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INDIAN OCEAN GRENADIERS OF THE SUBGENUS
CORYPHAENOIDES, GENUS *CORYPHAENOIDES*
(MACROURIDAE, GADIFORMES, PISCES)

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ABSTRACT: The subgenus *Coryphaenoides* of the large macrourid genus *Coryphaenoides* Gunnerus, 1765, is represented in the Indian Ocean by at least nine species: *C. asprellus* (Smith and Radcliffe, 1912); *C. castaneus* n. sp.; *C. hextii* (Alcock, 1890); *C. hoskyni* (Alcock, 1890); *C. macrolophus* (Alcock, 1889); *C. rudis* (Günther, 1878); *C. sibogae* Weber and de Beaufort, 1929; *C. woodmasoni* (Alcock, 1890); and an unnamed long-barbeled species. *C. castaneus* is described from four specimens taken on the Ninety East Ridge; it is most similar to *C. longicirrhus* Gilbert, 1905 of the mid-Pacific but differs in having a naked underside of snout and larger orbits. *C. asprellus*, previously known only from the holotype taken in Indonesian waters, is now recorded from five specimens taken in the Indian Ocean. *C. aequatoris* (Smith and Radcliffe, 1912) is questionably synonymized with *C. asprellus*. An undescribed, widely distributed species, notable in having a long barbel, relatively well-developed outer gill rakers, a long upper jaw, and low blunt snout is left unnamed. The species is somewhat intermediate in its characters with subgenera *Coryphaenoides* and *Chalinura*. Three species of peripheral waters are redescribed after evaluation of their status from examination of type specimens: *C. microps* (Smith and Radcliffe, 1912); *C. semiscaber* Gilbert and Hubbs, 1920; and *C. tydemani* (Weber, 1913). They may eventually be found in the area. A provisional key to all Indian Ocean species of the genus is provided.

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INTRODUCTION

The Indian Ocean has a diverse and interesting deep-sea fish fauna that was first brought to light at the turn of the century through expeditions of the *Challenger*, *Investigator*, and *Valdivia*. Few subsequent expeditions investigated the deep-sea fauna until the former Soviet Union expanded its world-wide fishery and oceanographic explo-

rations beginning in the mid-1960s and extending through the 1980s. The Indian Ocean was widely sampled by Soviet trawlers, and at continental slope depths, grenadiers formed one of the chief components of the fauna. The extensive collections of deep-sea fishes from these Soviet expeditions are largely deposited at the Shirshov Institute of Oceanology (IOAN) and the Zoological Museum of Moscow State University

(ZMMGU), both in Moscow, and at the Zoological Institute (ZIN) in St. Petersburg.

This is the fourth of a series of papers on Indian Ocean grenadiers that we and Yuri I. Sazonov (ZMMGU) have collaborated on. We treated species of the subgenus *Chalinura* of genus *Coryphaenoides* in a previous paper (Iwamoto and Shcherbachev 1991), *Kuronezumia* in a second paper (Shcherbachev, Sazonov, and Iwamoto 1992), and *Kunba* in our most recent paper (Iwamoto and Sazonov 1994). The present paper treats nine species of the subgenus *Coryphaenoides* (as defined by Iwamoto and Stein, 1974) known from the Indian Ocean and adjoining Indonesian and Philippine seas. Three species that appear to form a natural group (see Gilbert and Hubbs 1920:413–414) with *C. macrolophus* (Alcock, 1889) are included even though they have yet to be recorded from the Indian Ocean proper: *C. microps* (Smith and Radcliffe, 1912) and *C. semiscaber* Gilbert and Hubbs, 1920, from the northern Philippines; and *C. tydemani* (Weber, 1913), known from captures in the Arafura, Bali, Ceram, and Flores seas and off Celebes. Proper characterization of these three species has been difficult, and we hope that our fresh view of them will help clarify identification problems and indicate the areas needing more study and more specimens.

The genus *Coryphaenoides* poses some of the most difficult taxonomic problems in the family for a number of reasons, including: (1) specimens often attain large size with consequent ontogenetic changes; (2) samples are small because they are, for the most part, deeper living than most other genera; (3) their distributions are often broad, resulting in difficulty in assessing the extent of variation; and (4) the species often lack good externally visible apomorphies.

METHODS AND MATERIALS

Methods for taking measurements and counts follow procedures elaborated in Iwamoto (1970) and Iwamoto and Sazonov (1988). Institutional abbreviations follow Leviton et al. (1985) and Leviton and Gibbs (1988). Most of the previously unreported material for this study were collected by former Soviet Union vessels and are deposited in Moscow at the Zoological Museum of Moscow State University (ZMMGU) and the P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences (IOAN). Other institutions

from which specimens were examined include: AMS, BMNH, CAS, ISH, RUSI, SAM, USNM, ZMA, ZMUC, and ZSI.

KEY TO INDIAN OCEAN SPECIES OF THE GENUS *CORYPHAENOIDES*

The following key is provided as a guide to identifying all species of the genus found in Indian Ocean waters. Three Indonesian and Philippine species are also included as they may eventually be found in the area, but four others are not, owing to the lack of adequate study material to characterize the species. (An asterisk following a species name indicates that it has been keyed out twice.)

- 1a. Upper jaw extends to posterior 1/3 of orbit or beyond 2
- 1b. Upper jaw falls short of reaching to posterior 1/3 of orbit 18
- 2a. V. 7 3
- 2b. V. 8–13 5
- 3a. Inner gill rakers on first arch 16–19 total 4
- 3b. Inner gill rakers on first arch 10 ... *hextii**
- 4a. Chin barbel rudimentary; a greatly elongated ray in pectoral and pelvic fins *subserrulatus*
- 4b. Chin barbel well developed; pectoral and pelvic fins without greatly elongated rays *serrulatus*
- 5a. Barbel rudimentary 6
- 5b. Barbel well developed, short to long 8
- 6a. Inner gill rakers on first arch 16–19 total; V. 8 (rarely 9) *mcmillani*
- 6b. Inner gill rakers on first arch 8–13; V. 9–11 7
- 7a. Inner gill rakers on first arch 8–10; interorbital width 31–33% of HL *filicauda**
- 7b. Inner gill rakers on first arch 11–13; interorbital width 35–42% HL ... *carapinus**
- 8a. V. 8 (rarely 9); barbel notably long, 21–34% HL; a pronounced heightening of nape profile beginning somewhat behind mid-length of head, producing a strongly humpbacked appearance sp. 1 [longbeard grenadier]
- 8b. V. 9–13 (rarely 8); barbel short to long, 4–26% HL; humpback beginning over orbits or essentially lacking 9
- 9a. Underside of snout naked 10
- 9b. Underside of snout completely scaled 15

- 10a. Inner gill rakers on first arch 14–16; barbel long, 23–26% HL; snout bluntly pointed with subvertical ventral profile *murrayi* 21
- 10b. Inner gill rakers on first arch 8–14; barbel short to moderately long, 4–23% HL; snout distinctly pointed 11
- 11a. Scales all coarsely spinulated, relatively adherent, especially on head 12
- 11b. Scales thin, weakly or not at all spinulated and highly deciduous 14
- 12a. Mandibular teeth in 1 row; underside of head almost wholly naked 13
- 12b. Mandibular teeth in narrow band; underside of head almost all scaled, except for a median swath on snout *castaneus*
- 13a. Premaxillary teeth in 1 or 2 distinct rows; outer teeth enlarged, stout, bluntly pointed *armatus*
- 13b. Premaxillary teeth in narrow band 3 or 4 rows wide; all teeth rather narrow and sharply pointed *ferrieri*
- 14a. Inner gill rakers on first arch 8–10; interorbital width 31–33% of HL *filicauda**
- 14b. Inner gill rakers on first arch 11–13; interorbital width 35–42% HL *carapinus**
- 15a. Inner gill rakers on first arch 11–16 16
- 15b. Inner gill rakers on first arch 8–10 17
- 16a. Spikelike processes on preopercle; posterior nostril about 9% HL; interorbital width 29–31% HL *grahami*
- 16b. No spikelike processes on preopercle; posterior nostril 3–6% HL; interorbital width 23–30% HL *striaturus*
- 17a. Snout distinctly conical in lateral profile, protruding beyond mouth; mandibular teeth in narrow band about 3 or 4 teeth wide laterally; upper jaw 33–38% HL *asprellus**
- 17b. Snout blunt, barely protruding beyond mouth; mandibular teeth in 1–3 irregular rows laterally; upper jaws 39–44% HL *rudis*
- 18a. Second spinous ray of first dorsal fin elongated, 1.2 or more of HL 19
- 18b. No greatly elongated ray in first dorsal, height about equal to or less than HL 22
- 19a. Preopercle produced posteroventrally forming an acutely angulated corner *macrolophus*
- 19b. Preopercle margin broadly rounded 20
- 20a. Elongated spinous ray of first dorsal fin about 2 or more of HL; first dorsal with a blackish distal tip; a thin naked ventral edge along snout and suborbital region 21
- 20b. Elongated spinous ray of first dorsal fin 1.2–1.5 of HL; first dorsal lacking a black tip; snout and suborbital completely scaled *semiscaber*
- 21a. Postorbital length 49–56% HL; orbit-preopercle distance 44–46% HL *microps*
- 21b. Postorbital length 45–49% HL; orbit-preopercle distance 38–41% HL *tydemani*
- 22a. Underside of snout naked; V. 10; snout 27–28% HL; upper jaw 38–42%; teeth in lower jaw in 1 or 2 irregular series laterally. *castaneus**
- 22b. Underside of snout completely scaled; V. 7–10; snout 28–32% HL; upper jaw 27–39% HL; teeth in lower jaw in narrow to broad bands, usually 3 or more teeth wide laterally 23
- 23a. V. 7; upper jaw about 39% HL; postorbital length 53%; internasal 17%; barbel 16% *hextii**
- 23b. V. 8–10; upper jaw 27–38% HL; postorbital length 45–53%; internasal 21–31%; barbel 3–20% 24
- 24a. Barbel 10–20% HL; V. 9–10; preoral 13–15% HL *asprellus*
- 24b. Barbel 3–9% HL; V. 8–9; preoral 13–21% HL 25
- 25a. Teeth in lower jaw in broad band, band falls short of end of rictus; upper jaw 27–30% HL; scale rows below midbase of 1D. 3.5–4.5 *hoskyni*
- 25b. Teeth in lower jaw in narrow band, 3 or 4 teeth wide laterally, extends to or beyond end of rictus; upper jaw 31–38% HL; scale rows below midbase of 1D. 4.5–6.0 *woodmasoni*

DESCRIPTIONS

Genus *CORYPHAENOIDES* Gunnerus, 1765

The genus as used here follows definitions given by Iwamoto and Stein (1974) and Iwamoto and Sazonov (1988).

Coryphaenoides asprellus (Smith and Radcliffe, 1912)

(Fig. 1)

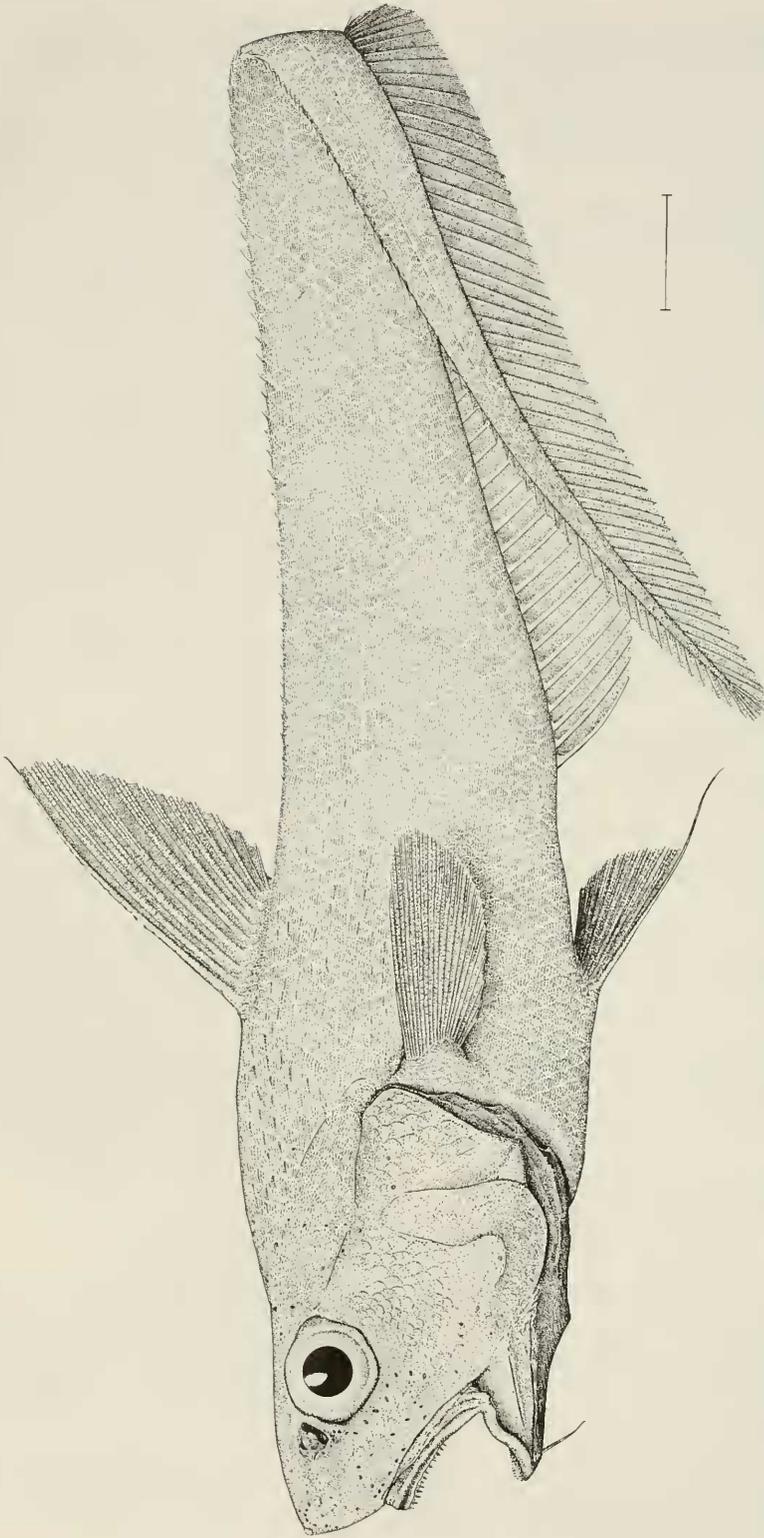


FIGURE 1. *Coryphaenoides asprellus* (Smith and Radcliffe). CAS 71487 (478 + mm TL) from off northwest coast of Australia in 1,600–1,700 m. Fins and scales variously reconstructed. Scale bar equals 25 mm.

TABLE 1. Selected measurements of *Coryphaenoides asprellus* (holotype), *C. aequatoris* (holotype), and *C. hoskynii* (holotype and 6 specimens). Asterisk (*) denotes holotype.

| | <i>hoskynii</i> | | | | | | <i>asprellus</i> | <i>aequatoris</i> | |
|---|-----------------|-------------|----------------|----------------|----------------|----------------|------------------|-------------------|----------------|
| | ZSI 1061 | ZSI 1057 | IOAN uncat. | *ZSI 123833 | ZMUC 373083 | ZMUC 373082 | CAS 66462 | *USNM 72935 | *USNM 72937 |
| TL (mm) | 245+ | 266+ | 333+ | 350+ | 321+ | 309+ | 410+ | 413+ | 188 |
| HL (mm) | 50.3 | 60.5 | 70.3 | 72.0 | 72.2 | 73.2 | 89.7 | 90.8 | 43.4 |
| The following in percent of head length | | | | | | | | | |
| Snout | 32.4 | 30.3 | 30.6 | 30.0 | 31.9 | 31.7 | 30.1 | 28.3 | 28.6 |
| Preoral | 19.9 | 18.2 | 19.1 | 15.6 | 19.7 | 19.9 | 19.9 | 15.4 | 16.1 |
| Internasal | 32.8 | 30.1 | 28.3 | 28.9 | 25.9 | 26.1 | 24.2 | 25.1 | 24.7 |
| Nostril | 9.5 | 9.1 | 7.7 | 12.2 | 7.6 | 5.7 | 5.0 | 7.9 | 5.1 |
| Interorbital | 28.2 | 24.5 | 26.3 | 28.9 | 24.2 | 25.3 | 23.6 | 28.3 | 24.2 |
| Orbit | 27.8 | 30.3 | 27.5 | 24.4 | 24.9 | 22.8 | 27.4 | 23.9 | 25.8 |
| Postorbital | 44.9 | 46.3 | 46.7 | 45.8 | 48.5 | 49.5 | 47.2 | 52.1 | 46.3 |
| Orb-preopercle | 45.7 | 46.3 | 43.4 | 47.2 | 46.5 | 45.9 | 46.4 | 46.8 | 44.9 |
| Upper jaw | 28.4 | 30.3 | 27.0 | 27.1 | 28.5 | 29.1 | 28.5 | 33.0 | 31.3 |
| Rictus | 21.5 | — | 20.8 | 22.3 | 23.5 | 22.1 | 24.2 | — | — |
| Barbel | — | 6.9 | 5.7 | 4.4+ | 5.5 | 4.8 | 9.1 | 9.9 | 15.7 |
| Gill slit | — | — | 9.1 | 8.3 | 6.9 | 6.7 | 8.1 | — | 8.5 |

Macrourus asprellus Smith and Radcliffe in Radcliffe, 1912: 118–119, pl. 26, fig. 1 (holotype, USNM 72935; Dutch East Indies, se. of Bachian Island, 1°00'00"S, 127°50'00"E; 845 fm [1,545 m])

?*Macrourus aequatoris* Smith and Radcliffe in Radcliffe, 1912: 120–121, pl. 26, fig. 3 (holotype, USNM 72937; Celebes, Gulf of Tomini, 0°08'00"S, 121°19'00"E; 1,089 fms [1,992 m]).

DIAGNOSIS.—V. 9–10; snout and mandible uniformly and completely scaled; length upper jaw $\frac{1}{3}$ or more of HL, extends to or beyond midorbit; barbel long, slender, about 10–20% HL, equal to or less than orbit diameter and much less than snout length or interorbital width; pyloric caeca 8–10; premaxillary teeth in broad bands, outer series slightly enlarged, mandibular teeth band about 3–4 teeth wide laterally.

MATERIAL EXAMINED.—USNM 72935 (holotype of *M. asprellus*, 90.8 mm HL, 413+ mm TL; see synonymy for locality data). USNM 72937 (holotype of *M. aequatoris*, 43.4 HL, 188 TL; see synonymy for locality data). ZMMGU P.19256 (110 HL, 514+ TL) and CAS 71487 (102 HL, 478+ TL); Exmouth Plateau off NW Australia, 16°55'S, 114°53'E, 1600–1700 m; *Prof. Mesitzhev* cr. 7, tr. 45; 24.IV.1979. ZMMGU P.19257 (2, 117–102 HL, 515–497+ TL); Ninety East Ridge, 11°14'S, 88°48'E, 1500–1600 m; *Fiolet* cr. 9, tr. 22; 13.VI.1977. ZMMGU P.19258 (90 HL, 428 TL); Mascarene Ridge; 11°17'S, 62°33'E; 2020–2290 m; *Vityaz'* cr. 17, sta. 2806; 7.I.1989.

COUNTS AND MEASUREMENTS (see also Table 1 and Diagnosis).—1D. II,9–11; 1P. i18–i21; total GR-I (outer/inner) 3-5/8-9, GR-II 6-7/7-9; scales below 1D. 5.0–7.5, below midbase 1D. 4.5–5.5, below 2D. 4–6, lat. line 30–39.

Total length 428+–515 mm, head length 90–117 mm. The following in percent HL: postrostral 73–78; snout 28–31; preoral 13–16; internasal 21–27; interorbital 22–30; orbit 21–26; suborbital 13–16; postorbital 46–53; orbit–preop. 45–50; upper jaw 31–38; barbel 7–20; gill slit 8–9; pre-A. 146–159; V.-A. 34–47; isthm.-A. 74–84; body depth 68–75; depth over A. origin 54–63; 1D.-2D. 12–24; height 1D. 83–92; length 1P. 46–62; length V. 72–88; post. nostril about 3 (female), 6–8 (male).

DESCRIPTION.—Head broad, greatest width about equal to postorbital length, length about 5 in total length; body long and gradually tapered from anal fin origin to tip of tail. Snout broadly conical in lateral view, broad over internasal space, protrudes beyond mouth a distance less than lens diameter. Orbit diameter less than snout and interorbital, greatest diameter less than 5 in HL. Interorbital space broad, flat to slightly convex. Suborbital region smoothly and gently convex, without a sharp, angular ridge. Preoperculum broadly rounded, its posterior margin slightly inclined, its ridge forming a strong club-shaped lobe at posteroventral angle; interopercle broadly triangular at exposed posterior end. Mouth wide, subterminal, upper jaw extends to slightly beyond vertical through midorbit, rictus falls short of that vertical. Barbel slender from base to tip, length less than orbit diameter. Free neuromasts on head prominent, especially so over surfaces of snout, suborbital, mandible, interorbital and

occipital region, their blackish color contrasting with light to medium brown ground color.

Gill membranes broadly attached to isthmus with no free posterior fold; gill openings extend forward close to point below juncture of preopercle and dentary. Outer gill slit short, greatly restricted; rakers along outer side of first arch few and rudimentary, other rakers tubercular.

Most of body and head uniformly covered with moderately large, finely and densely spinulated scales. Scale size highly variable on head; those on snout and on ventral surfaces generally much smaller; scales along suborbital, supranasal, and supraorbital slightly thickened and more adherent; median and lateral angles of snout with small, inconspicuous, scutelike scales. Entire underside of head scaled; interopercle naked, as are gill membranes, lips, and nasal fossa. Spinules on scales below interspace of dorsal fins extremely fine, short, spikelike, and in densely packed, irregularly convergent rows. More ventrally and forward on trunk, scales have spinule arrangement less well defined, and some spinules flattened, approaching lanceolate shape. In 497+ mm male specimen from Ninety East Ridge, squamation differs slightly; spinules appear coarser, rows better defined and fewer, and median row slightly, but noticeably enlarged.

Premaxillary dentition consists of a broad band of small teeth flanked along outer edge with a row of slightly enlarged, sharp conical teeth. Mandibular teeth all small, in a rather uniformly narrow band (3–4 teeth wide; slightly wider at symphysis).

Fins well developed except second dorsal rudimentary throughout. Long spinous ray of first dorsal fin finely and sparsely toothed, the greatly reclined spikes not overlapping, the ray distally terminating in a hair-fine tip. Outer pelvic ray thickened and elongate (probably more so in males than in females) and extending in one specimen (102 mm HL from Ninety East Ridge) to 11th anal ray. Pectoral origin slightly in advance of pelvic origin, first dorsal origin slightly behind that. Interspace between dorsals short, less than length base of first dorsal; anal origin below interspace.

Pyloric caeca in 110 mm HL male from Exmouth Plateau about 10, relatively short and slender, length of longest caecum about equal to orbit diameter. Gonads moderately developed. Swim bladder large, with a thick spongy layer and 4 very slender retia, each terminating in a

small gas gland. The 90-mm HL male from Mascarene Ridge had 8 long, slender caeca and relatively small gonads.

Color in Exmouth Plateau specimens and female from Ninety East Ridge light brown overall; male from latter area dark brown. Fins all blackish, except outer pelvic ray paler. Barbel light brown. Oral cavity gray, paler towards periphery, darker on tongue; gill cavity black. Branchiostegal membranes black; gular membrane dark grayish brown.

DISTRIBUTION.—Indonesia; northwestern coast of Australia; and Indian Ocean over Saya de Malha and Ninety East ridges, in 1,500–2,290 m.

SIZE.—To at least 52 cm TL.

REMARKS AND COMPARISONS.—The holotype of *C. asprellus* is badly deteriorated, with the head having come apart from the rest of the body. Nonetheless, most of the important head features remain for comparison with our material. The barbel in the holotype may have been longer than the 10% of HL measured, and in closer agreement with the 13–20% we measured in our fresher material. The original figure suggests that part of the belly, including the pelvic fins, was already gone when the illustration was rendered. We were unable to locate a pelvic fin in the specimen jar, but in the original description the count was given as questionably eight. That count is low for our material (9 or 10) and raises some doubt as to whether we have correctly identified our specimens as *C. asprellus*. Other features, on the other hand, like the jaw size, dentition, squamation, barbel length, and general physiognomy, support our identification.

The holotype of *Macrourus aequatoris*, which we here treat as a junior synonym of *C. asprellus*, is substantially smaller than other specimens, and measurement differences may in part be attributable to size. Thus, the preoral length (16% HL), orbit diameter (26%), suborbital width (16%), and outer pelvic ray (88%) were slightly longer, and the lengths of postorbital (46%), orbit-preopercle (45%), upper jaw (31%), and preanal (146%) were slightly shorter. Meristic characters, however, were in complete agreement.

The large female from the Ninety East Ridge showed some differences from the four male specimens studied in width of internasal (21% HL cf. 23–27%), interorbital (22% cf. 27–30%), orbit diameter (24% cf. 21–23%), postorbital length (50% cf. 52–53%), and length posterior nostril (3% cf. 6–8%). The lateral-line scale count

over a distance equal to predorsal length was also higher (39 cf. 30–37). In addition, the outer pelvic fin ray, though missing its tip on both fins, appeared shorter and thinner in the female, compared with those of the males. We presume these differences to be sexual, as the female was in every other way so similar to the males, especially the Exmouth Plateau specimens, that there is no reason to doubt their conspecificity.

The male from Ninety East Ridge was troubling in that it had a different overall appearance. The snout appeared somewhat blunter, the head contours smoother; squamation coarser, the spinule rows fewer, and with a distinct, enlarged median row; the underside of head had smaller, more adherent scales; teeth in the mandible appeared to be in a wider band; and the overall color was darker. In all these characters except the snout shape and mandibular teeth, the dark male from the Mascarene Ridge was similar. Nonetheless, all counts and measurements for both specimens agreed with the others (excluding sexually dimorphic female characters). With so little material available, we do not speculate on these variants.

Coryphaenoides hextii appears to be closely related, but a pelvic fin ray count of seven is well below the 9 or 10 of our specimens, and there were 13 pyloric caeca in a BMNH specimen (1892.6.17.4) examined. Also, the snout was shorter (25%) and internasal width narrower (18%). Neither the holotype nor any other specimen of *C. hextii* was found in the ZSI, but the one BMNH specimen we examined was probably sent there by Alcock. (We also examined a 133-mm juvenile from *Vityaz'* cruise 17 station 2832.)

Coryphaenoides asprellus is similar in many respects to *C. castaneus* but can be distinguished by its completely scaled underside of snout (cf. naked medially in *C. castaneus*), broader mandibular dentition (about four teeth wide laterally cf. about one row), and its shorter upper jaw (33–38% HL cf. 39–41%).

Coryphaenoides hoskynii is readily differentiated from *C. asprellus* in having a greater internasal width (28–30% HL), larger orbit (24–30%), shorter postorbital length (45–46%), shorter orbit-preopercle length (45–47%), shorter upper jaw (21–30%), and shorter barbel (about 5–7%).

We examined numerous specimens, including the holotype, of *C. woodmasoni* for comparison with *C. asprellus*. The size of the chin barbel was

the primary distinguishing character, it being much larger in *C. asprellus* (usually 13–20% HL cf. 3–9%). The pyloric caeca count was somewhat lower (8–10) than in *C. woodmasoni* (10–14).

Coryphaenoides asper Günther, 1877, known only from the holotype taken off Japan, is distinguishable from *C. asprellus* by its blunter snout profile, and coarser scale spinulation (spinules rather long, hindmost extending well beyond posterior edge of scale, dispersed in about five divergent rows).

Coryphaenoides castaneus new species

(Fig. 2)

No literature applies to this species, as far as we could determine.

DIAGNOSIS.—V. 10, outer ray elongated, about 61–123% HL, extending well posterior to A. origin to between 6th and 16th ray; a broad median naked area on underside of snout; upper jaw 39–42% HL, maxilla extends to below mid-orbit or beyond; greatest orbit diameter 21–23% HL, slightly less than interorbital width (24–27% HL); barbel 16–23% HL; premaxillary teeth band 5–6 teeth wide, with a distinctly enlarged outer series; mandibular teeth in a narrow band that tapers to 1 row; spinules on body scales in irregular, slightly convergent rows, spinule tips extend beyond posterior scale margins.

TYPE SPECIMENS.—HOLOTYPE: CAS 71486 (female, 95 HL, 420 TL); Ninety-Degree East Ridge, 14°42.4'S, 86°49.4'E; 1760 m; *Prof. Mesiatzev* cr. 7, tr. 12; 19.III.1979. PARATYPES: ZMMGU P.19259 (155 mm HL, 690+ mm TL); 14°51'S, 86°49'E; 1760 m; *Prof. Mesiatzev* cr. 7, tr. 11; 19.III.1979. ZMMGU P.19260 (159 HL, 740+ TL); same data as for holotype.

Three specimens of *Coryphaenoides longicirrhus* Gilbert, 1905, were examined for comparison: BPBM 3429 (198 HL, about 800 TL); Honolulu Fish Market; 10.II.1927. SIO 68-457 (136 HL, 650 TL); 17°54.5'N, 174°14.9'W. Hess Guyot; 2.IX.1968. SIO 68-460 (116 HL, 502+ TL); 18°32.0'N, 178°13.4'W, Hamilton Guyot; 4.IX.1968.

COUNTS AND MEASUREMENTS (see also Table 3 and Diagnosis).—II, 10–11; 1P, i18–i20; total GR-I (outer/inner) 3–4 / 9, total GR-II 7–8 / 8–10; scales below 1D, 5.5–7.5, below midbase 1D, 4.5–6, below 2D, 7–8, lat.line 34–39.

Total length 412–740+ mm; HL 95–159. The following in percent HL: postrostral 75–76; snout 27–28; preoral 12–14; internasal 22–24; post. nostril 5–6; suborbital 13–14; postorbital 54–56; orbit-preop. 51–53; gill slit 6–8; pre-A. 163–164;



FIGURE 2. *Congyphoenoides castaneus* new species. Holotype, CAS 71486 (420 mm TL) from Ninety Degree East Ridge, 1,760 m. Fins and scales partially reconstructed. Scale bar equals 25 mm.

TABLE 2. Measurements and counts of specimens of *Coryphaenoides microps*, *C. tydemani*, and *C. semiscaber*.

| | <i>C. semiscaber</i> | | | <i>C. microps</i> | | | <i>C. tydemani</i> | | | | |
|----------------------|----------------------|----------------|----------------|-------------------|------------------|----------------|--------------------|-----------------|-----------------|-----------------|-----------------|
| | USNM *83625 | USNM +14882 | USNM +14883 | CAS-SU +25452 | CAS-SU +25452 | USNM *72933 | CAS-SU 25440 | CAS-SU 25440 | ZMA *111.491 | ZMA *111.493 | ZMA *111.493 |
| MEASUREMENTS: | | | | | | | | | | | |
| TL | 212+ | 213 | 200+ | 187+ | 124+ | 413+ | 265 | 263 | 265 | 174+ | 160+ |
| HL | 48.3 | 41.8 | 45.4 | 39.9 | 23.7 | 82.0 | 59.9 | 48.9 | 53.1 | 37.0 | 34.4 |
| The following in mm: | | | | | | | | | | | |
| Snout | 29.0 | 28.9 | 27.8 | 30.1 | 31.2 | 28.4 | 31.9 | 31.3 | 28.2 | 29.5 | 31.7 |
| Preoral | 15.1 | 14.6 | 12.6 | 14.8 | 14.3 | 11.0 | 13.3 | 13.9 | 12.8 | 13.2 | 14.5 |
| Internas. | 15.1 | 15.6 | 16.1 | 17.0 | 19.8 | 15.2 | 16.2 | 16.6 | 16.6 | 15.4 | 17.4 |
| Interorb. | 19.9 | 21.1 | 17.6 | 19.3 | 23.2 | 20.7 | 18.8 | 24.9 | 23.7 | 22.4 | 23.0 |
| Orbit | 26.3 | 25.6 | 28.0 | 20.8 | 24.9 | 17.4 | 23.3 | 25.6 | 26.4 | 25.1 | 25.3 |
| Suborb. | 12.6 | 12.4 | 11.5 | 11.8 | 13.1 | 15.5 | 12.9 | 13.1 | 14.1 | 13.5 | 13.4 |
| Postorb. | 46.4 | 47.6 | 47.6 | 50.1 | 49.4 | 56.1 | 47.9 | 45.8 | 49.3 | 49.2 | 45.3 |
| Orb-preop. | 37.9 | 35.6 | 39.0 | 44.4 | 43.5 | 46.3 | 41.0 | 39.5 | 38.4 | 40.8 | 37.8 |
| Up. jaw | 29.4 | 29.4 | 34.8 | 30.8 | 32.5 | 30.4 | 29.0 | 31.1 | 31.1 | 33.8 | 32.8 |
| Barbel | 7.7 | 10.3 | 16.7 | 7.8 | 9.7 | 9.1 | 9.3 | 6.5 | 10.9 | 9.7 | 11.0 |
| Gillslit | 10.6 | 9.6 | 6.6 | 6.0 | 7.2 | 6.7 | 13.8 | 8.4 | ca.6 | — | — |
| Len. 1D. | 119 | 144 | 119+ | 293 | 388 | 190 | 282 | 262 | 266 | 319 | 297 |
| Counts: | | | | | | | | | | | |
| 1D. | II,10 | II,9 | II,9 | II,10 | II,9 | II,9 | II,10 | II,10 | II,9 | II,9 | II,9 |
| 1P. | i20/i21 | i—/i19 | i20/— | i19/i19 | i20/i20 | i19/i19 | i20/i21 | i20/i20 | i21/i21 | i21/i21 | i19/i18 |
| V. | 8 | 8 | — | 8/8 | 7/7 | 7/7 | 8/9 | 8/8 | 8/8 | 8/8 | 8/8 |
| GR-I(in) | 10 | 10 | 8 | 11 | 11 | 10 | 8 | 9 | 9 | 9 | 9 |
| GR-II(out) | 10 | 8 | 8 | 10 | 8 | 10 | 10 | 9 | 9 | 9 | 9 |
| GR-II(in) | 9 | 10 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Scales: | | | | | | | | | | | |
| 2D. | 8 | 10 | 8.5 | 8.5 | 7.5 | 9.7 | 7.5 | 6.5 | — | 8 | 8.5 |
| mid1D. | 5.5 | 6.5 | 5.5 | 7.5 | — | 6.5 | 6.5 | 6.5 | 7.5 | 6.5 | 6.5 |
| lat.l. | 34 | 35 | 32 | 35 | 37 | 31 | 37 | 40 | — | — | — |

* denotes holotype or lectotype.

+ denotes paratype or paralectotype.

isthm.-A. 85–94; body depth 81–89; 1D.-2D. 18–27; height 1D. 77 (1 spec.); length 1P. 50–54.

DESCRIPTION.—Head rather large and broad, length about 4–4.5 in TL; body deep in trunk region, but tapers rapidly behind vent. Snout bluntly pointed and slightly protruding, rather broad when viewed from dorsally, its width at lateral angles about equal to that of interorbital; median tip and lateral angles weakly tipped with small thickened scales. Orbits small, slightly more than $\frac{1}{2}$ HL. Interorbital broad, slightly convex, width greater than that between supranarial ridges. Preopercle margin rather broadly rounded, hind margin only slightly inclined from vertical; preopercle ridge forming a pronounced lobe at posteroventral corner; interopercle broadly triangular at posterior end, where it is slightly exposed beyond preopercle. Mouth large, rictus scarcely restricted, extends to below anterior $\frac{1}{2}$

of orbit, hind end of maxillary below mid-orbit or beyond; lips rather thick and papillaceous. Ridges of head not strongly developed, although suborbital and preopercle ridges well marked. Barbel moderate in length and slender, somewhat less than, to slightly more than, orbit diameter. Head pores not well developed, but free neuromasts numerous on head, occipital region and nape (although not especially prominent because of dark ground color).

Gill membranes broadly attached to isthmus, the gill openings extending forward only to level of vertical ridge of preopercle. Outer gill slit small, greatly restricted, only 3 or 4 small rakers along distal side of arch. Gill rakers low, tubercular; those on upper arm flattened and platelike.

Body and head uniformly covered with rather deciduous scales except for naked area on underside of snout, narrow strip of lower edge of

suborbital region, interopercle, anteriormost tip of mandibular rami, and usual places like gill membranes, lips, nostril region, and fins. Scales along ridges of head not especially large or thickened into coarsely spined scutes, although those present more adherent than adjacent scales. Body scales moderately large, scale-pocket margins darkly outlined, spinules sharp and more or less conical, in irregularly convergent rows to irregular quincunx pattern. In 420+ mm specimen, spinules in about 12 or more rows in largest scales; middle row consisting of 5 or 6 spinules, with posteriormost spinule slightly enlarged and broadly overlapping posterior edge of scale.

Premaxillary teeth in a tapered band 5 or 6 teeth wide at widest part; an enlarged outer series of conical, slightly recurved, evenly but rather widely spaced teeth. Lower jaw teeth in a narrow band that tapers to 1 row posteriorly.

Relative fin positions somewhat difficult to determine because of dorsal flexure in all 3 specimens, but pectoral apparently farthest forward, followed by pelvic and first dorsal. Origin of second dorsal close behind first dorsal, about on same vertical as anal. Second spinous ray of first dorsal rather thin, length slightly more than postrostral length of head, ending in a hair-fine filamentous tip; weak teeth along leading edge widely spaced and non-overlapping, becoming obsolete in 2 largest specimens.

Pyloric caeca of female holotype slender, simple, about 20 mm at the longest. Swim bladder in this specimen large, with a tough white tunica externa and a spongy internal layer; 4 slender retia folded once over themselves, each terminating in a small globular gas gland. The stomach contained a single, shrimp-like crustacean.

Overall ground color dark chocolate brown; fins all blackish; oral, branchial, and peritoneal linings, and branchiostegal and gular membranes all blackish or dark gray. Lips black. Naked areas on parts of head, under snout, and on mandible with a violet hue. Barbel in smallest specimen dark brown basally, but distal $\frac{1}{3}$ or so whitish; in larger two specimens, barbel uniformly medium brown.

DISTRIBUTION.—Known only from the holotype and two paratypes taken on the Ninety East Ridge in the Indian Ocean in 1,760 m.

SIZE.—To more than 740 mm TL.

ETYMOLOGY.—From the Greek, *castaneus*, of chesnut color.

REMARKS AND COMPARISONS.—*Coryphaenoides castaneus* is most similar to *C. longicirrus*,

differing only in the presence of a naked area under the snout, a coarser squamation, with spinules on body scales overlapping the posterior margin, and having a slightly narrower interorbital (24–27% HL vs. 28–30% in *C. longicirrus*). Additionally, the new species appears to have a slightly smaller orbit that goes 0.75–0.90 into the interorbital width, compared with about 0.63–0.78 in *C. longicirrus*. These proportional differences should be substantiated with more specimens representing a broader size range. The new species is also closely similar to *C. asprellus*, but is distinguishable mainly by the dentition on the lower jaw (narrow band becoming uniserial posteriorly, vs. in a broad band in *C. asprellus*), by the completely scaled underside of head in *C. asprellus*, the shape of the suborbital region (gently convex, almost flat in *C. asprellus*, angular in *C. castaneus*), and the squamation (spinules of body scales somewhat lanceolate in *C. asprellus*, contrasted with distinctly spikelike and conical in *C. castaneus*). The nape of *C. castaneus* is also higher, with a humpbacked appearance. Color of *C. asprellus* is somewhat paler, medium brown over most of body, dark brown to swarthy on head and over abdomen. *Coryphaenoides castaneus* can be distinguished from *C. woodmasoni* by its larger barbel, higher pelvic fin ray count, and generally longer outer pelvic ray.

Coryphaenoides hextii (Alcock, 1890)

Macrurus Hextii Alcock, 1890: 299–300 (one specimen, holotype, female, “22 inches” [ca. 56 cm]; *Investigator* st. 104; 1,000 fathoms [1,829 m]). Alcock 1892: 351, 353 (female, “nearly 23 inches long,” *Investigator* st. 122, 865–880 fathoms). Alcock 1894: pl. XII, fig. 3.

DIAGNOSIS.—V. 7; underside of head completely scaled; upper jaw 34–39% HL; maxillary extends to below posterior $\frac{1}{2}$ to $\frac{1}{4}$ of orbit, rictus to below middle third of orbit; barbel 16–21% HL; pyloric caeca 12–15; premaxillary teeth in broad band with outer enlarged series, mandibular teeth in narrow band about 3 teeth wide, inner series slightly larger than outer two.

MATERIAL EXAMINED.—NEOTYPE (here designated) BMNH 1892.6.17.4 (120 mm HL); Laccadive Sea; 12°05'55"N, 71°33'30"E; 865–880 fm [1,581–1,609 m]; “Investigator” st. 122. ZMMGU uncat. (22.6 HL, 133 TL); off Somalia; 12°43'N, 52°44'E; 2,380–2,300 m; VITYAZ' cr. 17, st. 2832; 16.I.1989.

COUNTS AND MEASUREMENTS (BMNH specimen first, followed by ZMMGU).—1D. II,9, II,10; 1P.–/i19, i21/i21; GR-I (outer/inner)–/1+1+8, ca. 6/2+8; GR-II (outer/inner) 1+1+7/

1+1+8, 2+8/2+8; scales below 1D. 7.5/7; below mid-base 1D. 5.5/ca. 6; below 2D. 5.4/ca. 8; lat. l. 34/45.

The following in percent HL: snout 24, 31; preoral 14, 19; internasal 17, 24; interorbital 24, 25; orbit 24, 30; suborbital 13, 15; postorbital 53, 46; orb.-preop. 49, 47; outer gill slit 10–14; pre-A. 182, 147; V.-A. 72, 44; greatest body depth 87, 80; 1D.-2D. interspace 47, 21; height 1D. 76,-; length V. 67,-; post. nostril 7, 10.

DESCRIPTION.—Head and body shape much as described and illustrated for *C. castaneus*. Snout conical in lateral profile, terminal and lateral angles tipped with small scutelike scales. Suborbital shelf broad, forming a shallow angle with ventral part of suborbital region. Posterior margin of preopercle broadly rounded; preopercle ridge forming a broad lobe at posteroventral angle. Interopercle broad, scarcely exposed beyond preopercle. Mouth relatively small for genus, subinferior. Barbel moderately long and slender, much shorter than interorbital width, about $\frac{2}{3}$ of orbit.

Squamation complete over head of BMNH specimen from Laccadive Sea, but juvenile from Somalia with underside of snout and suborbital, and anterior half of mandible naked. Scales of suborbital shelf strong and adherent, but not enlarged. Body scales covered with slender, conical, densely packed spinules in no particular arrangement, so far as we can tell.

First dorsal height about equal to postrostral length of head; leading edge of second spinous ray with small denticles almost rudimentary near base of BMNH specimen, but few and prominent in ZMMGU juvenile. Second dorsal fin rudimentary anteriorly, and origin difficult to ascertain; fin low throughout. Anal fin well developed. Outer pelvic ray slightly prolonged but falling short of anal fin origin.

Pyloric caeca in BMNH specimen 13, slender, much longer than orbit diameter (longest about 40 mm); in ZMMGU juvenile 12, relatively thick and short, much shorter than orbit diameter (about 2.3 mm).

Color described by Alcock (1890) as chocolate with blackish fins; mouth, gill cavity, and peritoneum black. Abdomen and gill cover blackish in ZMMGU juvenile; barbel dark.

REMARKS AND COMPARISONS.—The ZMMGU juvenile is questionably referred to this species. The naked undersides of snout and suborbital contrast with the fully scaled condition in the large Laccadive Sea female and Alcock's (1894:

pl. XII, fig. 3) figure of the species. Certain proportional measurements also show marked differences between the two examined specimens, notably those of the snout, orbit, internasal, postorbital, upper jaw, barbel, and gill slit. The count of lateral line scales over a distance equal to predorsal length is considerably higher in the ZMMGU specimen. Whether these differences are attributable to size is not known, and additional specimens of more representative size series are necessary to properly evaluate our identification.

A search by one of us (YNS) at the Zoological Survey of India in 1987 failed to find the holotype of *C. hextii*, but the BMNH specimen, reported on by Alcock (1892) and examined by us, is in good shape. Menon and Yazdani (1968), in their catalog of type-specimens in the Zoological Survey of India, did not list the type of *C. hextii*, nor did Menon and Rama-Rao (1970). To assure stability of the name, we here designate BMNH 1892.6.17.4 as the neotype of *Macrurus hextii*.

Coryphaenoides hextii differs from other members of the genus reported in this work by its seven pelvic fin rays (compared with eight or more). In addition, although closely similar to *C. woodmasoni* in overall appearance, it differs in having a longer barbel; compared with *C. castaneus* it has a somewhat shorter upper jaw, shorter outer pelvic ray, smaller premaxillary teeth, and different scale spinulation; compared with *C. asprellus* it has more pyloric caeca.

Coryphaenoides hoskynii (Alcock, 1890)

(Fig. 3)

Macrurus (Macrurus) Hoskynii Alcock, 1890a:214–215 (Bay of Bengal near Madras); 1894a:126 (in key); 1894b, pl. 9, fig. 4; 1899:116–117.

DIAGNOSIS.—V. (8) 9; undersides of snout and mandible fully scaled; upper jaw length 27–30% HL, posterior end of maxillary does not extend beyond midorbit; rictus restricted laterally, its length 18.4–22.3% HL; barbel small, less than 10% of head length; pyloric caeca 6–9; teeth in broad bands in both jaws, none enlarged.

MATERIAL EXAMINED.—ZSI 12833 (holotype, 72 mm HL, 357+ mm TL); Bay of Bengal, 18°26'N, 85°24'E; 2,396 m; *Investigator* sta. 97; 14.III.1890. ZSI N1057 (60.5 HL, 266+ TL), ZSI 1061 (50.3 HL, 245+ TL) and ZSI 1062 (58 HL, 378+ TL); "West Ceylon." ZMUC 373082-83 (2, 72.2-73.2 HL, 321+–309+ TL); Bay of Bengal, 17°10'N, 84°30'E; 2,820 m; *Galathea* sta. 299; 24.IV.1951. CAS 66462 (89.7 HL, 410+ TL) and ZMMGU P.19261 (70.3 HL, 333+ TL); off Socotra I., 12°43'N, 52°44'E; 2,380–2,300 m; *Vityaz'* cr. 17, sta. 2832; 16.I.1989.

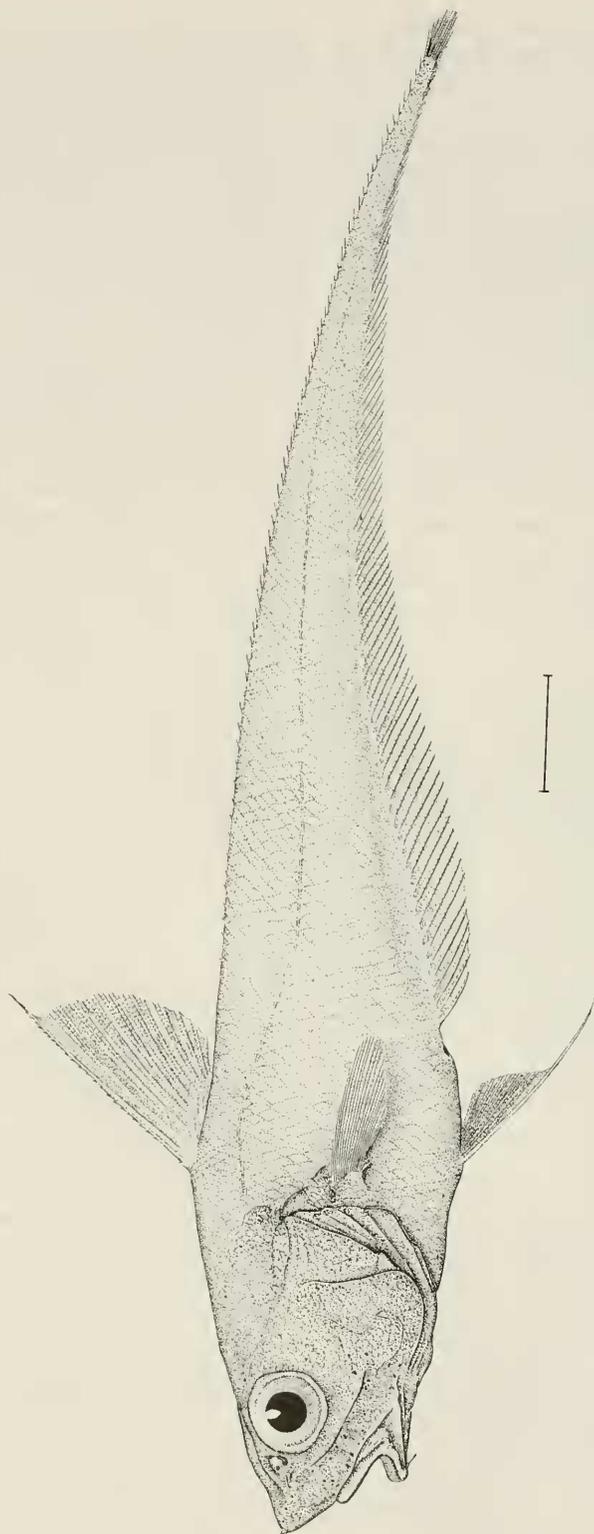


FIGURE 3. *Coryphaenoides hoskyni* (Alcock). ZMMGU P.19261 (333+ mm TL) from off Socotra in 2,380-2,300 m. Fins and scales partially reconstructed. Scale bar equals 2.5 mm.

COUNTS AND MEASUREMENTS (see also Tables 1 and 3).—1D. II,9–10; 1P. i17–22; total GR-I (outer/inner) 0–3/7–8, total GR-II 7–8/7–9; scales below 1D. 5–7.5, below mid-1D. 3.5–4.5, below 2D. 4–5, lat.l. 31–34.

The following in percent of head length: pre-A. 158–167; pre-V. 120–131; V.-A. 44–50; isthm.-A. 32–95; greatest body depth 71–80; 1D.-2D. 17.1–34.3; height 1D. 82–92; length 1P. 48–51; length V. 62–82.

DESCRIPTION.—Head 4.5–5.0 into total length; greatest depth more than postrostral length of head. Snout distinctly conical in lateral profile, tipped with a small but stout conical scute; smaller scutes at lateral angles of snout. Posterior nostril small to moderate in size, about 2–3 into least suborbital width. Orbits round to somewhat oval in outline, diameter shorter than snout length. Interorbital space broad, about equal to or more than orbit diameter. Suborbital shelf prominent and angular in cross section (more so in larger specimens), forming a distinct division between upper and lower parts of head. Posteroventral margin of preopercle broadly rounded; ridge on preopercle forms a prominent clublike head ventrally. Interopercle exposed beyond preopercle as a triangular fleshy tab. Mouth small for a *Coryphaenoides*, rictus falls below anterior one-third of orbit; posterior end of maxillary below mid-orbit. Chin barbel small, length about one-half or less of suborbital width. Free neuromasts of cephalic sensory system small but relatively prominent over most of head and on nape.

Gill membranes broadly attached to isthmus, without a free posterior fold; opercular opening extends forward to below or behind vertical portion of preopercle ridge. Outer gill slit greatly restricted, length of slit about equal to barbel length. Outer gill rakers on first arch rudimentary, sometimes absent; other rakers tubercular.

Relatively small scales cover all of head surfaces including entire underside of snout, suborbital, and lower jaw, but absent on gill and gular membranes and interopercle. Scales of body generally larger than those of head; fine, conical, greatly reclined spinules arranged in subparallel rows on scales below origin of second dorsal fin. Scales in other areas may have rows divergent or convergent. Median row of spinules on scales of dorsum usually with slightly enlarged spinules. Spinules generally reduced along posterior margin of dorsal body scales (not known for scales over ventral areas). In holotype the enlarged me-

dian spinule rows rather prominent, but in a large (female) Socotra specimen (CAS 66462) these enlarged spinules not present on those scales currently remaining.

Teeth small, in broad short bands in both jaws, none noticeably enlarged. In small Socotra specimens (ZMMGU P.19261), teeth bands about 6 or 7 rows wide in premaxillary, 5 or 6 rows wide in dentary; in larger specimen (CAS 66462), bands 8–10 rows wide in premaxillary, 6 or 7 in dentary. Teeth bands of both jaws scarcely tapered posteriorly, fall short of end of rictus.

Second spinous ray of first dorsal fin long, more than postrostral length of head; leading edge armed with slender, reclined, relatively wide-spaced denticles. Second dorsal rudimentary throughout; anal fin well developed. Pelvic fins well developed, outer ray stout, tapered to a prolonged tip that extends well beyond anal fin origin to about 7th anal ray (in small Socotra specimen).

Pyloric caeca of Socotra specimens relatively short and simple. Five caeca, longest about 5 mm in male, CAS 66462; 7 caeca, 14–17 mm in female, ZMMGU P.19261 from same trawl (count may have been higher in CAS 66462; a caecum or two may have been destroyed in attempt to make count). Testes of CAS 66462 relatively large; swim bladder with well-developed drumming muscles on anteroventral surface. Ovaries of ZMMGU P.19261 packed with spherical eggs, the largest 0.8–1.0 mm in greatest diameter; intestines long, folded three times (with 6 major bends).

Color in alcohol light grayish-brown, slightly more grayish over abdominal cavity; black over operculum, blackish over branchiostegal membranes. Fins dusky; tip of anal and spinuous second ray of first dorsal blackish. Mouth and gill cavities dark gray; peritoneum blackish. Lips and nostril membranes blackish.

SIZE.—To more than 410 mm TL.

DISTRIBUTION.—Northern Indian Ocean (Bay of Bengal and W. Arabian Sea) in 2,380–2,820 m.

REMARKS AND COMPARISONS.—Three specimens of *C. hoskynii* are deposited in the ZSI, including the holotype (ZSI 12833) taken in the Bay of Bengal in 2,396 m. The two others (ZSI cat. no. 1061 and 1057), trawled west of Sri Lanka and mislabeled "*Stomias affinis*," were discovered by one of us (YNS) during a visit to that museum in Dec. 1987. Alcock (1894:pl. 9, fig.

TABLE 3. Comparison of characters of four species of *Coryphaenoides* from the Indian Ocean: *C. woodmasoni*, *C. hoskynii*, *C. asprellus* and *C. castaneus*. Figures in parentheses refer to exceptional values for one specimen.

| | <i>woodmasoni</i> | <i>hoskynii</i> | <i>asprellus</i> | <i>castaneus</i> |
|--|---|--|---------------------------------------|--|
| MEASUREMENTS (in percent head length): | | | | |
| Snout | 28-33 | 30-32 | 28-31 | 27-28 |
| Preoral | 13-19 | 16-20 | 13-15 | 12-14 |
| Internasal | 21-27 | 24-33 | 21-27 | 22-24 |
| Interorbital | 21-27 | 24-29 | 22-30 | 24-27(29) |
| Orbit | 22-27(29) | 23-30 | 21-24 | (18)20-23 |
| Postorbital | 46-52 | 44-47 | 50-53 | 54-56 |
| Rictus | 22-31 | 21-24 | ca. 26 | — |
| Upper jaw | 30-37 | 27-30 | 33-38 | 38-42* |
| Barbel | 3-9 | 5-9 | 13-20 | 16-23 |
| Posterior nostril | 2-9 | 5-12 | 3-7 | 5-6 |
| Outer V. ray | 46-72 | 62-82 | 72-82 | 61-122 |
| COUNTS: | | | | |
| V. | 8-9(10) | 8-9 | 9-10 | 10 |
| Scales below mid-1D. | 4.5-7.0 | 3.5-4.5 | 4.5-5.5 | 4.5-6.0* |
| Pyl. caeca | 10-14 | 6-9 | 8-10 | 11 (1 spec.) |
| OTHER: | | | | |
| Teeth: mand. | 3-4 teeth wide laterally; extends to or beyond rictus | broad band; falls short of end of rictus | narrow band; 3-4 teeth wide laterally | narrow band; 1 row laterally extends to or beyond rictus |
| Underside of snout | scaled | scaled | scaled | naked |

4) figured the body scales of *C. hoskynii* as having a prominent median spinule row, but in our specimens this row is not so noticeably enlarged. Examination of the holotype revealed that Alcock's figure was somewhat exaggerated in this regard, and in reality, the median spinule row on most scales were only slightly larger than those on the scales of most of our specimens, suggesting some individual variation.

Coryphaenoides hoskynii is most similar to *C. woodmasoni*; the two are compared in the description of the latter species. As with *C. woodmasoni*, *C. hoskynii* differs from *C. asprellus* in having a shorter barbel and somewhat smaller orbit diameter. Additional differences include a broader posterior nostril, shorter upper jaw, broader, shorter teeth bands, and somewhat larger scales (see Table 3 for comparison of these characters).

Coryphaenoides macrolophus (Alcock, 1889)

(Fig. 4)

Macrurus macrolophus Alcock, 1889:394 (type locality Andaman Sea, SE by S of Ross Island; 265 fm [485 m]); 1891 in Wood-Mason and Alcock: 121 (2 spec., Bay of Bengal; 1892a:351, fig. 1 (Bay of Bengal 410 fm [750 m]); 1894a (in key): 126; 1894b: pl. 12, fig 1; 1899:115. Brauer 1906:266-267 (23 spec., e. African coast, 628-1362 m) (in part?). We-

ber 1913:159 (comparison of *Macrurus tydemani* with *M. macrolophus*).

Macrurus lophotes Alcock, 1889:385 (type locality Bay of Bengal, in 285-405 fm [521-741 m]); 1894a (in key):126; 1892b: pl. 3, fig. 2; 1899:116. Brauer 1906:266 (considered *M. lophotes* a synonym of *Macrurus macrolophus* Alcock).

Coryphaenoides macrolophus: Gilbert and Hubbs 1916:144; 1920:417 (concurrent with Brauer's synonymizing of *M. lophotes* with *M. macrolophus*).

Coryphaenoides lophotes?: Norman 1939:51 (Gulf of Aden, 1,061-1,080 m; questionably identified small, 110 mm spec. as this species).

REMARKS ON SYNONYMY.—Brauer (1906:266) stated that the branchiostegal ray count was seven as a rule, not six, thus suggesting that another genus was intermixed with his specimens. This was noted by Gilbert and Hubbs (1920:417). Alcock's two syntypes of *Macrurus lophotes* were "... far too much spoilt for complete description" (Alcock 1889:385). Our examination of the specimens (TI in 1970, YIS in 1987) were inconclusive because of their deteriorated condition (fragments in a vial). The physiognomy of the fish as illustrated by Alcock (1894b: pl.3, fig. 2), its proportions and counts, and particularly the angular outline of the preopercle bone and associated ridge generally support the synonymy.

DIAGNOSIS.—V. 8, rarely 9; head completely scaled, without naked ventral margins on snout

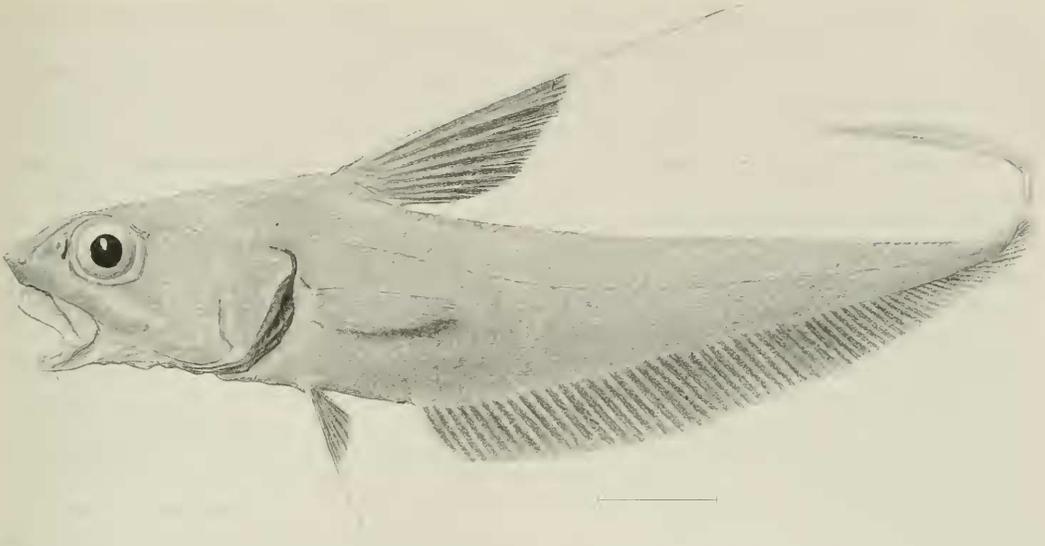


FIGURE 4. *Coryphaenoides macrolophus* (Alcock). CAS 66479 (263 mm TL) from off Socotra in 1,000–1,120 m. Fins and scales partially reconstructed. Scale bar equals 25 mm.

and suborbital regions; first dorsal fin high, second spine 1.3–2.1 times HL, adjoining segmented ray longer than postrostral length of head; barbel small, less than posterior nostril; pyloric caeca 9–12; preopercle slightly produced posteroventrally; mouth opening restricted, rictus extends to below anterior margin of orbits; upper jaw less than $\frac{1}{3}$ HL; outer pelvic ray filamentous at tip, extends beyond base of 8th or 9th anal ray.

MATERIAL EXAMINED.—Holotype, ZSI 11776 (56.5 mm HL, about 230 mm TL); Andamans, 7 miles SE by S of Ross I., Port Blair. BMNH 1891.9.2.8 (50.1 HL, 222 TL); Bay of Bengal; *Investigator* collection received from Indian Museum. BMNH 1939.5.24.690 (25.4 HL, 110 TL); Gulf of Aden; *John Murray* st. 193. ZSI uncat. (5 spec., 47.2–67 HL, 210–280+ TL); locality not known, but probably Bay of Bengal. ZMMGU P.19262 (5, 49.5–70.3 HL, 209–321 TL) and CAS 66479 (3, 39.4–60.3 HL, 178–263 TL); off Socotra, 12°22.8'N, 53°02.7'E; 1,000–1,120 m, *Vityaz* cr. 17, st. 2565; 28.X.1988. ZMMGU P.19263 (2, 65.6–78.6 HL, 304–322+ TL); 13°11'N, 46°24'E; 600 m; *Dmitry Stepanov* cr. 5, tr. 60. ZMMGU P.19264 (52.6 HL, 257+ TL); Timor Sea; 9°01.2'S, 130°59.5'E; 540 m; *Akademik Berg*. ZMMGU P.19265 (47.7 HL, 235+ TL); S. of Java; 8°39'S, 111°55'E; 560–600 m; *Prof. Mesiatzev* cr. 7, tr. 46.

COUNTS AND MEASUREMENTS (see also Diagnosis).—1D. 11,9–11; 1P. i20–i24; total GR-I (outer/inner) 4–6/10–12, total GR-II 11–12 / 9–10; scales below 1D. 7.5–9, below mid-base 1D. 5.5–6.5, below 2D. 6–7, lat. line 33–36.

Total length 178–321 mm, HL 35.4–70.3 mm.

The following in percent of HL: snout 28–31; preoral (9) 12–14; internasal 17–26; interorbital 18–21; orbit 21–26; suborbital (10) 12–15; postorbital 46–49 (51); orbit-preop. 41–44 (46); upper jaw 28–31; rictus 19–23; post. nostril 8–12; barbel 7–8 (11); gill slit (8) 10–12; pre-1D. 109–118; pre-A. 140–163; pre-V. 100–119; isthm.-A. 74–88; V.-A. 43–50; body depth 68–79; depth over A. origin 56–66; 1D.-2D. 21–40; height 1D. 129–213; 1P. 51–60; V. 54–74;

DESCRIPTION.—Head rather low and broad, greatest width about equal to greatest height, about equal to postorbital length, HL about 4.2–5.0 into TL; body tapers rapidly behind anal origin; greatest depth under 1D. origin, about equal to postrostral length of head in 60 mm HL specimen. Snout bluntly angled when viewed dorsally, broadly conical in lateral profile, extends beyond mouth a distance less than pupil diameter, tipped with a prominent conical tubercle with radiating spiny ridges; lateral angles with one or two smaller tubercles. Orbit less than snout length; interorbital space shallowly concave, 1.4–1.5 into orbit diameter. Suborbital region angular in cross section, ventral half angled strongly medially. Upper jaws extend posteriorly to below anterior edge of pupil, mouth opening restricted posterolaterally, the rictus extends to below posterior nostril or anterior margin of orbit. Lips plicate anteriorly, somewhat papillaceous most

elsewhere. Barbel small, thin, about equal to or less than posterior nostril. Posterior margin of preopercle inclined forward, forming an acute angle with lower horizontal margin; in Socotra specimens, posteroventral corner not particularly extended or lobelike, but in Bay of Bengal specimen (BMNH 1891.9.2.8) corner produced into a prominent lobe (Fig. 4). Preopercle ridge forms a lobelike posteroventral corner. Interopercle exposed as a fleshy narrow tab posteroventrally.

Gill membranes broadly attached to isthmus, the two sides not connected; no posterior free fold. Gill filaments long; gill rakers small, generally tubercular. Outer gill slit small, usually less than least width of suborbital region; 3–6 rudimentary spiny rakers on outer side of first arch; 10–12 tubercular rakers on inner series, usually arranged (1–2) + (8–10).

Fins well developed, second spinous ray of 1D. greatly prolonged, usually more than 1.5 of HL, anterior edge with low, closely set spinules proximally. First segmented ray longer than postrostral length of head, succeeding rays rapidly shorter. Pectoral fins pointed, without prolonged rays, its length somewhat more than postorbital length of head. Outer pelvic ray produced into a hair-fine filament that extends well beyond anal fin origin to 8th or 9th anal ray.

Scales densely covered with slender, greatly reclined, needlelike spinules that increase in length posteriorly on scale field, the tips of posteriormost spinules greatly overlap scale edge; spinules arranged in slightly convergent rows on most scales of body. Median nasal ridge and suborbital ridge with somewhat thickened, coarser scales; these thickened scales to a lesser degree developed along supranarial ridges and along dorsal edge of orbits. Head essentially completely covered with scales; no ventral naked margins of snout and suborbital as in *C. microps*. Lower jaw rami lacking scales only at anteriormost one-quarter. Gular and branchiostegal membranes completely naked.

Intestines long, with 4 bends (a double "S"); stomach walls rather thin, 9, 9, 11, 11, and 12 short and slender pyloric caeca in five specimens. Swim bladder large, a pair of drumming muscles in males; two kidney-shaped gas glands, each connected to a short, broad rete mirabile in 60 mm HL Socotra specimen (CAS 66479); its stomach contained many copepods, polychaete

worm fragments, small shrimplike remains, and a tanaidacean.

Color swarthy overall, fins all black, mouth dark gray, gill cavity black, lips and gums pale.

SIZE.—To more than 32 cm TL.

DISTRIBUTION.—Northern Indian Ocean, from off Socotra and the Gulf of Aden to the Bay of Bengal and the Andamans in 628–1,362 m.

REMARKS AND COMPARISONS.—*Coryphaenoides macrolophus* belongs to a group of species that Gilbert and Hubbs (1920:413) characterized as having "a produced dorsal spine, a deep and sharply compressed body, and a dorsal contour horizontal behind the first dorsal fin." The group includes *C. marginatus* Gilbert and Hubbs, 1916, *C. macrolophus*, *C. microps*, *C. semiscaber*, and *C. tydemani*. The species share other characters such as a relatively small, restricted mouth opening; low, slightly protruding snout; small teeth in bands lacking a prominently enlarged series; small barbel; and highly restricted gill openings. *Coryphaenoides macrolophus* is readily distinguished from *C. tydemani*, *C. microps*, and *C. marginatus* by its almost completely scaled underside of head (the other three species have ventral margin of snout, suborbital, and edge of mandibular rami naked), and the shape of its preopercle, which is strongly lobed posteroventrally with the ridge forming a sharp, prolonged, posteroventral angle. The latter character also distinguishes the species from *C. semiscaber*, which, in addition, has a narrower internasal (15–16% HL cf. 17–26%).

Coryphaenoides microps (Smith and Radcliffe, 1912)

Macrouirus microps Smith and Radcliffe, 1912:410–414, fig. 6 (E of Masbate I., Philippines; 604 fm [1,105 m]).

Coryphaenoides microps: Gilbert and Hubbs, 1920

We include a diagnosis and brief description of this species even though it is not known from the Indian Ocean, because it is closely similar to *C. macrolophus* and *C. tydemani*, and it may eventually be found in the area.

DIAGNOSIS.—A *Coryphaenoides* with upper jaw not extending beyond vertical through mid-orbit, its length 30–33% HL; V. 7 or 8; length elongated spinous ray of first dorsal fin more than 2 times HL; ventral aspects of snout and suborbital mostly scaled, but with ventral margin naked; orbit diameter 17–25% HL, less than, to about

equal to interorbital width, much less than snout length; orbit-preop. distance 44–46% HL; free margin of preopercle broadly rounded, preopercle ridge forming a short, angular lobe at posteroventral corner; dorsal, pelvic, and anal fins generally pale basally, blackish distally.

MATERIAL EXAMINED.—HOLOTYPE: USNM 72933 (82.0 mm HL, 413+ mm TL); Philippines, near Atulayan I.; 13°37'39"N, 123°41'09"E; 560 fm [1,024 m]; *Albatross* sta. 5470; 18.VI.1909. PARATYPES: CAS-SU 25446 (2, 23.7–39.9 HL, 124±187+ TL); Philippines off northern Luzon; 18°34'15"N, 121°51'15"E; 224 fm [410 m]; *Albatross* sta. 5325; 15.XI.1908.

COUNTS AND MEASUREMENTS.—See Table 2. Other measurements in percent HL: length post. nostril 7–10; pre-A. 160–172; isthmus to A. 89–97; body depth 68–79; 1D.-2D. interspace 22–79; length 1P. 58–73; length V. 48–96. There were 14 slender pyloric caeca in a paratype.

DESCRIPTION.—The description of *C. macrolophus* closely applies also to this species. *Coryphaenoides microps* has a blunter snout and smaller orbits than do any other species of this group. Bluntness of snout most prominent in large holotype, where ventral profile low and almost vertical. Orbit proportionately smaller than in other species. In concert with small orbits, post-orbital and orbit-preop. distances long. Free margin of preopercle broadly rounded, but preopercular ridge forms short but rather sharp lobe at posteroventral corner. Lips in holotype thick and papillaceous, but in smaller paratypes, lips more slender and smooth. Suborbital region notably broad in holotype and relatively flat in cross-section, but narrower and more angular in paratypes, and more similar in those respects to other related species.

Premaxillary teeth in broad bands, the outermost series slightly larger than others in holotype, but essentially not enlarged in paratypes. Mandibular teeth in a broad band, tapering to a narrow band posteriorly.

Scales like those in *C. semiscaber*, with many subparallel rows (about 18 in holotype) of short, slender, greatly reclined spinules, each row with 8–10 spinules. Underside of snout with moderately broad margin of naked skin; naked margin becoming narrower posteriorly on suborbital and ventral margin of preopercle. Mandibular rami have naked margins, broader anteriorly and

merging with margins of suborbital and preopercle.

Elongated spinous dorsal ray decreases proportionally in length with increase in size: in large holotype (82 mm HL), 1.9 times HL; in 40 mm HL and 24 mm HL paratypes, 2.9 and 3.9 times HL, respectively. Origins of first dorsal and pelvic fins about on same vertical (or pelvics slightly anterior); pectoral origin anterior to that vertical.

Color of specimens examined faded from long preservation, but recorded in original description (Radcliffe 1912:117) as: "Ground color, sepia, scales with grayish cast; fins dark seal-brown."

DISTRIBUTION.—Known only from the Philippines, in 410–1,024 m.

REMARKS.—Gilbert and Hubbs (1920:418–419) provided some additional descriptive information, as well as counts and measurements, for the type specimens of *C. microps* that were not given in the original description. This information allowed us to correct a blunder made presumably at the Stanford Natural History Museum during the cataloging procedure, where two paratypes of the species were inadvertently switched with a paratype of *C. semiscaber*. (See Remarks in description of *C. semiscaber*.) Our measurement and count data agreed closely with Gilbert and Hubbs's data and, fortunately, the specimen tags with the Stanford catalog numbers also corresponded with the correct species and not with the bottle labels.

Coryphaenoides rudis Günther, 1878

Coryphaenoides rudis Günther, 1878:24 (Kermadec Islands).

Gilbert and Hubbs, 1916:144 ("The largest specimen, the one figured [by Günther, 1887, pl. 27], may be designated as the type . . .")

Macrurus (Macrurus) rudis: Günther, 1887:131 (description; additional information on type specimens).

Nematonurus macrocephalus Maul, 1951:17 (Madeira).

Macrourus paradoxus Smith and Radcliffe in Radcliffe, 1912: 115–116, pl. 25, fig. 1 (eastern Palawan, Philippines).

Coryphaenoides paradoxus: Sazonov and Iwamoto, 1988:52–53 (discussion of possible synonymy of *C. rudis* and *C. paradoxus*).

DIAGNOSIS.—A large species (120+ cm) with 1D. II, 9–11; V. 9–10 (usually 10, rarely 8 or 11). Snout low, scarcely protruding; orbits small, about 1.5 into snout, 1.8–1.9 into interorbital width, 5.0–6.0 into HL. Suborbital region vertical; no strong sharp ridges on head. Mouth large, subterminal; upper jaw long, extends beyond vertical through hind margin of orbits, rictus ex-

tends about to under posterior $\frac{1}{4}$ of orbit. Teeth prominent, an outer enlarged series on premaxillary behind which a narrow villiform band; mandibular teeth in about 3 irregular series near symphysis, becoming uniserial posteriorly. Head fully scaled except lips, gill membranes, and interopercle. (After Sazonov and Iwamoto 1992.)

MATERIAL EXAMINED.—LECTOTYPE: BMNH.1889.12.7.74 (male with large testes, 170 mm HL, about 840 mm TL); N of Kermadec Islands; 600 fm [1,097 m]; *Challenger* st. 171. Other specimens: ZMMGU P.19266 (196 HL, 935+ TL); West Australian Ridge, 28°32'S, 98°29'E; 1120 m; *Prof. Mesiatzev* cr. 7, tr. 42; 18.IV.1979. ZMMGU P.19267 (150 HL, 713 TL); West Australian Ridge, 31°33'S, 95°40'E; 1,400–1,420 m; *Zvezda Kryma* cr. 6, tr. 138; 19.IX.1976. AMS 29340-001 (144 HL, 710 TL); Australia, off Sydney; 33°45'S, 152°03'E; 1,120–1,170 m; FRV *Kapala* st. K89-13-02; 30.VI.1989. SIO 68-479 (255 HL, 1200 TL); 22°07'N, 171°36'E; 16.IX.1968. ZMMGU P.19268 (162+ HL, 775 TL); off Socotra, 12°43'N, 52°44'E; 2,300–2,380 m; *Vityaz'* cr. 17, st. 2832; 16.I.1989.

COUNTS AND MEASUREMENTS.—LECTOTYPE: D. II,9 + 92; 1P. i19/i19; V. 10/10; GR-I (outer/inner) ?- 1+9, GR-II 0+7/1 + 8; scales below 1D. 9, below 2D. 6.5, below mid-base 1D. 7.5, lat. line over pre-1D. length 37; pyloric caeca 14.

Measurements in millimeters, percent of HL in parentheses: 170 mm HL, postrostral 131 (77); snout 44 (26); preoral 19 (11); internasal 33 (19); post. nostril 12 (7); interorbital 53 (31); orbit 30 (18); suborbital 25 (14); postorbital 102 (60); orbit-preop. 91 (54); upper jaw 68 (40); barbel 30 (17); gill-slit 10 (6); preanal 270 (159); V.-A. 100 (59); isthm.-A. 177 (104); body depth 148 (87); 1D.-2D. 53 (31); height 1D. 120 (71); 1P. 95 (56); V. 127 (75).

SIZE.—To at least 120 cm.

DISTRIBUTION.—Broadly distributed: Pacific (Kermadecs, Philippines; Darwin Seamount in central Pacific, Tasman Sea, Nazca Ridge); Indian Ocean (off Socotra Island and West Australian Ridge); subtropical to tropical Atlantic, including the Gulf of Mexico and Caribbean Sea.

REMARKS.—Gilbert and Hubbs (1916), in their list of grenadier species, designated the 33-inch specimen figured in Günther (1887: pl. 27) as "the type." Because Günther (1878) referred to more than one specimen in his original description, Gilbert and Hubbs's type designation is for a lectotype, and the other specimens of the type series become paralectotypes. Our measurement and count data for the lectotype, most of which have not been previously recorded, are provided above. Descriptions of the species by Maul (1951,

as *Nematonurus macrocephalus*), Marshall and Iwamoto (1973, as *Coryphaenoides macrocephalus*), and Iwamoto and Sazonov (1988, as *C. paradoxus*) are more than adequate and need not be duplicated here. The illustration of the lectotype (Günther 1887: pl. 27) is exceptional in its accuracy and artistry.

Three BMNH paralectotypes we examined were representatives of two species of *Nezumia*. Other records of *C. rudis* by Brauer (1906) and McCann and McKnight (1980) represent other species.

Sazonov and Iwamoto (1992:53) were reluctant to synonymize *Macrourus paradoxus* and *Nematonurus macrocephalus* with this species because of the absence of good comparative series from throughout the distribution area, especially of smaller individuals. Our experience with this genus, particularly over the past few years, has demonstrated the sorts of variation one might expect with a large, widely distributed species. Our specimens appear to confirm in *C. rudis* these kinds of variation.

***Coryphaenoides semiscaber* Gilbert and Hubbs, 1920**

(Fig. 5)

Coryphaenoides semiscaber Gilbert and Hubbs, 1920:410–414, fig. 6 (E of Masbate I., Philippines; 604 fm [1,105 m])

We include a diagnosis and brief description of this species even though it is extralimital, because of its close similarity to *C. macrolophus*, *C. microps*, and *C. tydemani*, and because it eventually may be caught in the Indian Ocean.

DIAGNOSIS.—A *Coryphaenoides* with upper jaw not extending beyond vertical through mid-orbit, its length 29–35% HL; V. 8; spinous dorsal ray elongated, 119–144% HL; ventral aspects of snout and suborbital completely scaled; orbit diameter 26–28% HL; orbit-preop. distance 36–39% HL; free margin of preopercle broadly rounded, preopercle ridge not forming a sharp, angular lobe at posteroventral corner.

MATERIAL EXAMINED.—HOLOTYPE: USNM 83625 (48.3 mm HL, 251 mm TL); E of Masbate I., Philippines; 12°31'30"N, 123°35'24"E; 604 fm [1,105 m]; *Albatross* sta. 5215. PARATYPES: USNM 148882 (41.8 HL, 213 TL); same data as for holotype. USNM 148883 (45.4 HL, 200+ TL); off E coast Mindoro, Philippines; 12°52'N, 121°48'30"E; 218 fm [399 m]; *Albatross* sta. 5124.

The small, 93± mm paratype (CAS-SU 25452) from *Albatross* sta. 5534 represents another species (see Remarks).

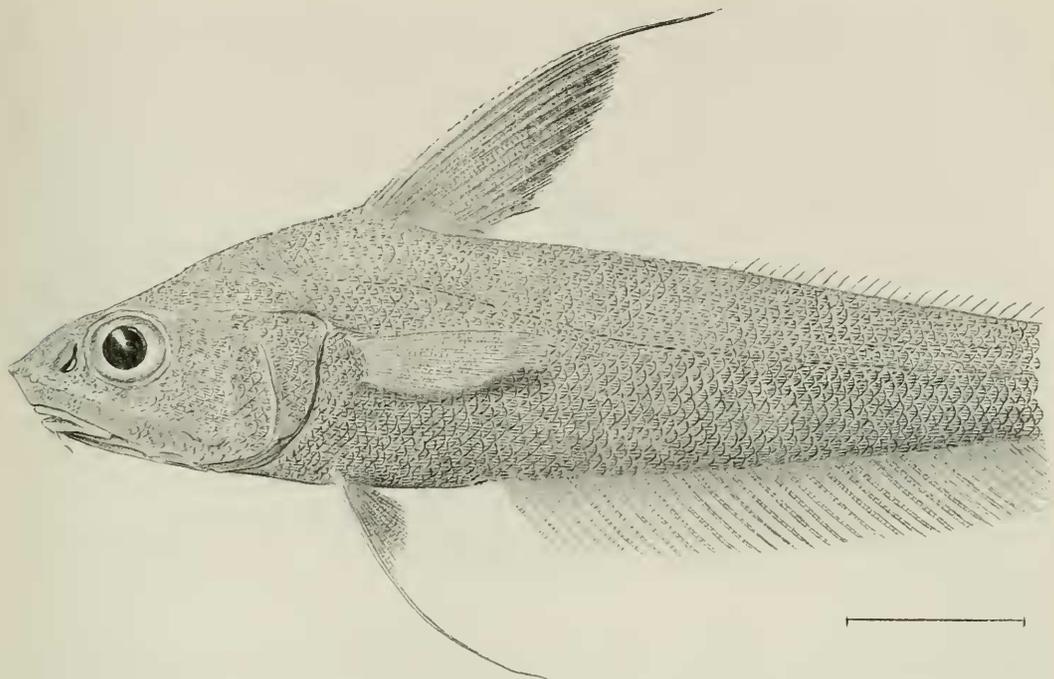


FIGURE 5. *Coryphaenoides semiscaber* Gilbert and Hubbs. After Gilbert and Hubbs (1920: fig. 6). Philippines, east of Masbate Island, in 1,105 m. Scale bar equals 25 mm.

COUNTS AND MEASUREMENTS.—See Table 2. Other measurements in percent HL: length post. nostril 7–10; pre-A. 160–172; isthmus to A. 93–97; body depth 68–79; 1D.-2D. interspace 44–79; length 1P. 60–73; length V. 95–96.

COMPARATIVE DESCRIPTION.—The descriptions for *C. macrolophus* and *C. microps* adequately apply also to this species. *Coryphaenoides semiscaber* has a somewhat blunter snout profile than does *C. macrolophus* and is similar in that respect to *C. tydemani* and smaller individuals of *C. microps*. The elongated spinous ray of the first dorsal fin in *C. semiscaber* is distinctly shorter and more heavily serrated than in the other three species. The completely scaled underside of the snout and suborbital region are like that in *C. macrolophus*. The preopercle bone is broadly rounded posteriorly with the chord of the posterior margin vertical; the preopercular ridge has a small, rounded, posteroventral angle (Fig. 5). The shape of the bone and associated ridge is similar to that in *C. tydemani* and *C. microps* and contrasts sharply with that in *C. macrolophus*, where the posterior margin of the preopercle is inclined forward to form a distinct lobe or acute angle at the posteroventral corner,

and the vertical and horizontal ridges meet at a sharp angle or acute lobe. Color of the specimens after long preservation is medium brown, with fins darker except anteriorly at the base of the anal and the base of the pelvic fins, where the fins are somewhat paler. Unlike *C. microps* and *C. tydemani*, the species lacks a distinctly blackish tip of first dorsal. Gilbert and Hubbs (1920: 412) counted six and eight pyloric caeca in two of the paratypes, counts that are lower than the 14 we obtained from a paratype of *C. microps*.

DISTRIBUTION.—The species appears to be confined to the Philippines region, but we suspect that more thorough sampling in the seas off the Malayan Archipelago will reveal its presence over a wider area.

REMARKS ON TYPE MATERIAL.—In their original description, Gilbert and Hubbs (1920:410) provided a table of counts and measurements for three paratypes—the two listed above in the Materials Examined section, and a third specimen from *Albatross* sta. 5534. That third paratype, cataloged as CAS-SU 25452, was apparently switched with two paratypes of *C. microps*, CAS-SU 25446. Our measurements and counts of these switched specimens correspond almost perfectly

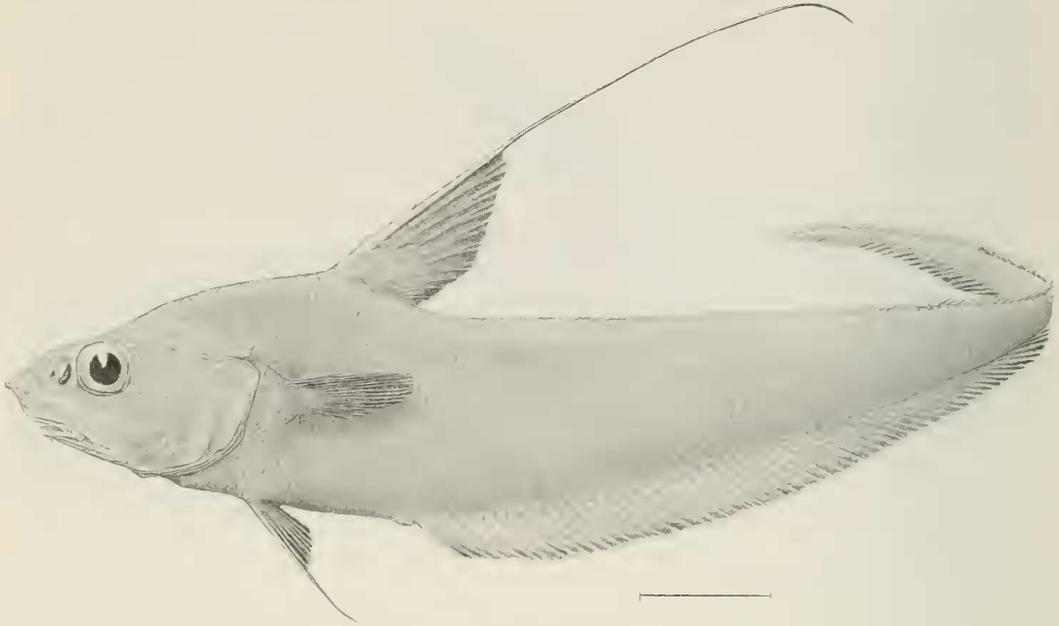


FIGURE 6. *Coryphaenoides tydemani* (Weber). CAS-SU 25440 (263 mm TL) from Buton Straits near Celebes in 1,600–1,700 m. Fins and scales partially reconstructed. Scale bar equals 25 mm.

with the data provided for the two species by Gilbert and Hubbs (1920). Metal tags attached to the specimens also confirm the inadvertent switch and subsequent mislabeling of the specimen bottles. The specimens are now reunited with their proper identification and jar labels.

The small paratype, CAS-SU 25452, appears to represent a different species from *C. semiscaber* in having an acute, lobelike preopercle angle, with a preopercle ridge that is prolonged and pointed, as in *C. macrolophus*. The small size and mediocre condition of the specimen, and the lack of adequate comparative material, leave its proper identity undetermined.

Coryphaenoides tydemani (Weber, 1913)

(Fig. 6)

Macrurus tydemani Weber, 1913:158, pl. 1, fig. 6 (syntypes from Bali Sea, Flores Sea, Ceram Sea, and Arafura Sea; 538–1,310 m).

Coryphaenoides tydemani: Gilbert and Hubbs 1920:414–417 (Buton Strait near Celebes; 559 fms [1,022 m]). Weber and de Beaufort 1929:31–32, fig. 6 (compiled).

DIAGNOSIS.—A *Coryphaenoides* with upper jaw not extending beyond vertical through mid-orbit, its length 29–34% HL; V. 8 (rarely 9); length elongated spinous ray of first dorsal fin more than

2.5 times HL; ventral aspects of snout and sub-orbital almost completely scaled (a thin, naked ventral margin only); orbit diameter 23–26% HL, slightly more than interorbital width, but less than snout length; orbit-preop. distance 38–41% HL; free margin of preopercle broadly rounded, preopercle ridge not forming a sharp, angular lobe at posteroventral corner; dorsal, pelvic, and anal fins generally pale basally, blackish distally (some individuals may have overall dark fins).

MATERIAL EXAMINED.—LECTOTYPE (here designated): ZMA 111.493 (34.4 mm HL, 160+ mm TL); Flores Sea, 7°36.0'S, 117°30.8'E; 694 m; *Siboga* sta. 314; 17.III.1900. PARALLECTOTYPES: ZMA uncat. (37.0 HL, 174+ TL), same data as for lectotype; ZMA 111.491 (53.1 HL, 265 TL); Ceram Sea, 3°37.7'S, 131°26.4'E; 324 m; *Siboga* sta. 170; 26.VIII.1889. Other specimens: CAS-SU 25440 (2:48.9–54.9 HL, 263–265 TL) and USNM 99475 (2:52.4–58.8 HL, 258±288+ TL); Buton Straits near Celebes, 5°35'S, 122°20'E; 559 fm [1,022 m]; *Albatross* sta. 5648; 16.XII.1909.

COUNTS AND MEASUREMENTS (see also Diagnosis and Table 2).—The following in percent HL: post. nostril 8–11; pre-A. 163–181; isthmus to A. 81–96; body depth 78–95; 1D.-2D. interspace 16–19; length 1P. 60–71; length V. 61–85.

DESCRIPTION (primarily of lectotype, supplemented with comments on other specimens).—Head more than 4.5 of TL (tail tip missing),

slightly longer than greatest body depth, its greatest width over opercles about equal to distance snout tip to hind rim of orbit. Body behind abdominal cavity greatly compressed and deep, depth over anal origin about equal to postrostral length of head. Snout pointed, slightly projecting beyond mouth, tipped with a prominent median spinous tubercle; no similar lateral tubercles developed. Orbit small, about 4 in HL, less than snout length but more than least interorbital width. Mouth small, restricted laterally, posterior edge of maxilla below anterior edge of pupil, posterior extent of rictus below posterior naris. A small, but rather stout-based, chin barbel. Free margin of preopercle broadly rounded, the low preopercular ridge forming a slight lobe at posteroventral corner. Tip of interopercle scarcely exposed beyond preopercle margin.

Gill membranes broadly attached to isthmus at level approximately under opercle (difficult to gauge because of expanded gill cover and branchiostegal rays). Gill filaments rather short, about as long as diameter posterior nostril; rakers tubercular, armed with several recurved needlelike spinules; first gill slit greatly restricted.

Paired fins well developed; first dorsal fin with short, steep base; first spinous ray spikelike, second greatly elongated, rather stout basally with 14 reclined, spaced denticles along leading edge, the ray becoming filamentous distally, extending most of distance to end of tail. Outer pelvic ray filamentous, extends to base of 4th or 5th anal ray. Second dorsal fin rudimentary throughout, but anal well developed. Pectoral fin origin anterior to pelvic origins.

Scales densely covered with long, slender, needlelike, greatly reclined and overlapping spinules, arranged in 9–12 more or less parallel rows (smaller paralectotype from same locality had 8–10 rows, larger of CAS-SU 25440 had as many as 16), the tips of posteriormost spinules overlapping posterior edge of scale. Spinules generally so small that no overall striated pattern produced. Head essentially completely covered with scales except lips, nasal, branchiostegal, and gular membranes. A thin margin along ventral edge of snout and suborbital naked, but scarcely noticeable in this small specimen. In larger paralectotype (ZMA 111.491) and in both from CAS-SU 25440, this naked margin more prominent. Scales and scale spinules along suborbital and nasal ridges slightly thickened, but not prominently so.

Teeth in narrow bands in both jaws, about 4

or 5 teeth wide on mandible and premaxillary. Bands appear slightly wider in ZMA 111.491.

Color in alcohol overall light brown to grayish. Branchial and opercular regions and area over abdominal cavity blackish. Lips blackish. First dorsal, pectoral, and pelvic fins blackish distally, but rather pale at base. Anal mostly pale anteriorly, but distal margin black anteriorly, the fin becoming overall blackish toward posterior end of tail. (In paralectotype ZMA 111.491, all fins completely dark.) Gill cavity blackish, mouth grayish. Chin barbel pale except dark at base.

SIZE.—Attains at least 27 cm.

DISTRIBUTION.—Apparently confined to Indonesian waters in 324–1,022 m.

REMARKS.—We examined the three syntypes of *C. tydemani* through the courtesy of I.J.H. Isbrücker of ZMA. We have chosen one of these (ZMA 111.493, 160 mm TL) from the Flores Sea as lectotype, as it is in relatively good condition and agrees well with the original description of the species. Paralectotype ZMA 111.491 from Ceram Sea appeared somewhat different from the other two specimens in having a blunter snout, broader head, and completely dark fins without pale bases. The first two differences may be attributable to distortions caused by preservation. The fin-color difference may be individual variation. We also examined two specimens collected by the *Albatross* off Buton Straits in 1,022 m. These agree in essentially all respects with the type specimens.

We compared these specimens of *C. tydemani* with the holotype (USNM 72933) and two paratypes (CAS-SU 27452) of *C. microps*. They were similar in most features, notably in having an exceptionally long spinous ray in the first dorsal (190, 293 and 388% HL in *C. microps*), a thin naked ventral margin along the snout and suborbital, and a black-margined anal fin. The two smaller (CAS-SU) paratypes of *C. microps* had a black-tipped first dorsal fin, but the large holotype had a uniformly dark first dorsal. Small differences in length of postorbital (49–56% HL in *C. microps* vs. 45–49% HL in *C. tydemani*) and orbit-preopercle distance (44–46% vs. 38–41%) were the only proportional measurements of note. The orbit diameter may be smaller in *C. microps*—the large holotype and larger paratype from CAS-SU 25452 had measurements of 17% and 21% HL, compared with 23–26% in the five *C. tydemani* we examined. The smaller paratype of *C. microps* from CAS-SU 25452 had an orbit measurement of 23% HL, but relative orbit

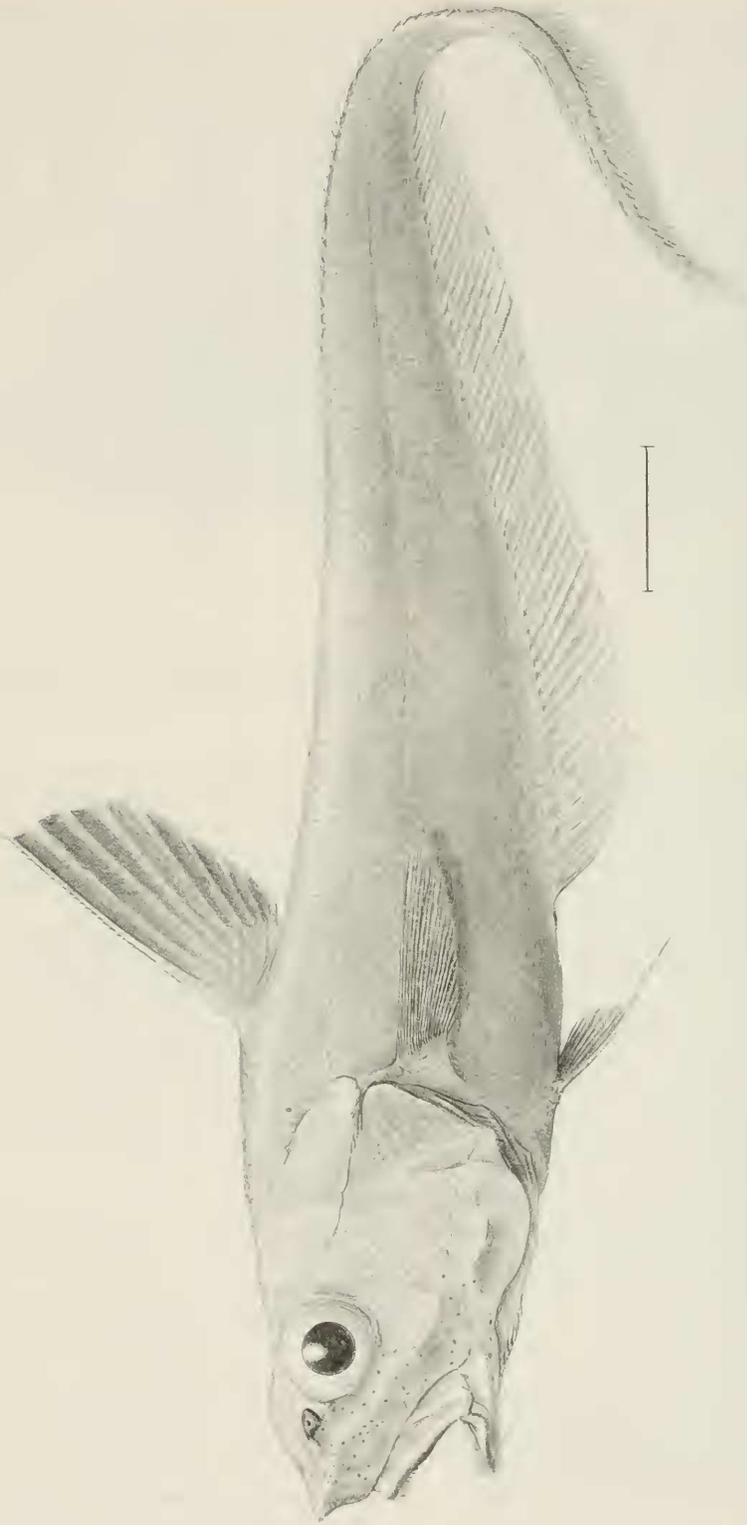


FIGURE 7. *Coryphaenoides woodhousoni* (Alcock). CAS 66430 (350+ mm TL) from off Saya de Malha Bank, Mascarene Ridge in 1,520–1,720 m. Partly reconstructed from 390+ mm TL specimen, same collection. Scale bar equals 25 mm.

size in most species usually decreases with age, which would be in agreement with the small size of that specimen. Examination of adequate size series of both species are necessary to confirm these differences.

It appears that *C. tydemani* and *C. microps* are so similar that additional material from throughout the Indo-Malayan and Philippines regions may eventually show them to be conspecific, and the minor differences we have observed are simply populational or size-related. Because such material is not now available to us, we continue to recognize the two as distinct species.

Coryphaenoides woodmasoni (Alcock, 1890)

(Fig. 7)

Macrurus Wood-Masoni Alcock, 1890b:301 (Arabian Sea; 1,000 fms [1,829 m]). Alcock in Wood-Mason and Alcock 1891: 121 (Gulf of Manaar, "a male nearly 18 inches long"; *Investigator* sta. 109, 738 fms [1,350 m]). Alcock 1892:363 (Laccadive Sea, 559 and 902 fm [1,022 and 1,650 m]); 1894a: 12 (in key); 1894b: pl. 13, fig. 1); 1899:114–115.

DIAGNOSIS.—V. 8–9 (rarely 10); underside of snout and mandibles completely scaled; upper jaws 30–35% HL, premaxilla extends to slightly beyond midorbital level, rictus not restricted laterally; barbel short, 3–9% HL; pyloric caeca 10–14; teeth in moderately wide bands 3–4 teeth wide laterally, outer premaxillary slightly enlarged.

MATERIAL EXAMINED.—Laccadive Sea: HOLOTYPE: ZSI 12867 (108 mm HL, about 480 mm TL); 11°12'47"N, 74°25'30"E; 1,829 m; *Investigator* sta. 104. Gulf of Manaar?: BMNH 1892.6.17.3 (94.4 HL, 435 TL) (accession from ZSI, probably specimen reported by Wood-Mason and Alcock 1891). Ninety East Ridge: ZMMGU P.19269 (77.7 HL, 387 TL); 11°44'S, 88°47'E; 1,600 m; *Fiolent* cr. 9, sta. 24; 14.VI.1977. Mascarene Ridge, Saya de Malha Bank: ZMMGU P.19270 (3, 48.2–72.5 HL, 214–349 TL); 9°48.5'S, 60°42'E; 1,650 m; *Fiolent* cr. 9, sta. 51; 1.XI.1977. ZMMGU P.19271 (3, 86.1–98.0 HL, 415–452+ TL) and CAS 71480 (85.4 HL, 447 TL); 8°26'S, 59°29'E; 1,300–1,260 m; *Fiolent* cr. 9, sta. 52; 2.XI.1977. ZMMGU P.19272 (2, 73.2–90.9 mm HL, 368–437+ mm TL); 8°07'S, 59°18'E; 1,300–1,240 m; *Fiolent* cr. 7(9), tr. 53; 3.IX.1977. ZMMGU P.19273 (2, 78.2–93.2 HL, 384–446 TL); 8°08'S, 59°37'E; 1,247–1,259 m; *Zvezda Kryma* cr. 6, tr. 210; 3.XI.1976. ZMMGU P.19274 (10, 76.4–114 HL, 367–494+ TL) and CAS 66430 (5, 75.8–119 HL, 350±525+ TL); 09°40'S, 60°31'E; 1,520–1,720 m; *Vityaz'* cr. 17, st. 2815; 9.I.1989. CAS 66475 (81.0 HL, 390+ TL); 8°32'S, 59°14'E; 960–1,130 m; *Vityaz'* cr. 17, st. 2820; 10.I.1989. No specific locality: ZSI F361/1, 358-60/1 (4, 65.5–95.3 HL, 240±387+ TL).

COUNTS AND MEASUREMENTS (see also Table 3 and Diagnosis).—D. II,9-10 + 100–115; 1P.

i19–i24; total GR-I (outer/inner) usually 3–4/(7)8–9, total GR-II 7–8(9)/(7)8–9; scales below 1D. usually 7.5–9.0, below mid-1D. 4.5–7.0, below 2D. 5.5–8.5 (usually 6.0–7.5), lat. line 39–46.

Total length 214–525 mm; HL 48.2–119 mm. The following in percent HL: postrostral 69–75; snout 28–33; preoral 13–19; internasal 21–29; interorbital 21–27; orbit 22–27; suborbital 13–16; postorb. 46–52; orbit-preop. 45–50; gill slit 5–8; post. nostril 2–10; pre-A. 146–174; isth.-A. 70–91; body depth 68–84; 1D.-2D. 14–41; height 1D. 57–79; length V. 46–72.

DESCRIPTION (based primarily on Mascarene Ridge specimens).—Head about 4.5–5 in TL; greatest body depth about equal to postrostral length of head. Snout pointed, broadly conical in lateral view, protruding less than lens diameter beyond mouth. Orbit shape circular to somewhat oval, about 4 into head, about equal to or slightly more than interorbital width. Interorbital space almost flat. Suborbital region with a distinct shelf, strengthened by 3 or 4 rows of slightly thickened scales. Preopercle margin broadly rounded, slightly lobate, the inner ridge forming a strong club-shaped process at lower angle. Jaws subterminal, premaxillary extends to about mid-orbit, rictus unrestricted, extends to below anterior 1/3 of orbit. Barbel small, thin, length about one-half of least suborbital width. Cephalic-sensory pores little developed, free neuromasts rather conspicuous in most specimens, evident over snout, suborbital, interorbital, and on surfaces of nape, occiput, and operculum.

Gill membranes broadly attached to isthmus, without a free posterior fold; gill openings extend forward to below vertical portion of preopercular ridge. Outer gill slit strongly restricted by folds of skin, length of slit usually less than barbel length, about equal to length of gill filaments. Gill rakers rudimentary and few along outer side of first arch, tubercular or platelike on inner side of arch.

Head and body surfaces covered with moderate-sized scales, those over head ridges slightly (if at all) thickened, only those on suborbital and supraorbital ridges heavier; terminal and lateral angles of snout tipped with small tubercular scales. Underside of head almost entirely covered with small scales except lips, gill membranes, and small area immediately above symphysis of upper jaws. Body scales densely covered with small, spike-like, recumbent spinules, generally aligned in

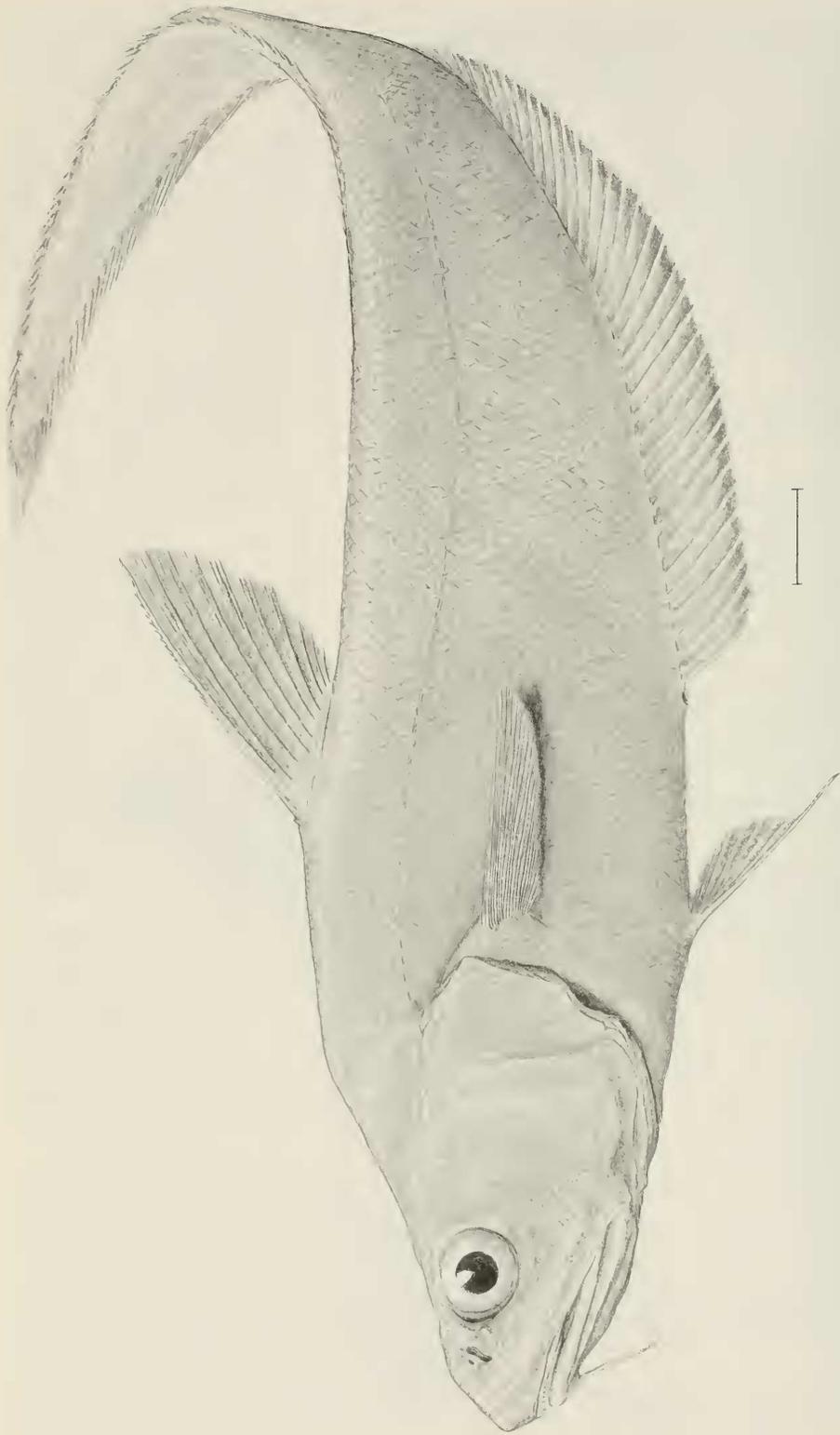


FIGURE 8. *Coryphaenoides* sp. 1. CAS 71488 (573+ mm TL) from off Chatham Rise, east of New Zealand in 1,200 m. Fins and scales partially reconstructed. Scale bar equals 25 mm.

slightly convergent rows, the median row in each scale somewhat more elevated than adjacent rows.

Teeth all small and fine except for slightly enlarged outer series on upper jaw flanking a broad inner band of small teeth; in one specimen (CAS 71480), teeth in inner band arranged in somewhat diagonal rows, but teeth more uniformly scattered in others. Mandibular teeth uniformly small and in a narrow band 2 or 3 rows wide laterally, but band wider at symphysis.

Fin origins best seen in Figure 7. Outer pelvic ray weak, hair thin distally, extending at most only past bases of first few anal rays. Second spinous ray of first dorsal serrated along leading edge with small non-overlapping, reclined, spikelike teeth.

Pyloric caeca (of 12 specimens examined) well developed, 10 to 14 in distal counts, lengths from about half orbit diameter to more than orbit diameter. Intestine long; coiling pattern with 4 or 6 bends.

Color in alcohol light brown overall, ventral aspects of head, operculum, and trunk darker, somewhat swarthy. Mouth, gill chamber, branchiostegal membrane, and lips black; gular membrane dark gray. Orbital rim and all fins except second dorsal blackish; barbel brown basally, but pale distally.

SIZE.—To more than 53 cm TL.

DISTRIBUTION.—Northern portion of Indian Ocean off Indian subcontinent and on Mascarene and Ninety East ridges, in 1,240–1,829 m. The species is fairly abundant at these mid-slope depths, which lie above the depths at which *C. hoskynii* has been found (2,380–2,820 m).

REMARKS AND COMPARISONS.—*Coryphaenoides woodmasoni* is closely similar in several important features to *C. hoskynii* (Alcock, 1890), including squamation, dentition, a small barbel, eight or nine pelvic fin rays, a broadly conical snout, and fin pattern. Major differences lie in the count of pyloric caeca, width interorbital, length posterior nostril, length upper jaw, length rictus, and number of scale rows below midbase of first dorsal fin. These features are compared in Table 3.

Coryphaenoides woodmasoni may also be confused with *C. castaneus*, but the naked underside of snout and the longer barbel (13–20% HL) of that species is distinguishing. Other features are compared in Table 3.

Coryphaenoides sp. 1

(Fig. 8)

Coryphaenoides (*Coryphaenoides*) sp. indet. Iwamoto 1986: 355 (2 spec., Agulhas Bay and off Mozambique; 696–960 m).

Coryphaenoides (*Coryphaenoides*) *rudis* (nec Günther, 1887): McCann and McKnight, 1980:35, figs. 16, 17, 18 (up. rt.) (1 spec., off Cape Palliser, New Zealand, 1,205–1,293 m).

Coryphaenoides sp.: Okamura in Amaoka et al. 1990:184, fig. 126 (6 spec., New Zealand, 100–763 m).

Coryphaenoides sp. B long barbel rattail: Paulin et al. 1989: 129, fig. 56.30b (in key).

DIAGNOSIS.—V. 8 (9); naked surfaces on underside of head confined to a median swath below snout tip, a narrow strip along ventral margins of snout and suborbital, and anterior end of mandible; snout low, barely protruding in adults; mouth large, upper jaw extends to end of orbit; chin barbel long, usually about $\frac{1}{4}$ to $\frac{1}{3}$ HL; outer GR-1 relatively well developed, lappet-shaped; a distinct hump in profile of nape.

MATERIAL EXAMINED.—New Zealand area: ISH 4009/79 (157 mm HL, 715+ mm TL); 48°46'S, 172°33'E, 705–695 m; *Wesermunde* sta 411 (157)/79. ISH 4046/79 (126 HL, 515+ TL); 42°50'S, 176°45'W, 900–913 m; *Wesermunde* sta. 557 (137)/79; 6.VII.1979. ISH 4041/79 (170 HL, 770+ TL); 42°53'S, 176°07'W, 895–905 m; *Wesermunde* sta. 154/79; 10.VII.1979. ZMMGU P.19275 (114 HL, 533 TL) and CAS 71488 (122 HL, 573+ TL); 44°04'S, 178°19'E, 1,020 m; *Poseidon* trawl 75; 3.II.1978.

Tasman Sea (off New South Wales, Australia): AMS uncat (5, 30.4–54.0 HL, 151± 283+ TL); E of Broken Bay; FRV *Kapala*; 1979. AMS I.17866-007 (61.7 HL, 280+ TL); off Sydney, 33°57'S, 151°45'E, 720 m; FRV *Kapala*; 6-7.XI.1977. AMS I.17867-007 (2:51.6–64.3 HL, 210±280+ TL); off Sydney, 33°41'S, 151°57'E, 720 m; FRV *Kapala*; 9.XI.1972. AMS I.20452-018 (46.6 HL, 225+ TL); off Broken Bay, 33°38'S, 152°04'E, 822 m; FRV *Kapala*; 19.VIII.1975. AMS I.24059-016 (2, 142–154 HL, 690±730 TL); off Norah Head, 33°32'S, 152°09'E, 942–978; FRV *Kapala* st. 83-09-02; 23.VIII.1983. AMS I.20477-002 (88 HL, 355 TL); SE of Newcastle, 33°11'S, 152°24'E, 732 m; FRV *Kapala*; 7.XII.1977. AMS I.20485-006 (59.7 HL, 285+ TL); SE of Broken Bay, 33°40'S, 151°56'E, 731 m; FRV *Kapala*; 1977. AMS I.21724-006 (48.9 HL, 233+ TL); E of Broken Bay, 33°37'S, 152°07'E, 1005 m; FRV *Kapala*; 1979. AMS I.24613-005 (43.3 HL, 343 TL); off Broken Bay, 33°32'S, 152°04'E, 823 m; FRV *Kapala* st. 75-05-05; 19.VIII.1975. AMS I.24771-002 (470 TL); off Broken Bay, 33°43'S, 152°03'E, no depth; FRV *Kapala* st. 84-10-08; 1984. AMS I.24992-002 (66.2 HL, 340+ TL); Sydney, Gabo Is., 35°29'S, 150°56'E, 1,116 m; FRV *Kapala*; 1984. AMS I.25056-004 (2, 127–149 HL, 620±730+ TL). AMS I.28717-003 (90 HL, 383 TL); E of Newcastle, 32°53'S, 152°47'E, no depth; FRV *Kapala*; 1988.

Coral Sea: ZMMGU P.19276 (2, 143–148 HL, 635-610+ TL); 25°07'S, 162°51'E, 1,100–1,130 m; *Mis Tikhi*; IV. 1978.

Indian Ocean: CAS 50151 (36 HL, 130+ TL); off Mozambique, 22°30'S, 36°09'E, 960 m; *Anton Bruun* cr. 8, sta. 399B; 1.X. 1964. SAM 27707 (1 spec.); off Natal, South Africa,

27°17.5'S, 32°54.1'E; 780–720 m; RV *Meiring Naude*, st. SM 66; 20.V.1976. SAM 31568 (1 spec.); 27°04.6'S, 33°04.0'E; 680 m; RV *Benguela*, st. G13493/27-08; 12.VIII.1988. SAM 27711 (1 spec.); off Natal, 28°09.8'S, 32°47.4'E; 940 m; RV *Meiring Naude*, st. SM 90; 23.V.1976. SAM 27712 (1 spec.), off Natal, 28°37.8'S, 32°38.4'E; 1,200–1,000 m; RV *Meiring Naude*, st. SM 107; 25.V.1976. SAM 32735 (2 spec.); off Natal, 28°21.9'S, 32°34.6'E; 775–825 m; RV *Meiring Naude*, st. SM 38; 28.V.1975. ZMMGU P.19277 (111 HL, 470+ TL); Madagascar Ridge, 29°59'S, 45°57'E, 1,285–1,360 m; *Zvezda Kryma* cr. 6, tr. 15; 2.VII.1976. ZMMGU P-16027 (70 HL, 363 TL); Madagascar Ridge, 32°25'S, 35°04'E, 1,230–1,260 m. ZMMGU P.19278 (158 HL, 735+ TL); Madagascar Ridge, 32°28.0'S, 43°29.3'E, 1,060 m; *Prof. Mesiatsev* cr. 7, tr. 136; 24.VI.1979. ZMMGU P.19279 (134 HL, 620+ TL); Madagascar Ridge, 33°30'S, 44°00'E, 940–1,100 m; *Zvezda Kryma* cr. 6, tr. 20; 7.VII.1976. ZMMGU P.19280 (138 HL, 665 TL); Madagascar Ridge, 32°31.6'S, 43°36.0'E, 1,050 m; *Heroevka* cr. 1, tr. 206; 12.VI.1980.

Atlantic Ocean: ZMMGU P.19281 (93 HL, 432 TL); Gulf of Guinea off Congo R. mouth, 6°29'S, 11°13'E, 1,000 m; *Fiolent* tr. 99; 1.III.1976. SAM 29026 (1 spec.); off Namibia, 19°59'S, 11°27.4'E; 805 m; st. 804-6. CAS 71481 (93 HL, 460 TL); South Africa, 27°03'S, 13°55'E, 1,000 m; *Poltava* tr. 487; 5.II.1970. ZMMGU P.19282 (57 HL, 265+ TL); South Africa, 31°47'S, 15°27'E, 1,500–1,600 m; *Fiolent* cr. 4, tr. 70; 18.III.1974. ZMMGU P.19283 (129 HL, 585+ TL); South Africa, 33°40'S, 17°16'E, 900 m; *Poltava* tr. 429; 1.1970. ZMMGU P-15643 (109 HL); Walvis Ridge, 33°17.7'S, 2°14.3'E, 928–1,115 m; *Prof. Mesiatsev* cr. 8, tr. 22. ZMMGU P-15690 (67 HL, 375+ TL); Walvis Ridge, 31°54'S, 2°06'E, 940–990 m; *Prof. Mesiatsev* cr. 8, tr. 24; 3.IX.1979. SAM 32937 (4 spec.); 34°55.5'S, 18°12.8'E; 894 m; RV *Africana* cr. 60, st. A7024; 12.III.1988. SAM 32938 (1 spec.); 34°53.6'S, 18°13.1'E; 901 m; RV *Africana* cr. 60, st. A7027; 13.III.1988. SAM 32946 (2 spec.); 33°18.6'S, 17°28.8'E; 480 m; RV *Africana* cr. 60, st. A6990; 5.III.1988. SAM 32947 (2 spec.); 34°53.6'S, 18°13.1'E; 901 m; RV *Africana* cr. 60, st. A7027; 13.III.1988. SAM 32948 (1 spec.); 34°55.6'S, 18°11.7'E; 903 m; RV *Africana* cr. 60, st. A7037; 14.III.1988. SAM 32960 (1 spec.); 26°43.6'S, 13.36.0'E; 900 m; RV *Africana* cr. 69, st. A8413; 21.I.1989. SAM 32937 (4 spec.); 34°55.5'S, 18°12.8'E; 894 m; RV *Africana* cr. 60, st. A7024; 12.III.1988. RUSI 25768 (156 HL, 740+ TL); off Cape Point, 33°25.8'S, 17°02.1'E; 826 m; 14.I.1986.

COUNTS AND MEASUREMENTS.—D. II,9-10 + 95-115; 1P. i17-i21; V. 8 (rarely 7 or 9); total GR-I (outer/inner) 7-9/11-13, GR-II 9-12/11-13; scales below 1D. 9.5-11, below 2D. 7-12., below mid-1D. 7-10, lat.1. 38-48

Total length 265-770 mm, HL 57-170 mm. The following in percent HL: snout 24.5-29; preoral 7-11 (15); interorbital (14) 16-20; orbit (bony) 19-23; suborbital (fleshy) 9-13; postorbital about 48-57; orbit to preopercle 44-50; upper jaw 40-45; barbel 21-34; outer gill slit 17-24; pre-A. 143-179; pre-1D. 118-129; isthmus to A. 82-111; body depth 62-89; 1D.-2D. interspace 21-40; height 1D. 60-84; length V. 43-70.

DESCRIPTION.—Head long, shallow, 4.2-5.0 in

TL (5.6 in one spec.), width 2 or less in HL; body more slender in young, becoming deep in mature adults; an elevated nape, very pronounced in large individuals (greater than about 130 mm HL) giving severe humpbacked appearance. Orbit small, 4-5 in HL; in larger adults (e.g., 93 mm HL from Gulf of Guinea, ZMMGU P.19281) anteroventral margin fleshy, especially so in larger specimens, where upper edge of suborbital difficult to determine. Snout low, bluntly pointed and slightly protruding beyond mouth in small specimens, but in larger specimens snout lower, less protruding (e.g., 93 mm HL specimen) or virtually nonprotruding (e.g., 138 mm HL specimen from the Madagascar Ridge, ZMMGU P.19280). Interorbital space flat or slightly convex; width less than orbit diameter. Mouth large, rictus extends posteriorly to below hind $\frac{1}{3}$ of orbit; maxillary notably wide, posterior edge about equal to least suborbital width, and extends to below hind edge of orbit. Barbel long, slender; length varies from about $\frac{1}{4}$ to $\frac{1}{3}$ HL. Suborbital region lacking a heavily scuted ridge; ridge low, poorly developed, especially in largest specimens (> 130 mm HL); upper shelf area broader than that below ridgeline. Sensory pores generally large and well developed along ventral surfaces of head, especially along ventral margin of snout, suborbital, preopercle, and mandibles. Preopercle with somewhat prolonged posteroventral margin, forming a shallow lobe. Interopercle broad, but almost entirely hidden behind preopercle, exposed posterior tip somewhat flaplike.

Gill opening wide, extending forward ventrally about to posterior edge of maxillary. Gill filaments long; outer rakers of first arch well developed, characterically (for subgenus) flaplike, shaped somewhat like a flattened spiny-headed club, usually one at or above angle; other rakers of more tubercular form.

Scales generally cover most of head and body. Naked areas limited on head to gill membranes, lips, median swath below snout tip in most specimens, ventral edge of suborbital and preopercle in some individuals, and anterior part of mandible. In a specimen 635+ mm from the Coral Sea (ZMMGU P.19276), virtually entire underside of snout, suborbital, preopercle, and mandible scaled; also a few small scales at tip of interopercle, but this specimen an exception. Scales on underside of head small; those on suborbital also small, but a file of small, thickened scales aligned above ridge; these, however, not

forming a longitudinal ridge. Scales dorsally on head have spinules aligned in longitudinal rows, which give surface a somewhat striated texture. Spinules on body scales numerous and closely packed, individual spinules greatly reclined, small, fine, aligned in either discrete subparallel or slightly convergent rows.

Premaxillary teeth with a broad band of small inner teeth and a single series of moderately enlarged and widely spaced, conical teeth forming outer boundary. Outer teeth rather broad tipped. Lower jaws with teeth clustered in a band anteriorly, but narrowing laterally to 3 or 4 irregular series; teeth larger along outer edge and similar in shape to outer premaxillary series but smaller.

Paired fins moderately developed; in largest specimens, barely or not at all extending past level of anus. Pelvic and pectoral origins about on same vertical, first dorsal behind this. Anal origin behind vertical through hind margin of first dorsal a distance about half length of first dorsal base. Interspace between first and second dorsal fins variable, somewhat greater than length first dorsal base in some, less than base in others. Second dorsal rudimentary over most of length, rays becoming well developed only near posterior quarter or so.

Pyloric caeca long, twice internasal width, bifid branching at base in some; distal count 10–18. Retia and gas gland numbers in one Mozambique Plateau specimen 5 or 6 (somewhat deteriorated); retia long, slender, convolutedly coiled.

Color in alcohol in large Coral Sea and New Zealand specimens light brown, overall, lips, jaws, and underside of head generally pale. Mouth and gill cavities dark gray or black (including rakers and arches, but not filaments). All but dorsal part of orbital rim blackish. Paired fins dusky. Distal margin of anal fin blackish, otherwise fin dusky. Indian Ocean and Atlantic specimens darker, medium to dark brown overall, fins blackish, underside of snout, lips, lower jaws, and gill membranes blackish; orbital rim entirely black.

SIZE.—To more than 85 cm TL.

DISTRIBUTION.—Throughout most of the Indian Ocean, east to New Zealand, and west to the Atlantic coast of Africa from South Africa in the south, to the Gulf of Guinea (6°S) in the north. Depth range 696–1,600 m, but most common around 900–1,200 m.

REMARKS AND COMPARISONS.—McCann and McKnight (1980) first recorded this species as *Coryphaenoides rudis* for a specimen collected

off New Zealand. Iwamoto (1986:335) recognized two small specimens from southern Africa as probable representatives of “an undescribed species related to *Coryphaenoides macrolophus*,” but because they were juveniles, he refrained from describing them as new. Subsequently, he and Shcherbachev examined numerous specimens in collections of ISH, FSFRL, AMS, IOAN, ZMMGU, and NMNZ, and were planning to describe the species. However, in the meantime, it was learned that Peter McMillan of New Zealand was also planning to describe the species from New Zealand and Australian collections. It was thought that McMillan’s description would long precede ours, but other commitments prevented him from completing his descriptions as hoped. Recent communication with McMillan suggests that his description of the longbeard grenadier will be published soon.

The species is similar to *Coryphaenoides dubius* Smith and Radcliffe, 1912, described from a single 425-mm specimen taken in the Philippines. They share in common a distinctive head profile, eight pelvic fin rays, a hump-backed nape, small eyes, and low blunt snout. However, the holotype and only known specimen of *C. dubius* has a much smaller mouth (the maxillary falling well short of the posterior margin of the orbit), cardiform teeth in a moderately broad band in the lower jaw, and a shorter barbel.

Relationships with a second undescribed species from the Tasman Sea that will be described by McMillan are apparently even closer, and we have had difficulty distinguishing the two. That species has been given the common name slender rattail (Paulin et al. 1989). (In keeping with our desire to avoid the term rattail for these fishes, we henceforth call it slender grenadier, and *Coryphaenoides* sp. 1 longbeard grenadier, in contrast to “long barbel rattail” of those authors.) So far as we can tell, all counts are similar and only a few proportional measurements can be used for comparisons. The slender grenadier has somewhat longer posterior nostrils (7–10% HL, cf. 4–8% [but only 3 of 21 specimens had a measurement exceeding 6.7%]), a wider internasal (15–17% HL, cf. 12–16%, usually 13–15%) and interorbital (18–21% HL, cf. 14–21%, usually less than 19%), and shorter head relative to total length. These features, however, overlap to a large degree and generally cannot be used alone for identification of the species. The slender grenadier has more extensive naked areas on the un-

derside of head, a smaller maximum size (about 43 cm TL in specimens we have examined, cf. 85 cm for the longbeard rattail), a more-slender body lacking the humped back, and the snout is generally more pointed and protruding.

The longbeard grenadier is highly distinctive in having a series of characters that sets it apart from most of its congeners, including the long, low head; broad maxillary; lobelike preopercle; elevated lappet-shaped gill rakers on first arch; wide gill openings that extend forward to nearly below posterior end of maxillary; long barbel; and fairly numerous gill rakers on either side of the first arch. Relationships with other members of the genus (aside from the slender grenadier) are obscure. The five or six retia and gas glands and the dentition pattern place it closest to members of subgenera *Chalinura* and *Nematonurus*, but the extent of squamation on the underside of the head, the spinulation on the scales, and the physiognomy of the head (especially its shallow, long shape) is quite different from those of *Chalinura* and *Nematonurus*. The species also lacks the characteristic row of scales along the leading edge of the snout, behind which are two lunate naked patches, a feature of most *Chalinura* (in this regard the species is similar to *C. striatulus*). The elongated head resembles to some extent that of *C. (Nematonurus) ferrieri* (Regan, 1913), and the rather extensive squamation on the underside of the head is reminiscent of the condition in *C. (N.) lecointei* (Dollo, 1900). But, in addition to the dentition differences, the distinctive gill rakers on the first gill arch and the low pelvic fin ray count set the species apart from members of subgenus *Nematonurus*.

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LITERATURE CITED

- ALCOCK, A. 1889. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator,' Commander Alfred Carpenter, R.N., D.S.O., commanding. No. 13. On the bathybial fishes of the Bay of Bengal and neighbouring waters, obtained during the seasons 1885-1889. *Ann. Mag. Nat. Hist.*, ser. 6, 4 (23): 376-399; (24):450-461.
- . 1890a. Natural history notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander R. F. Hoskyn, R.N., commanding. No. 16. On the bathybial fishes collected in the Bay of Bengal during the season 1889-1890. *Ann. Mag. Nat. Hist.*, ser. 6, 6: 197-222, pls. 8-9.
- . 1890b. Natural history notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander R. F. Hoskyn, R.N., commanding. No. 18. On the bathybial fishes of the Arabian Sea, obtained during the season 1889-90. *Ann. Mag. Nat. Hist.*, ser. 6, 6: 295-311.
- . 1892a. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator,' Lieut. G. S. Gunn, R.N., commanding. Series 2, No. 5. On the bathybial fishes collected during the season of 1891-92. *Ann. Mag. Nat. Hist.*, ser. 6, 10 (59):345-365, pl., 2 figs.
- . 1892b. Illustrations of the zoology of the Royal Indian Marine Survey Ship 'Investigator.' Fishes. Part I, pls. I-VII.
- . 1894a. Natural history notes from H.M. Indian Marine Survey Steamer 'Investigator,' Commander C. E. Oldham. R.N., commanding. Series 2, No. 11. An account of a recent collection of bathybial fishes from the Bay of Bengal and from the Laccadive Sea. *J. Asiat. Soc. Bengal* 63 (pt. 2):115-137, pls. 6-7.
- . 1894b. Illustrations of the zoology of the Royal Indian Marine Survey Ship 'Investigator.' Fishes. Part II, pls. VIII-XIII.
- . 1899. A descriptive catalogue of Indian deep-sea fishes in the Indian Museum, collected by the Royal Indian Marine Survey Ship 'Investigator.' Indian Museum, Calcutta. iii+211 pp., 8 pls., 1 map.
- AMAOKA, K., K. MATSUURA, T. INADA, M. TAKEDA, H. HATANAKA, AND K. OKADA. 1990. Fishes collected by the R/V *Shinkai Maru* around New Zealand. Japan Marine Fishery Resource Research Center, Tokyo. 410 pp.
- BRAUER, A. 1906. Die Tiefsee-Fische. I. Systematischer Teil. Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia," 1898-1899, 15:1-432, text-figs. 1-176, pls. 1-18.
- DOLLO, L. 1900. *Macrurus lecointei*, poisson abyssal nouveau recueilli par cette expédition Antarctique Belge. *Bull. Acad. Roy. Belgique (Sci.)*(6): 1-20.
- GILBERT, C. H. 1905. The deep-sea fishes of the Hawaiian Islands. Pp. 575-713, figs. 230-276, pls. 66-101 in *The aquatic*

- resources of the Hawaiian Islands. D.S. Jordan and B. W. Evermann, eds. Bull. U.S. Fish Comm. 1903, 22(pt. 2, sect. 2).
- GILBERT, C. H. AND C. L. HUBBS. 1916. Report on the Japanese macrouroid fishes collected by the United States fisheries steamer "Albatross" in 1906, with a synopsis of the genera. Proc. U.S. Natl. Mus. 51: 135-214, pls. 8-11.
- GILBERT, C. H. AND C. L. HUBBS. 1920. The macrouroid fishes of the Philippine Islands and the East Indies. U.S. Natl. Mus. Bull. 100, 1 (pt. 7): 369-588, figs. 1-40.
- GUNNERUS, J. E. 1765. Efterretning om bergglaxen, en rar norsk fisk, som kunde kaldes: *Coryphaenoides rupestris*. K. Norske Videnskabers Selskab Skrifter Trondhjem, 3(4):50-58, pl. 3, fig. 1, 2.
- GÜNTHER, A. 1877. Preliminary notes on new fishes collected in Japan during the expedition of H.M.S. "Challenger." Ann. Mag. Nat. Hist., ser. 4, 20: 433-447.
- GÜNTHER, A. 1878. Preliminary notices of deep-sea fishes collected during the voyage of H.M.S. "Challenger." Ann. Mag. Nat. Hist., ser 5, 2: 17-28. 447.
- GÜNTHER, A. 1887. Report on the deep-sea fishes collected by H.M.S. Challenger during the years 1873-76. Rep. Sci. Res. Challenger 22(Zool.)(pt. 1)[text]: 1-335; (pt. 2)[plates]: pls. 1-73.
- IWAMOTO, T. 1970. The R/V Pillsbury Deep-Sea Biological Expedition to the Gulf of Guinea, 1964-65. 19. Macrouroid fishes of the Gulf of Guinea. Stud. Trop. Oceanogr. 4(pt.2): 316-431.
- IWAMOTO, T. 1986. Family Macrouridae. Pp. 330-341 in Smiths' sea fishes. M.M. Smith and P. C. Heemstra, eds. Macmillan South Africa, Johannesburg.
- IWAMOTO, T. AND Y. I. SAZONOV. 1988. A review of the southeastern Pacific *Coryphaenoides* (sensu lato) (Pisces, Gadiformes, Macrouridae). Proc. Calif. Acad. Sci. 45(3): 35-82, figs. 1-9.
- IWAMOTO, T. AND Y. N. SHCHERBACHEV. 1991. Macrouroid fishes of the subgenus *Chalinura*, genus *Coryphaenoides*, from the Indian Ocean. Proc. Calif. Acad. Sci. 47(7): 207-233, figs. 1-17, tabs. 1-7.
- IWAMOTO, T. AND D. L. STEIN. 1974. A systematic review of the rattail fishes (Macrouridae: Gadiformes) from Oregon and adjacent waters. Occas. Pap. Calif. Acad. Sci. (111):1-79.
- LEVITON, A. E. AND R. H. GIBBS, JR. 1988. Standards in herpetology and ichthyology. Standard symbolic codes for institution resource collections in herpetology and ichthyology. Supplement No. 1: additions and corrections. Copeia 1988(1):280-282.
- LEVITON, A. E., R. H. GIBBS, JR., E. HEAL, AND C. E. DAWSON. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. Copeia 1985(3):802-832.
- MARSHALL, N. B. 1973. Family Macrouridae. Pp. 496-665 in Fishes of the western North Atlantic. Daniel M. Cohen, ed. Mem. Sears Found. Mar. Res. (1)(pt.6).
- MARSHALL, N. B. AND T. IWAMOTO. 1973. Genus *Coryphaenoides*. Pp. 565-600, in Fishes of the western North Atlantic. Daniel M. Cohen, ed. Mem. Sears Found. Mar. Res. (1)(pt.6).
- MAUL, G. E. 1951. Monografia dos peixes do Museu Municipal do Funchal. Familia Macrouridae e Merlucciidae. Bol. Mus. Munic. Funchal 5 (art. 12):5-55, figs.
- MCCANN, C. AND D. G. MCKNIGHT. 1980. The marine fauna of New Zealand: macrouroid fishes (Pisces: Gadida). New Zealand Oceanogr. Inst. Mem. 61:1-91.
- MENON, A.G.K. AND K.V. RAMA RAO. 1970. Type-specimens of fishes described in the R.I.M.S. "Investigator" collections (1884-1926). Copeia 1970(2):377-378.
- MENON, A.G.K. AND G.M. YAZDANI. 1968. Catalogue of type specimens in the Zoological Survey of India. Part 2. Fishes. Rec. Zool. Surv. India 61: 91-190.
- NORMAN, J.R. 1939. Fishes. Sci. Rep. John Murray Exped. 1933-1934, 7(Zool.)(1): 1-116.
- PAULIN, C., A. STEWART, C. ROBERTS, AND P. McMILLAN. 1989. New Zealand fish, a complete guide. Natl. Mus. New Zeal. Miscell. Ser. 19. 279 pp.
- RADCLIFFE, L. 1912. Descriptions of a new family, two new genera, and twenty-nine new species of anacanthine fishes from the Philippine Islands and contiguous waters. Proc. U.S. Natl. Mus. 43: 105-140, pls. 22-31.
- REGAN, C. T. 1913. The Antarctic fishes of the Scottish National Antarctic Expedition. Trans. Roy. Soc. Edinburgh 49(pt. 2)(2): 229-292, pls. 1-11.
- SAZONOV, Y.I. AND T. IWAMOTO. 1992. Grenadiers (Pisces, Gadiformes) of the Nazca and Sala y Gomez ridges, southeastern Pacific. Proc. Calif. Acad. Sci. 48(2):27-95, 37 figs., 7 tabs.
- SHCHERBACHEV, Y.N., Y.I. SAZONOV, AND T. IWAMOTO. 1992. Synopsis of the grenadier genus *Kuronezumia* (Pisces: Gadiformes: Macrouridae), with description of a new species. Proc. Calif. Acad. Sci. 48(3): 97-108, 9 figs., 1 tab.
- WEBER, M. 1913. Die Fische der SIBOGA-Expedition. Siboga Exped. 57: 1-719, pls. 1-12.
- WEBER, M. AND L. F. DE BEAUFORT. 1929. The fishes of the Indo-Australian Archipelago, 5. E. J. Brill. Leiden. 458 pp.
- WOOD-MASON, J. AND A. ALCOCK. 1891. Natural history notes from H.M. Indian marine survey steamer 'Investigator,' Commander R.F. Hoskyn, R.N., commanding. Series 2, No. 1. On the results of deep-sea dredging during the season 1890-91. Ann. Mag. Nat. Hist., ser. 6, 8: 16-34; 119-138, 2 pls.

