin. They differ by *zonatus* having five broad bars (*vs* eight narrow bars) and short gill filaments (3.8-6.4 *vs* 10.0-13.0 % head length).

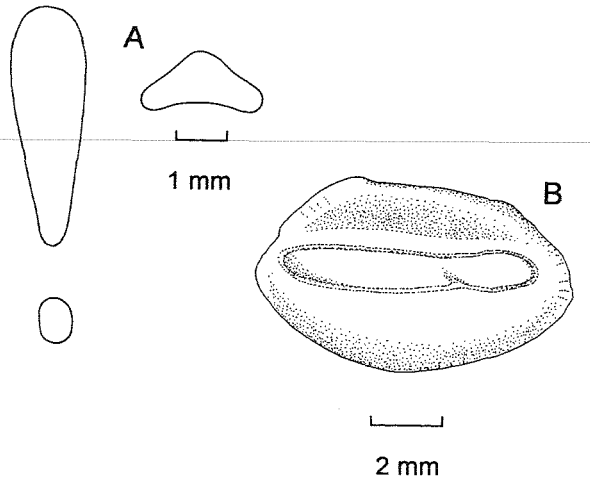


Fig. 89. *Neobythites zonatus*. A, basibranchial tooth patches and vomer of paratype, ZMUC P771159, SL 128; B, median view of right sagitta of holotype.

Description: The principal meristic and morphometric characters are shown in Table 40.

Rather robust fish with indistinct lateral line; snout blunt, equal in length to eye window; maxilla ends behind eye; teeth granular; vomer subtriangular with few large teeth and anterior basibranchial tooth patch very broad anteriorly (Fig. 89A); anterior nostril with low rim and large posterior flap and larger posterior nostril a mere hole; hind margin of preopercle with two spines; ventral fin reaches little more than halfway from base to anal fin; anterior gill arch with 2-4 short and 2-3 long rakers on upper branch, one long raker in angle and lower branch with 7-9 long and 4-6 short rakers; 3-5 rather long pseudobranchial filaments.

Sagittal otolith (Fig. 89B) oval, with even rim, almost twice as long as high, highest anteriorly; sulcus narrow with incompletely separated colliculi; ostium almost twice as long as cauda.

Axial skeleton (from radiographs). Tips of all neural and haemal spines pointed; first neural spine half length of second spine; vertebrae 3-9 with depressed neural spines; bases of vertebral spines 5-11 enlarged; parapophyses on posterior 8-13 precaudal vertebrae; pleural ribs on vertebrae 3-13; epipleural ribs on vertebrae 3-9.

Coloration. Dorsal fin with four ocelli continuing as rather broad black bars on body; often broad bar in front of dorsal fin and in a few specimens narrow bars between the broad ones further posteriorly. Distance from upper jaw symphysis to anterior edge of black part of 1st, 2nd, 3rd and 4th ocellus is, respectively, 28.0-34.5, 43.5-48.5, 58-68 and 72-80% SL; caudal fin and posteriormost part of dorsal and anal fin black; dorsal part of body brown, lighter ventrally; snout darker brown with line

Table 40. Meristic and morphometric characters of *N. zonatus*.

| | Holotype | HT+12 paratypes | Nos | Tent.ref. spm |
|---|---|---|---|---|
| Standard length | 139 | 79-174 | 13 | 179 |
| Meristic characters | | | | |
| Dorsal finrays | 103 | 100 (102.8) 105 | 11 | 104 |
| Caudal finrays | 8 | 8 | 11 | 8 |
| Anal finrays | 89 | 85 (88.9) 91 | 11 | 90 |
| Pectoral finrays | 27 | 27 (27.4) 28 | 11 | 28 |
| Pseudobr. filaments | 4/3 | 3 (4.1) 5 | 12 | 5 |
| Precaudal vertebrae | 13 | 12 (12.9) 13 | 13 | 13 |
| Total vertebrae | 60 | 59 (60.2) 62 | 12 | 60 |
| Long rakers on ant. gill arch | 12 | 11 (12.2) 13 | 13 | 11/12 |
| Ant. dorsal ray above vertebra no. | 5 | 5 (5.3) 6 | 13 | 5 |
| Ant. anal ray below dorsal ray no. | 19 | 18 (19.0) 20 | 12 | 20 |
| Ant. anal ray below vertebra no | 15 | 14 (15.3) 17 | 12 | 15 |
| Morphometric characters | | | | |
| In % of SL | | | | |
| Head length | 22.5 | 21.0 (22.3) 23.5 | 11 | 23.5 |
| Depth orig. anal fin | 16.0 | 14.5 (16.1) 17.0 | 11 | 14.5 |
| Upper jaw length | 11.5 | 9.9 (10.7) 11.5 | 11 | 11.0 |
| Hor. eye window | 4.5 | 4.3 (4.5) 4.8 | 11 | 4.9 |
| Postorbital length | 12.7 | 11.5 (12.9) 14.0 | 6 | 13.5 |
| Preanal length | 41.0 | 37.0 (40.1) 45.0 | 11 | 43.5 |
| Predorsal length | 26.0 | 23.0 ( 25.2) 26.0 | 11 | 26.5 |
| Base of ventral fin to anal fin origin | 24.5 | 21.0 (24.1) 27.5 | 11 | 25.0 |
| Ventral fin length | 12.5 | 12.0 (14.0) 15.5 | 11 | 16.0 |
| In % of head length | | | | |
| Longest filaments on ant. gill arch | 5.5 | 3.8 (5.0) 6.4 | 13 | 4.8 |

through eyes; abdomen, eye and gill cover bluish; tiny black spots all over head and body.

Biology: The material examined consists of ten females, one male and two unsexed specimens. Six specimens with gastropods in intestine. Trawled on upper part of continental slope.

Distribution: Known from ten localities (Fig. 3) near New Caledonia from depths of 490-950 m. The tentatively referred specimen is from Caroline Is. from a depth of 274 m.

Remarks: The specimen from off Caroline Is. (Table 40, column 5) far removed from the type locality is tentatively referred to *N. zonatus* mainly because it is much bleached with only indications of black on dorsal fin and no bars on body; neural spines 1-7 are depressed while numbers 1-2 are erect in all other examined *Neobythites* specimens; bases of neural spines 5-11 are much enlarged; pseudobranchial filaments are very short. However, the specimen falls within the variation of *N. zonatus* in almost all other characters.

## *Neobythites* sp.

Figs. 90, 91

*Neobythites somaliaensis* Nielsen, 1995: 10 (additional referred specimen).

Material examined (1 specimen, SL 74):
ZM MGU P-18913, SL 74, male, between Somalia and South Yemen (11°35.3'N, 52°39.6'E), R/V DMITRY STEFANOV cr. 3, trawl 42, 400 m, 28 Dec. 1988.

Description: Characters which vary from those of *N. somaliaensis* (cf. Table 32) are underlined. Meristic characters: Number of rays in dorsal fin 101, caudal fin 8, anal fin 89, pectoral fin 29, precaudal vertebrae 13, total vertebrae 60, pseudobranchial filaments 4, origin of dorsal fin above vertebra no.5, origin of anal fin below dorsal fin ray no. 19 and vertebra no. 15; long rakers on anterior gill

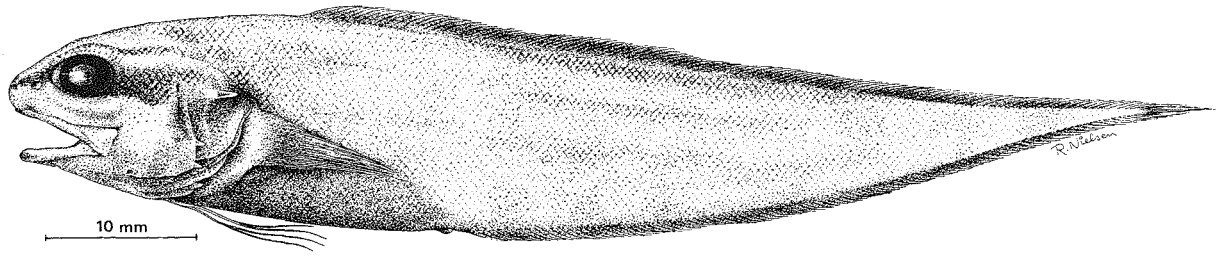


Fig. 90. *Neobythites* sp. ZM MGU P-18913, SL 74.

arch 7. Morphometric characters. In % of SL: head 22.0, depth at origin of anal fin 16.0, horizontal eye window 5.1, preanal 39.0, predorsal 25.0, from basis of ventral fins to anal fin origin 26.5. In % of head: longest filaments on anterior gill arch 10.5.

Remarks on material: Nielsen (1995: 10) treated the present specimen as tentatively referred to and not as a paratype of *N. somaliaensis* due to what he considered minor differences in many meristic characters and in form of vomer (Fig. 91). However, with the present knowledge of intraspecific variation within *Neobythites* this specimen should rather be considered belonging to an undescribed species. Since the specimen is a juvenile, additional material is necessary before an eventual new species can be established.

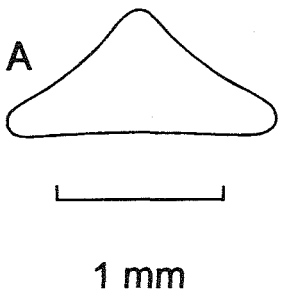


Fig. 91. *Neobythites* sp. vomer of ZM MGU P-18913, SL 74.

## ACKNOWLEDGMENTS

I wish to thank the following persons for helping with material and information: M.E. Anderson (RUSI), M.L. Bauchot (MNHN), N. Chernova (ZISP), O. Crimmen (NHM), G. Duhamel (MNHN), M.F. Goman (NMV), A. Graham (CSIRO), K.E. Hartel (MCZ), P. Heemstra (RUSI), P.A. Hulley (SAM), T. Iwamoto (CAS), S. Jewett (USNM), F. Krupp (SMF), H. Larson (NTM), P.R. Last (CSIRO), J. Maclaine (NHM), J.E. McCosker (CAS), M. McGruther (AMS), Y. Machida (BSKU), K. Matsuura (NSMT), S. Morrison (WAM), N.V. Parin (IOAN), C.D. Paulin (NMNZ), J.R. Paxton (AMS), P. Pruvost (MNHN), C.D. Roberts (NMNZ), S. Thaipal (PMBC), Y. Sazonov (ZM MGU), G. Schultze (ISH), J.A. Seigel (LACM), B. Séret (MNHN), K.-T. Shao (ASIZP), Y. Shcherbachev (IOAN), D.G. Smith (USNM), H.J. Walker (SIO), H. Wilkens (ZMH), J.T. Williams (USNM).

Mogens Andersen, Robert Nielsen and Birgitte Rubæk (ZMUC) made most of the illustrations and Jørgen Knudsen and Torben Wolff (ZMUC) helped identifying the stomach contents.

Nigel R. Merrett (U.K.) and Bernard Séret (MNHN) made many helpful comments and suggestions to the manuscript.

Special thanks to Werner Schwarzhans, Hamburg, who made the illustrations of the sagittas and with whom I have had many discussions and to Franz Uiblein, University of Salzburg, for discussions and help with the statistics.

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