PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES

Volume 54, No. 17, pp. 279–301, 7 figs., 3 tables July 31, 2003

The Grenadier Genus *Mataeocephalus* Berg, 1898 (Teleostei, Gadiformes, Macrouridae), with Descriptions of Two New Species

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We recognize six species of *Mataeocephalus: M. acipenserinus, M. adustus, M. cristatus* sp. nov., *M. tenuicauda, M. kotlyari* sp. nov., and *M. hyostomus*. The last species was formerly considered to belong to *Hyomacrurus*, a genus that was thought, based on its six branchiostegal rays, to be most closely related to *Coryphaenoides*, but differing in the advanced placement of the anus. We consider *Hyomacrurus* to be a synonym of *Mataeocephalus*, but retain it as a subgenus containing two species, *M. kotlyari* and *M. hyostomus*. *Mataeocephalus microstomus* Regan and *M. nigrescens* Smith and Radcliffe are relegated to the synonymy of *M. acipenserinus*. A revised diagnosis of *Mataeocephalus* is provided, and its status within the group of macrourids with seven branchiostegal rays is discussed.

From the mid-1960s through the 1980s research vessels of the former Soviet Union conducted extensive exploratory trawling cruises in the Atlantic, Indian and Pacific oceans. Many of the areas explored had previously been infrequently or never before sampled. The thalassobathyal fish fauna of oceanic elevations (e.g., sea mounts, guyots, ridges, plateaus, etc.) within the tropical and subtropical waters of the Indian Ocean and western Pacific is particularly rich in grenadiers of the families Bathygadidae and Macrouridae (Shcherbachev et al. 1979; Shcherbachev 1984, 1987). Our studies of these grenadiers have resulted in the description of numerous new species and new records for the area, as well as resolution of a number of difficult taxonomic problems (Sazonov and Shcherbachev 1982, 1985; Shcherbachev and Piotrevsky 1982; Merrett et al. 1983; Iwamoto and Sazonov 1988; Iwamoto and Shcherbachev 1991; Shcherbachev et al. 1986, 1992; Iwamoto and Sazonov 1994; Shcherbachev and Iwamoto 1995; Iwamoto and Williams 1999).

The genus *Mataeocephalus* was represented in several of these collections, certain members of which were from localities that have helped resolve some perplexing questions of identification. Included among these specimens was an undescribed species taken at widely separated localities in the western Pacific and Indian Ocean. No representative of subgenus *Hyomacrurus* was collected by Soviet vessels, but in 1995, the Taiwanese research vessel *Fishery Researcher I* made a series of trawl hauls off the east coast of southern Luzon, Philippines. One of those trawls in the Lagonoy

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Gulf near the type locality of *Macrourus hyostomus* Smith and Radcliffe, 1912 resulted in the collection of six specimens of that species, all in good condition. Those specimens allowed us to compare the species with one previously recorded as an undescribed species of *Mataeocephalus* (Iwamoto and Merrett 1997; Merrett and Iwamoto 2000; Iwamoto and Graham 2001) and collected by the French in the Loyalty Islands, Vanuatu, and the Chesterfield and Bellona Plateau, and by the Australians off the northwestern and southeastern corners of Australia. The two species are closely similar, but sufficient differences were found to justify designating the latter as a new species. A third species, *H. heyningeni* (Weber, 1913), had been assigned to the genus by Gilbert and Hubbs (1916:423) without their having examined specimens. Two of us (YIS, YNS) have examined the types and determined that they represent a species of *Coryphaenoides*.

The purpose of this paper is to record the new material of *Mataeocephalus*, redefine the diagnosis of the genus, describe two new species, and discuss the relationships of the two subgenera.

Materials and Methods

This study was initiated by Sazonov, who with Shcherbachev, had examined a substantial number of specimens collected by vessels of the former Soviet Union. Those collections were augmented by types and other *Mataeocephalus* material Sazonov had examined in the USNM and CAS in 1993 during a visit to the U.S. Sazonov and Shcherbachev also examined material in the Zoological Museum of Copenhagen University in 1989 and the Zoological Museum of Hamburg University in 1995 and 2001. Sazonov had prepared a rough draft of a manuscript in which he had descriptions of four species (including the two new ones) of *Mataeocephalus*, a key to the species, and two large tables of measurements and counts. He sent this draft to Iwamoto for comment and additions. Partly on account of other commitments, but also because of some misgivings about Sazonov's treatment of certain species, Iwamoto declined to participate in the project, but encouraged Sazonov to publish his results with Shcherbachev. However, about that same time, Sazonov's research emphasis took a turn towards the alepocephaloids, especially those from Australia and New Caledonia. Consequently, nothing further was done on the *Mataeocephalus* manuscript. His sudden and most-unexpected death in March 2002 left the project hanging, and Shcherbachev took over the job of completing those papers that Sazonov had in the works. It was with Shcherbachev's encouragement that Iwamoto agreed to help complete the paper. The manuscript was completely reworked and a substantial amount of information was added, notably the introductory remarks, the remarks under the genus and subgenera, and the section on *Hyomacrurus*, including the description of *H. hyostomus*. Sazonov's descriptions of *M. cristatus and M. adustus* remain relatively intact, but all others were extensively modified.

Our study specimens are deposited in AMS, BMNH, CAS, CSIRO, MNHN, USNM, ZMB, ZMH, ZMMSU, and ZSI. Institutional abbreviations are taken from Leviton et al. (1988) and later amended in Leviton and Gibbs (1985). The reader is referred to Eschmeyer's (1998) *Catalog of Fishes* for detailed references and authorities to taxonomic names used. Methods for taking counts and making measurements follow procedures of Gilbert and Hubbs (1916) and slightly modified by Iwamoto (1970) and Iwamoto and Sazonov (1988).

DESCRIPTIONS

Genus *Mataeocephalus* Berg, 1898

Coelocephalus Gilbert and Cramer, 1897 (type species *Coelocephalus acipenserinus* Gilbert and Cramer 1897, by monotypy).

Mataeocephalus Berg, 1898 (replacement name for *Coelocephalus* Gilbert and Cramer, 1897, preoccupied by *Coelocephalus* Clark 1860, in Coleoptera).

Hyomacrurus Gilbert and Hubbs, 1920 (type species *Macrourus hyostomus* Smith and Radcliffe, 1912, by original designation)

DIAGNOSIS.— Branchiostegal rays 6 or 7; precaudal vertebrae 12–14; anal pterygiophores before first caudal vertebra 10–18. Retia and gas glands two, drumming muscles in males. Anus situated within a small to medium-sized periproct which is variously removed from anal fin origin. A rudimentary to small light organ usually developed before anus. Spinous second ray of first dorsal fin with rudimentary to well-developed serrations along leading edge; ray greatly elongated in some. Mouth small, length upper jaw usually about one-third length of head. Barbel short, thick at base, rapidly tapering to fine tip. Gill membranes broadly attached across isthmus, without broad free fold, greatly restricting opercular opening. Gill arches restricted at upper and lower ends by broad membrane folds connecting adjacent arches; first arch broadly connected laterally to gill cover by membrane or folds of skin, greatly restricting outermost gill slit. Outer series of rakers on first gill arch absent or few and rudimentary, consisting of one or more tiny spinules in each. Dentition in bands in both jaws; those in upper jaw in short, broad, truncated band in most species, in tapered band in others. Teeth in lower jaw in tapered band, short in some not reaching to end of rictus, longer in others reaching to end of rictus. Underside of head either covered with small scales or mostly naked. Tip of snout armed with a pair of stout conical tubercular scales covered with small, short spinules and joined mesially near their bases; leading edge of snout with characteristic series of (usually) seven stout spiny scales between scutes at terminal and lateral angle. Numerous conspicuous free neuromasts along leading edge of snout and on ventral surfaces. Behind leading edge of snout a deep scaleless groove connecting to a longitudinal groove running along each side of broad median ridge of scales. Suborbital ridge sharp and angular in cross section in most species, dividing head into dorsal and ventral parts; a broad shelf dorsally armed with coarsely spinulated scales above edge and separated from an upper smaller series of scales by a groove lined with a file of free neuromasts.

REMARKS.— The genus *Coelocephalus* was established by Gilbert and Cramer (1897) for their new Hawaiian species *C. acipenserinus.* Because the genus name had been previously used in Coleoptera, Berg (1898) provided the replacement name *Mataeocephalus*. The genus was based solely on its difference from *Caelorinchus* in having the second dorsal spine serrated, a point not lost by Gilbert and Cramer (1897:423), who stated that the character "is of doubtful value, especially in view of the rudimentary serrae present on the second dorsal spine of *Coelorhynchus gladius.*"

Despite this inauspicious beginning, the genus concept persisted, and in 1899, Garman described *Macrurus tenuicauda* from the Gulf of Panama and recognized the close similarity of his new species to *M. acipenserinus.* He made the interesting observation: "branchiostegal rays commonly seven, frequently six; in each case there are seven either on one side or the other or on both sides" (Garman 1899:216). Regan (1908:221) described *Macrurus microstomus* from a single 18-cm specimen taken off Saya de Malha Bank in the western Indian Ocean. In his brief description, he gave six as the number of branchiostegal rays.

In 1912, Radcliffe described two other species (*M. adustus* and *M. nigrescens*) from the rich *Albatross* collection from the Philippines. He, too, saw similarities in the genus to *Caelorinchus*, especially in head shape, but he noted that "the spinous occipital ridges characteristic of the species of that genus are lacking," (Radcliffe 1912:125). He described two other characters of importance, "the spinigerous tubercle that is normally bifid" at the tip of the snout, and "the submarginal groove anterior to" the side of the snout. Radcliffe noted the presence of this latter character in *Macrourus hyostomus* and concluded, "the intergradations are such as to suggest the desirability of considering *Mataeocephalus* and *Coelorhynchus* as subgenera under *Macrourus"* (*loc. cit.*).

In their monumental work "The macrouroid fishes of the Philippine Islands and East Indies," Gilbert and Hubbs (1920:563) stated: "This genus [*Mataeocephalus*] is not intermediate between *Macrourus* and *Coelorhynchus* as Radcliffe has suggested. It is really related to *Lionurus* in a manner analagous [*sic*] to that by which *Coelorhynchus* is related to *Coryphaenoides* (*Macrourus*). The similarity . .in snout. . .and infraorbital ridge, is due to convergence rather than to common origin." (It should be noted that their concept of *Lionurus* corresponds to certain genera currently accepted as members of the seven-branchiostegal-rayed group, including *Kumba, Kuronezumia, Lucigadus, Nezumia, Sphagemacrurus, Ventrifossa*, and a few others. Currently, *Lionurus* is recognized as a member of the six-branchiostegal-rayed group, and often treated as a subgenus of *Coryphaenoides*.)

More than half a century after Gilbert and Hubbs's (1920) revision, Marshall (1973) published his extensive work on the Macrouridae of the western North Atlantic. Marshall provided a key to all genera of grenadiers and a diagnosis of *Mataeocephalus* that included several new characters that he had discovered, among which were "no outer gill rakers on 1st arch, abdominal vertebrae 13–14,.swim bladder with 2 retia mirabilia," and "anus variable in position, either just before the origin of the anal fin or between the origins of the pelvic and anal fins" (*ibid*, p. 618). In his key and diagnosis, Marshall recorded the number of branchiostegal rays as seven, despite Garman (1899) and Regan's (1908) findings of variability in that count.

Iwamoto (1979:144–145) modified Marshall's diagnosis of the genus and placed emphasis on the broad naked area surrounding the anus and its location relative to the anal and pelvic fins, but recognized the variable nature of this character, especially as it concerned *M. adustus*, which he considered the most primitive member. He considered the genus to be closest to *Nezumia* Jordan, 1904, based on the presence of seven branchiostegal rays and the nature of the periproct region, among other characters.

The diagnosis we provide above is highly tentative and in need of more definitive characters, as most of those listed are plesiomorphic for the seven-branchiostegal-rayed macrourids or are found among a large number of species. The character differences between *Mataeocephalus* and *Hyomacrurus* are weak, with only the lanceolate scale spinules and invariable six branchiostegal rays in the latter seemingly of importance. Lanceolate scale spinules, however, are known in many grenadier genera, and the presence of six or seven branchiostegal rays in *M. tenuicauda* suggests that the character can be variable within a taxon. On this basis, we consider *Hyomacrurus* to be a synonym of *Mataeocephalus*, although warranting subgeneric standing. The entire classification of macrourids with seven branchiostegal rays must be considered uncertain, as no comprehensive phylogenetic analysis has been made of this large group. The genera are for the most part poorly defined, and it is our feeling that several, perhaps many, may prove to be paraphyletic or polyphyletic.

The following key and descriptions should allow the reader to identify with confidence adults of the *Mataeocephalus* species so far as we know them. Owing to the breadth of geographic coverage represented by our examined material, we feel it unlikely that additional species will be

found except by division of currently accepted ones, in which case the widespread *M. acipenserinus* is a likely candidate (see below). The genus is confined to subtropical and tropical waters of the Indo-Pacific (Iwamoto 1979:144). It is the only grenadier genus with more than one species that is absent from the Atlantic.

Key to Species of *Mataeocephalus*

1a. Underside of snout fully or almost fully covered with scales. 2
1b. Underside of snout naked except for characteristic overlapping series along anterior leading edge 4

2a. Branchiostegal rays 7; spinules on body scales slender, conical 3
2b. Branchiostegal rays 6; spinules on body scales narrowly lanceolate. (subgenus *Hyomacrurus*) 5

3a. Spinules on median row of body scales not enlarged; scales along narrowest part of suborbital shelf in 4–6 rows, those immediately below orbit small, not thickened; height 1D much greater than head length . . . . . *Mataeocephalus* (*M.*) *adustus*
3b. Spinules on median row of body scales slightly enlarged, giving a faintly striated appearance to body surface; scales on suborbital shelf in 2 or 3 distinct rows, the lower row separated from those above by a line of sensory neuromasts, the lower row thickened, stoutly spinulated; height 1D less than 135% HL(usually 50–90%)*Mataeocephalus* (*M.*) *cristatus* n.sp.

4a. A dermal window of light organ extending anteriorly from periproct; 5.5–9.5 (usually 7–9) scale rows below origin of second dorsal fin. . . . . *Mataeocephalus* (*M.*) *acipenserinus*
4b. No dermal window of light organ before periproct; 9–11 (rarely 8) scale rows below origin of second dorsal fin. . . . . *Mataeocephalus* (*M.*) *tenuicauda*

5a. Pyloric caeca 16–19; scales below mid-base 1D 4.0–5.5, below 2D 4.5–5.5; V 7, rarely 6; height 1D 88–119% HL. . . . . *M.* (*Hyomacrurus*) *kotlyari* n.sp.
5b. Pyloric caeca 8–13; scales below mid-base 1D 3.5–4.5, below 2D 5.0–7.5; V 7–8, rarely 9; height 1D 124–295% HL. . . . . *M.* (*Hyomacrurus*) *hyostomus*

Subgenus *Mataeocephalus* Berg, 1897

DIAGNOSIS. Branchiostegal rays 7, rarely 6. Body scales densely covered with slender, reclined, needleshaped spinules. Anus situated close before anal fin or far anterior, between anal and pelvic fins. Underside of head scaled or naked.

Mataeocephalus acipenserinus (Gilbert and Cramer, 1897)

Fig. 1; Table 1

Coelocephalus acipenserinus Gilbert and Cramer, 1897:422–423, pl. 42, fig. 1 (lectotype USNM 47721; Hawaiian Is.; 545–686 m).

Macrurus (*Coelorhynchus*) *acipenserinus*: Lloyd, 1909:159 (Bay of Bengal; 1134 m).

Macrurus macrolophus (*nec* Alcock): Brauer 1906:266 (Somalia; 628–1134 m).

Mataeocephalus acipenserinus: Berg, 1898: 41. Gilbert, 1905:676–677 (Hawaii; 406–911 m). Iwamoto, 1990: 246, fig. 555 (compiled). Sazonov and Iwamoto, 1992:70 (Sala-y-Gomez; 730–800 m). Iwamoto and Merrett, 1997:533–534, fig. 26 (Chesterfield and Bellona Plateau, Loyalty Islands, Wallis and Futuna Islands; 760–900 m). Iwamoto and Williams, 1999:188–189, fig. 38 (WA, Australia; 650–945 m). Merrett

and Iwamoto, 2000: 769 (Vanuatu, Wallis and Futuna Islands; 748–1220 m). Iwamoto and Graham, 2001: 484, fig. 98 (NSW, Australia; 823–933 m).

Macrourus microstomus Regan, 1908: 221, pl. 23, fig. 2 (Saya de Malha Bank; 549–914 m).

Mataeocephalus microstomus: Norman, 1939:52 (Zanzibar and Maldive areas; 640–797 m); Shcherbachev, 1987: 7 (listed; Saya de Malha and off Sumatra; 600–875 m).

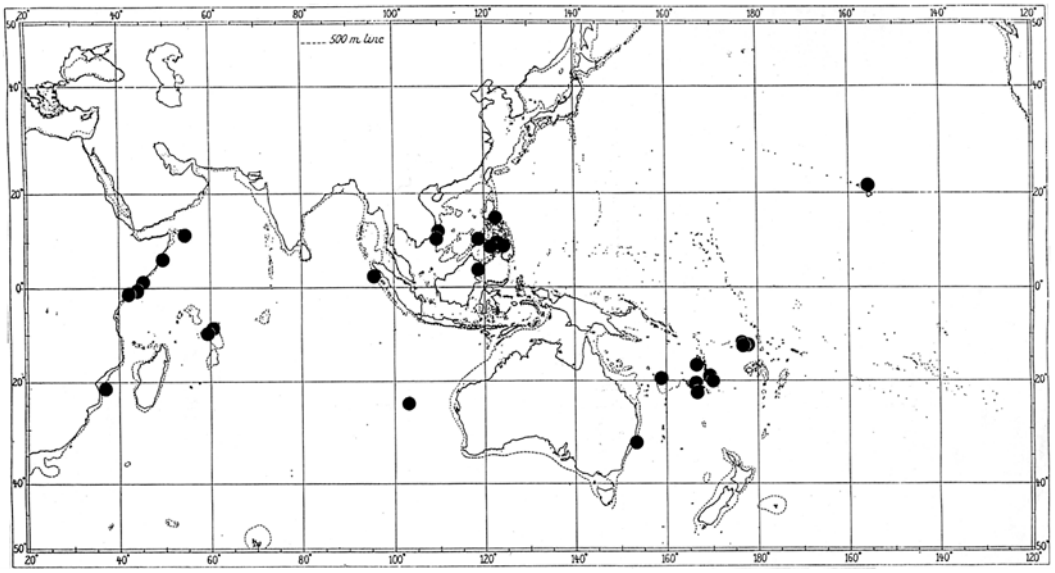
Mataeocephalus nigrescens Smith and Radcliffe in Radcliffe, 1912: 125, pl. 28, fig. 2 (holotype USNM 72492; Philippines; 1344 m). Gilbert and Hubbs, 1920: 563 (Philippines; listed). Iwamoto, 1990:245, fig. 553 (in key).

Diagnostic description.— Branchiostegal rays 7; V 7–8, P i17–i25; precaudal vertebrae 13–14 (n = 4); anal pterygiophores before first caudal vertebra 17–18 (n = 4). Snout length 34–43% of HL; orbit diameter 27–35%; interorbital width 18–24%; orbit to angle of preopercle 27–36%; upper jaw 19–28%. Teeth in lower jaw in short lunate patch. Underside of head anterior to lower jaw naked; scales on vertical portion of infraorbital shelf enlarged, scutelike, in two rows, those in lower series largest. Second ray of 1D with 4–11 sparsely set denticles and a filamentous tip, sometimes notably elongated. Body scales with reclined conical spinules in 5–12 parallel to slightly diverging rows; rarely, spinules in middle row slightly enlarged. Light organ variably developed, appearing as only a slightly thickened anterior portion of periproct to a subtriangular or pear-shaped anterior extension of periproct. Anus within periproct and removed from anal-fin origin, usually closer to anal fin than to insertion of pelvic fin.

Counts and measurements (see Table 1).

Distribution.— Widely distributed in tropical waters of the Indo-Pacific region (Fig. 1). In the Indian Ocean the species has been recorded from the Saya de Malha Bank (type locality of *M. microstomus*), off Zanzibar and the Maldives (Norman 1939), near the coast of Mozambique and Somalia, off Socotra, near Indostan, off Sumatra, and off Western Australia. In the Pacific Ocean it has been recorded from Hawaii (type locality of *M. acipenserinus*), Philippine seas (type locality of *M. nigrescens*), South China Sea, Tasman Sea off the southeastern coast of Australia, off New Caledonia, and the Sala y Gomez Ridge (Sazonov and Iwamoto 1992). Capture depths range from about 600 to 1300 m.

Remarks.— We have not examined the holotype of *M. microstomus*, which was inadequately described in the original description. We did, however, examine a good series of *Mataeocephalus* from Saya de Malha Bank on the Mascarene Plateau (Table 1), the type locality of the species, which support our synonymizing of the species with *M. acipenserinus.* Our comparison of the type specimens of *M. nigrescens* with specimens of *M. acipenserinus* from the Indian Ocean found them indistinguishable in almost all characters except for a slightly higher range of upper jaw lengths (ca. 22–28% HL compared with 19–24% in *acipenserinus*) and a relatively shorter anterior projection of the anterior dermal window of the light organ. Such differences hardly suffice to separate the two at the species level. Similarly, *M. acipenserinus* from the type locality (Hawaii) are essentially indistinct from those taken off the Sala-y-Gomez Ridge in the southeastern Pacific. Iwamoto (1990) used the distance orbit to angle of preopercle to distinguish *M. nigrescens* and *M. acipenserinus*, but from our data (see Table 1) this character shows such overlap as to be of no value. Other characters, including suborbital width, interdorsal space, and upper-jaw length, varied slightly from population to population, but in general, the differences were insufficient to recognize more than a single species. For example, the type specimens of *M. nigrescens* differ from the type specimens of *M. acipenserinus* in their shorter external projection of the light organ, fewer scales between the lateral line and middle of the first dorsal fin, and longer distance anus to anal-fin origin. However, fishes from the South China Sea and Indian Ocean are intermediate in those characters. The supposed difference between the two nominal species in number of



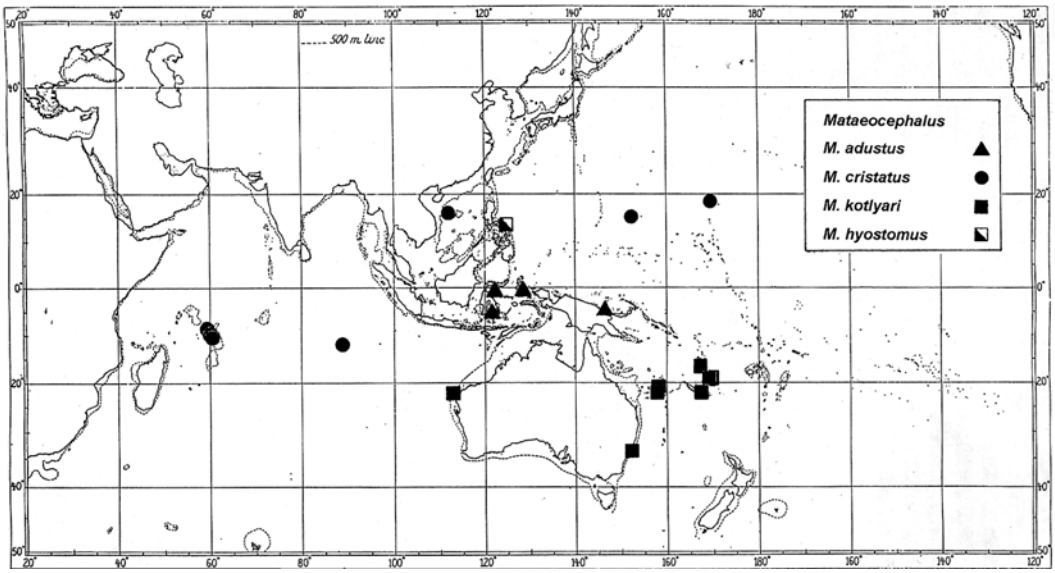


FIGURE 1 (above). Collection localities of *Mataeocephalus acipenserinus* in the Indo-West Pacific. Captures in the southeastern Pacific (Sala y Gomez Ridge) are not shown.

FIGURE 2 (below). Collection localities of *Mataocephalus adustus, M. cristatus, M.* (*Hyomacrurus*) *hyostomus* and *M.* (*Hyomacrurus*) *kotlyari* in the Indo-West Pacific.

spinule rows on body scales (5–6 in *M. acipenserinus*, 8–10 in *M. nigrescens*) is likely attributable to size, with smaller specimens having 5–9 rows and larger ones having 8–12. The extreme variability in the shape and length of the dermal window of the light organ also does not allow us to use this character for diagnostic purposes. The geographic variation in morphometric characters we have seen in this species resembles that recorded by Sazonov and Shcherbachev (1997) for *Sokodara misakia* and *S. johnboborum*, viz., fishes from the western Indian Ocean are closer to

TABLE 1. Counts and measurements of *Mataeocephalus acipenserinus* from different localities. Counts within parentheses are rare for specimens in each area. The western Indian Ocean specimens come from Socotra, Somalia, Mozambique & the Mascarene Plateau

Locality	*w. Indian Ocean*	*India*	*Sumatra*	*Western Australia*	*South China Sea*	*Philippines*	*e. Australia*	*Hawaii*	*Sala y Gomez*
No. of spec.	n=32	n=1	n=5	n=10	n=26	n=12	n=2	n=14	n=21
TL, mm	141+--254+	160+	211+--235+	145+--188+	151+--217+	139+--247+	246+--275+	92+--177+	118--250
HL, mm	27.7–64.2	34.7	45.6–59.5	36–46	31.5–48	35.3–55	51.2–53.5	25.3–51.5	26.5–54
	In percent of head length								
Snout len.	35–43	38	38–39	36–42	34–41	37–40	40–41	37–42	39–44
Orbit	27–34	27	29–32	28–33	28–35	29–33	29–29	27–34	29–34
Interorb.	17–21	20	19–22	21–23	18–23	19–24	22–24	20–24	20–23
Postorb.	28–34	32	31–33	28–32	30–33	31–36	32–33	30–33	26–33
Orb-preop	27–34	31	31–34	29–32	30–34	32–36	31–31	27–31	28–35
Suborb.	13–16	16	13–16	15–17	14–17	16–17	14–15	13–15	14–17
Up. jaw	19–24	31	19–24	20–24	22–25	22–28	21–23	21–24	20–28
Barbel	4-–7	4	4–8	5–7	5–7	4-–8	6–6	3–6	4–9
Anus-A.	4-–13		11–18	8–14	11–25		11–15	5–13	6–12
Depth	47–68		54–61	50–58	49–59	55–65	57–63	49–61	47–60
1D. ht.	54-–132*		79–92	51–62	57–59		59	59–63	50–63
P. len.	44–52		42–46	38–50	37–49	39–44	46	42–59	41–57
V. len.	39–57		42–54	44–58	36–56	38–49	48	42–51	45–70
1D.-2D.	27–41		31–49	20–36	27–41	30–39	29–34	17–33	14-–32
	Counts								
1D.	II,8–10	II,10	II,8–9	II,8–9	II,7–10	II,8–10	II,9	II,8–10	II,8–10
P.	i,18–23	I,20	i,19–24	i,18–22	i,19–23	I,17–21	i,18–23	i,19–25	i,20–25
V.	(7)8	7	8	(7)8	(7)8	8	8	8	(7)8
GR-I(int.)	6–7	6	6	6–7	6–8	6–8	6–8	6–7	6–8
Scales 1D.	7–8(9)	7–8	6–7	7–8	6–7	(6)7–8	8–9	8–9	8–9
--mid-1D	5–6.5(7.5)		5–6.5	5–6	5–6.5	5–6.5	5.5–6.5	6–7.5	6–7.5
--2D.	(5.5)6.5–8		6.5–8.5	7–8.5	7.5–8	5.5–7.5	8–9	8–8.5	7–9
Pyl.caeca	10–19	10	13–17	14-–16	13–15				14–15

those from the South China Sea than to fishes from the Sala-y-Gomez Ridge or Hawaiian Islands (the type locality).

For the reasons given above, we cannot support continued recognition of *M. nigrescens* and *M. microstomus* as species distinct from *M. acipenserinus.* Minor differences between populations of *M. acipenserinus* appear to exist, but our materials are insufficient to analyze intrapopulational relationships. We recognize *M. tenuicauda* as a separate species based on a number of differences from *M. acipenserinus*. It has a greatly reduced internal lens of the light organ, lacks an anterior

projection of the periproct, has 8.5–11 scale rows between the lateral line and origin of the second dorsal fin, and attains a somewhat larger size than *M. acipenserinus* (to about 71 mm HL, vs. about 64 mm). The two species have 17–18 anal pterygiophores before first caudal vertebra, many more than the 9–11 of the other species.

MATERIAL EXAMINED.— LECTOTYPE (here designated): USNM 47721 (39.6 mm HL, 134+ mm TL) and PARALECTOTYPES USNM 47721 (3, 24–47.5 HL, 118+-161+ TL); Kaiwi Channel, 21°12′N, 157°38′30″W; 375 fm [686 m]; ALBATROSS sta. 3474.

PACIFIC OCEAN. **Hawaiian Islands**: USNM 47728 (7, 25.3–47.5 HL, 92+-176+ TL); 21°08′N, 157°43′W; 642 m; ALBATROSS sta. 3475. CAS-SU 3142 (4, 44–51.5 HL, 161+-177+ TL); 21° 08'30"N, 157°49′W; 627 m; ALBATROSS sta. 3470. **Philippines**: USNM 72942 (holotype of *M. nigrescens*, 51 HL, 247+ TL); 9°12′45″N, 125°20′E; 735 fm [1344 m]; ALBATROSS sta. 5492. USNM 149306 (paratypes of *M. nigrescens*, 44 HL, 203+ TL); 9°37′05"N, 121°12′37″E; 340 fm [622 m]; ALBATROSS sta. 5424. USNM 149307 (paratypes of *M. nigrescens*, 41.5 HL, 182+ TL); 9°37′45″N, 121°11′E; 495 fm [905 m]; ALBATROSS sta. 5425. USNM 149309 (4 paratypes of *M. nigrescens*, 43–55 HL, 162+-225+ TL); 9°38′30″N, 121°11′E; 508 fm [929 m]; ALBATROSS sta. 5423. USNM 149310 (paratype of *M. nigrescens*, 49.2 HL, 239+ TL); 8°34′48″N, 124°01′E; 700 fm [1280 m]; ALBATROSS sta. 5515. USNM 149311 (2 paratypes of *M. nigrescens*, 40–41.8 HL, 150+-154+ TL); 4°06′50″N, 118°47′20″E; 347 fm [635 m]; ALBATROSS sta. 5586. USNM 149312 (paratype of *M. nigrescens*, 35.3 HL, 139+ TL); 10°57′45″N, 118°38′15″E; 375 fm [686 m]; ALBATROSS sta. 5348. USNM 149313 (2 of 3 paratypes of *M. nigrescens*, 47–52.8 HL, 178+-215+ TL); 13°21′00″N, 122°18′45″E; 530 fm [969 m]; ALBATROSS sta. 5219. **Sala-y-Gomez Ridge**: see Sazonov and Iwamoto (1992: 71) for list of specimens. **South China Sea**: ZMMSU P-19496 (5, 36–48 HL, 160+-217+ TL); 11°33.2′N, 109°48.2′E; 900–1300 m; ODISSEY tr. 50. ZMMSU P-19497 (18, 31.5–47 HL, 151+-209+ TL); 10°10′N, 110°02'E; 680–750 m; ODISSEY tr. 52. ZMMSU P-19498 (3, 42–46 HL, 175+-188+ TL); 10°40.8′N, 110°03′E; 760–800 m; ODISSEY tr. 57. **Australia off New South Wales**: AMS I.29742-002 (51.2 HL, 275 TL); 32°09′S, 153°09′E; 1079–1143 m; KAPALA sta. K89-17-07. AMS I.29753–009 (4, 37.4–51.0 HL, 170+-215+ TL); 31°53′S, 153°16′E; 878–933 m; KAPALA sta. K89-17-06. AMS I.30304-007 (1 spec.); 32°12′S, 153°06′E; 823–860 m; KAPALA sta. K89–17–09. **Southwestern Pacific off New Caledonia and vicinity:** see specimen list in Iwamoto and Merrett (1997:533) and Merrett and Iwamoto (2000: 769)

INDIAN OCEAN. **Bay of Bengal**: ZSI 1097/1 (34.7 HL, ca. 160+ TL); INVESTIGATOR sta. 321. **Maldives**. BMNH 1939.5-24-723-724 (2, 48.4–53.2 HL, 159+-232+ TL); 797 m; DISCOVERY sta. 143. Socotra. ZMMSU P-19499 (58.3 HL, 254+ TL); 12°20'N, 53°03.7′ E; 1000–1120 m; VITYAZ-II cr. 17, sta. 2565; 28 Oct. 1988. **Somalia**: ZMB 12999 (57.7 HL, 240+ TL); 1°49'N, 45°29.5′E; 1134 m; VALDIVIA sta. 256. ZMB 22342, 22343 (2, 59.5, 49.7 HL, 234–211 TL); 1°40.6′S, 41°47.1′E; 693 m; VALDIVIA sta. 251. ZMB 17643 (64.2 HL, 254+ TL); 0°24.3′S, 42°49.4′E; 1019 m; VALDIVIA sta. 252. ZMB 24128 (43.5 HL, 179 TL); VALDIVIA sta. unknown, Somalia region. ZMB 22587 (35.8 HL, 191 TL); 6°24.1′N, 49°31.6′E; 628 m; VALDIVIA sta. 265. **Mozambique**: ZMMSU P-19517 (3, 46.0–49.5 HL, 170+- 253 TL); 20°58.5′S, 35°56.2′E; 950–900 m; VITYAZ-II cr. 17, sta. 2621; 20 Nov. 1988. **Mascarene Ridge**: ZMMSU P-19492 (5, 30.5– 45.0 HL, 133+-202+ TL); 8°39′S, 59°45′E; 820–790 m; FIOLENT cr. 9, tr. 54; 3 Sep. 1977. ZMMSU P-19494 (5, 35.5–45.5 HL, 147+-179+ TL); 9°32.7'S, 60.02′E; 800 m; FIOLENT cr. 9, tr. 156. ZMMSU P-19518 (6) and CAS 82135 (2, 27.7–51.0 HL, 141–231 TL); 9°34′S, 59°55′E; 830–430 m; VITYAZ II cr. 17, sta. 2816; 9 Jan. 1989. ZMMSU P-19519 (53.3 HL, 247 TL); 8°32′S, 59°40′E; 960–1300 m; VITYAZ-II cr. 17, sta. 2820; 10 Jan. 1989. **Mentavay Ridge off Sumatra**: ZMMSU P-19495 (5, 45.6–59.5 HL, 211+-235 TL); 3°46′N, 95°00′E; 800–850 m;

PROF. MESIATZEV cr. 7, tr. 7; 28 Feb. 1979. **West Australia off Carnarvon**: ZMMSU P-15356 (10, 36–46 HL, 145+-188+ TL); 23°57.9′S, 112°14.2′E; 834–831 m; VITYAZ sta. 4564; 1 Dec. 1959. ZMMSU P-15356 (10, 36–46 HL, 145+-188+ TL); 23°57.9'S, 112°14.2′E; 834–831 m; VITYAZ sta. 4564.

Mataeocephalus adustus Smith and Radcliffe, 1912

Figs. 2; Table 2

Mataeocephalus adustus Smith and Radcliffe in Radcliffe, 1912:126–127, pl. 28, fig. 3 (holotype USNM 72943; off Celebes, 1472 m). Merrett and Iwamoto, 2000:769–771, fig. 26 (Vanuatu, 1058–1191 m).

Diagnostic description.— Branchiostegal rays 7; V 7; P i15-i17; precaudal vertebrae 13 (n = 3); anal pterygiophores before first caudal vertebra 9 (n = 3). Snout relatively short, 34–37% HL (one juvenile with 41%), 1.2–1.5 times longer than orbit; orbit diameter 24–28% HL, 1.1–1.3 times longer than interorbital width; orbit to angle of preopercle 38–41% HL; interspace between dorsal fins usually more than 34% HL (10% HL in one juvenile). Jaw teeth in tapered bands, those on premaxillary extending to rear of rictus. Underside of head entirely scaled; suborbital scales small, not modified into enlarged, spiny scutes, those on upper half in four to six rows. Second ray of first dorsal fin with few or no denticles, tip filamentous, often notably elongated. Body scales with reclined conical spinules in 12–18 parallel rows, none enlarged. Dermal window of light organ absent; periproct relatively small. Anus variable in position, about midway between anal and pelvic fins in small juveniles, closer to anal fin origin in adults.

Counts and measurements.— (See Table 2.)

Distribution.— Philippines, n. of New Guinea, Vanuatu (Fig. 2). Depth range 919–1472 m.

Remarks.— *Mataeocephalus adustus* appears in some ways to be the most generalized member of the genus, and its placement here is debatable and tentative. Several characters of the species differ to various degrees from those of other members of the genus, including: (1) relatively high non-depressed snout and deep head; (2) fine spinulation on, and the non-thickened nature of, scales along the leading edge of the snout; (3) long tapered band of premaxillary teeth spanning most of rictus; (4) relatively large mouth that is not markedly U-shaped; (5) small periproct and poorly developed light organ; (6) posterior position of the anus, close before or slightly removed from the anal fin; (7) greatly reduced serrations on spinous dorsal ray; and (8) only nine anal pterygiophores anterior to the first caudal vertebra. This last count is the lowest we have found among representatives of the genus. All of these differences, however, are relative and do not represent a sharp, clearly defined divergence. Other characters of the species support unification as they appear to represent synapomorphies of the genus. They include (1) distinctive, bifid, terminal snout scute composed of two, relatively slender, forwardly pointed, cone-shaped halves joined along the basal midline; (2) deep, scaleless, crescentic grooves behind the dorsal leading edge of the snout on each side, each connected to a deep longitudinal groove running between the median nasal crest and the lateral nasal ridges; (3) either no gill rakers on the lateral side of the first gill arch or few extremely small and rudimentary rakers. This last character is shared with *Caelorinchus* and *Macrourus*, both of which have characteristically six branchiostegal rays.

Material examined.— Holotype: USNM 72943 (47.5 mm HL, 225+ mm TL); Indonesia, Gulf of Boni, Celebes; 3°42′S, 120°45′50″E; 805 fm [1472 m]; ALBATROSS sta. 5654; 18 Dec. 1909. Paratypes: **Indonesia**: USNM 149273 (2, 25.5–48 HL, 112+-197 TL); south of Patiente Strait; 00°56′30″S, 128°05′00″E; 569 fm [1041 m]; ALBATROSS sta. 530; 2 Dec. 1909. USNM 149247 (26 HL, 151 TL); Gulf of Tomini, Celebes; 00°21′33″N, 121°04′01″E; 747 fm [1366 m];

TABLE 2. Counts and measurements of *Mataeocephalus adustus* from different localities.

	Indonesia			*off Papua New Guinea*			*off Vanuatu*		
Cat. No.	USNM 149274	USNM 72943*	USNM 149273	ZMMSU P-15355			MNHN 1995-846	MNHN 1995-978	MNHN 1995-978
TL, mm	151+	225+	197+	94+	269+	286+	307+	146+	183+
HL, mm	40	47.5	48	24.9	71.5	75	61.8	31.2	43
	In percent of head length								
Snout len.	35	35	34	41	37	35	37	38	39
Preoral		30	28		30	30	30	33	35
Orbit	29	27	26	28	25	24	23	25	24
Interorb.	23	23	24	23	23	22	22	22	20
Postorb.	40	40	39	37	39	41	41	40	40
Orb-preop	41	41	39	38	40	40	40	39	38
Suborb.		15	14		16	14	16	15	15
Up. jaw	26	24	28	27	28	29	27	25	24
Barbel	10	4	10	9	8	6	5	8	7
Depth	54	64	63	54	67	70	63	61	63
1D. ht.		112					157		
P. len.	51	47					52	51	
V. len.	51	30					53	46	
1D.-2D.	55	44	43	10	57	48	43	29	33
	Counts								
1D.	II,10	II,9	II,7	II,10	II,7	II,8	II,9	II,8	II,9
P.	i,17	i,15	I,16	i,16–17	I,16	I,16–17	I,19	I,18–17	I,17
V.	7	7	7	7	7	7	7	7	7
GR-I(int.)	8	8	8	7	8	8	7	9	9
Scales 1D.		6	7		6	7	7		4
--mid-1D		4.5	4.5		4.5	4.5	5		
--2D.			5.5		7	6	6.5	6	
Pyl.caeca			15			16		18	

* Holotype

ALBATROSS sta. 5605; 16 Nov. 1909. OTHER MATERIAL. **Papua New Guinea**: ZMMSU P-15355 (3, 24.9–75 HL, 94+-286+ TL); 5°22′S, 146°14′E; 1380–1400 m; DMITRY MENDELEYEV cr. 18, sta. 1542; 14 Feb. 1977. **Vanuatu**: MNHN 1995-846 (61.8 HL, 307+ TL); 15°53.81′S, 167°30.42′E; 1100–1191 m; MUSORSTOM 8, sta. CP 1076; 4 Oct. 1994. MNHN 1995-854 (43 HL, 183+ TL); 18°03.70′S, 168°54.40′E; 1058–1086 m; MUSORSTOM 8, sta. CP 1037; 29 Sep. 1994. MNHN 1995-978 (31 HL, 146+ TL); 18°53.29′S, 169°52.65′E; 919–1000 m; MUSORSTOM 8, sta. CP 1008; 25 Sep. 1994.

***Mataeocephalus cristatus* Sazonov, Shcherbachev and Iwamoto, sp. nov.**
Figs. 2–4; Table 3

DIAGNOSTIC DESCRIPTION.— Branchiostegal rays 7; V 7; P i17-i21, usually i18 or more; precaudal vertebrae 12 (n=2); anal pterygiophores before first caudal vertebra 11 (n=2). Snout length 35–41% of HL, 1.4–2.0 times longer than orbit; orbit diameter 21–25% HL, about equal to (0.8–1.1 times) interorbital width; orbit to angle of preopercle 33–38% HL; interspace between dorsal fins usually less than 30% HL. Head shallow, usually wider than deep, dorsal surface of snout slightly convex, its dorsal profile straight or slightly concave, top of head at mid-orbit flat or slightly concave. Snout (Fig. 4) depressed and narrowly pointed in lateral view; broadly triangular in dorsal view; tipped with two stout spiny conical scutes pointed forward and joined mesially at base. Leading edges of snout covered with small, non-imbricate scales, each covered with short, conical spinules, the scales broadly overlapping dorsal and ventral surfaces and interspersed with short, thick sensory papillae. Above and behind leading edge of snout a deep groove. Naked membrane of nasal fossa restricted by surrounding scaled ridges. Mouth small, U-shaped and inferior; a small short barbel below tip of lower jaw. Oral valves covered with thick short papillae. Jaw teeth in short, broad, non-tapered bands, the upper tooth bands each somewhat truncated posteriorly, the two halves of lower jaw forming a broad crescent; none of teeth enlarged. Underside of head usually entirely scaled, although some specimens with median swath on underside of snout naked; upper (shelf) portion of suborbital with two rows of somewhat enlarged, coarsely modified scales in narrowest portion; a line of free neuromasts between each row. Gill membranes broadly united across isthmus restricting opening of operculum; no free posterior fold. Gill arches restricted by membranes across upper and lower arms; outer gill slit narrow; outer rakers on first arch absent. Spinous second ray of first dorsal fin with weak serrations on leading edge. Body scales with needle-like spinules in 12–18 parallel rows, the middle row enlarged in most scales, forming parallel striations on the body surfaces. Dermal window of light organ absent; periproct relatively small. Anus removed from anal fin in juveniles and adults, situated about midway between origin of anal fin and base of pelvic fin. Pyloric caeca finger-like, simple, with no branching above base.

COUNTS AND MEASUREMENTS (see Table 3).

DISTRIBUTION.— Indian Ocean (Saya de Malha Bank, Mascarene Ridge, Markus-Necker Ridge, Ninety East Ridge), and western Pacific Ocean (South China Sea) (Fig 2). Depth range 1000–1720 m.

ETYMOLOGY.— From the Latin *crista*, a crest, in reference to the slightly enlarged middle row of spinules on most body scales.

REMARKS.— The count of 12 precaudal vertebrae in this species contrasts with the 13–14 found in other *Mataeocephalus*. We examined 21 specimens of *M. cristatus*, 15 of which came from the Mascarene Plateau in the western Indian Ocean. Three specimens were represented from the Ninety-East Ridge in the eastern Indian Ocean, one was from the South China Sea, and two were from the Markus-Necker Ridge in the western Pacific. Inadequate representation from the last three areas prevented us from estimating populational differences, although based on Table 1, one might suspect that fishes from the Markus-Necker Ridge had the shortest snout, those from the Ninety East Ridge had the smallest orbit, and all specimens from eastern localities had the widest interorbital and longest upper jaw.

TYPE SPECIMENS.— HOLOTYPE: ZMMSU P-15345 (48.0 mm HL, 215 mm TL); Ninety East Ridge, 11°31′S, 88°55′E; 1600–1700 m; PROF. MESIATZEV cr. 7, tr. 5; 18 May 1979. PARATYPES: **Indian Ocean**: **Ninety East Ridge**: ZMMSU P-15346 (33 HL, 152 TL); same data as for holotype. ZMMSU P-15347 (57.5 HL, 271 TL); 11°45′S, 88°47′E; 1600 m; FIOLENT cr. 9, tr. 24; 14 June

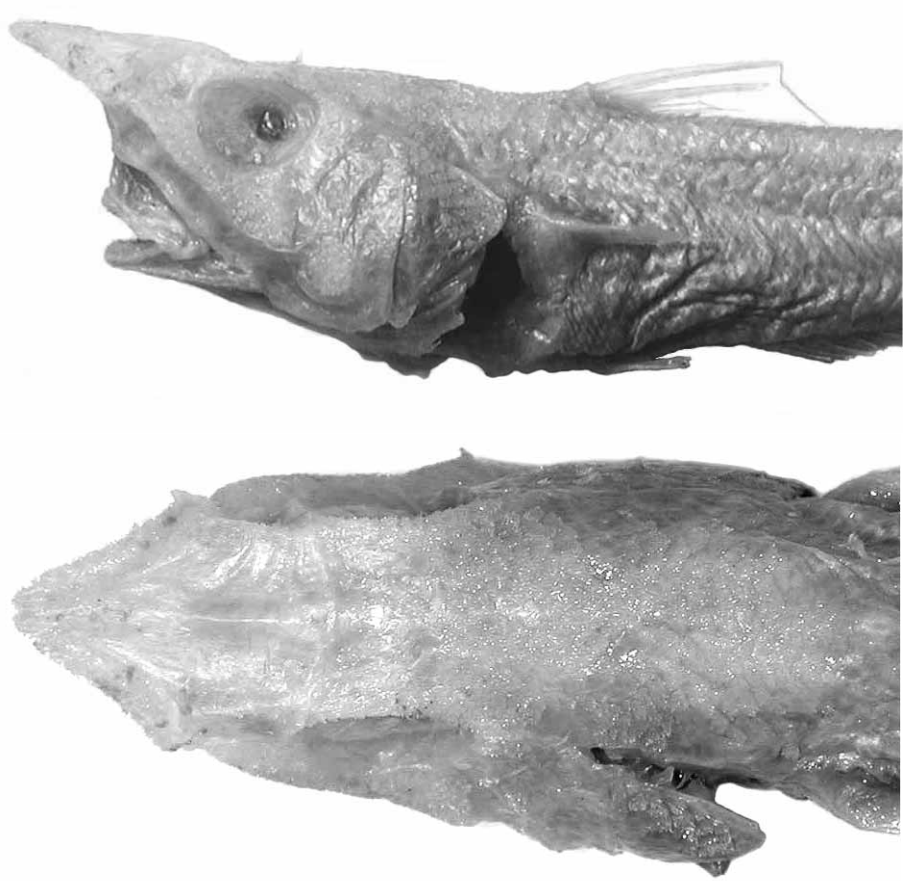


FIGURE 3 (above). Lateral view of paratype of *Mataeocephalus cristatus* (CAS 82136, 51.6 mm HL) from the Mascarene Ridge in 1300-1240 m.

FIGURE 4 (below). Dorsal view of head of paratype of *Mataeocephalus cristatus* (CAS 82136).

1977. **Saya de Malha Bank**: ZMMSU P-15350 (52.0 HL, 255 TL); 1280 m; CHATYR-DAG cr. 4, tr. 16; 28 Aug. 1974. **Mascarene Ridge**: ZMMSU P-15351 (44.0 HL, 152+ TL); 8°26′S, 59°29′E; 1300–1260 m; FIOLENT cr. 9, tr. 52; 2 Sep. 1977. ZMMSU P-15352 (5: 42–55 HL, 200–267 TL) and CAS 82136 (2: 51.6–53.0 HL, 212+-230+ TL); 8°57'S, 59°19′E; 1300–1240 m; FIOLENT cr. 9, trawl 53; 2 Sep. 1977. ZMMSU P-15353 (52.5 HL, 241 TL); 8°08'S, 59°37.6′E; 1247–1269 m; ZVEZDA KRYMA cr. 6, tr. 210; 9 Nov. 1976. ZMMSU P-19490 (53.5 HL, 230 TL); 9°38′S, 60°56′E; 1700–1650 m; VITYAZ-II cr. 17, sta. 2814; 9 Jan 1989. ZMMSU P-19491 (3: 54.0–58.0 HL, 267–271 TL); 9°40′S, 60°31′E; 1520–1720 m; VITYAZ-II, cr. 17, sta. 2815; 9 Jan. 1989. **Pacific Ocean**: **South China Sea**: CAS 38331 (44.7 HL, 217 TL); off Vietnam, Paracel Is., 15°38′N, 111°54′E; 1234–1264 m; STRANGER sta. NAGA60-67; 29 Feb. 1960**. Markus-Necker Ridge**: ZMMSU P-15354 (52.0 HL, 249 TL); 19°08′N, 171°09′E; 1000–1250 m; MYS UNONY tr. 62; 24 Aug. 1979. ZMMSU P-19489 (53.0 HL, 245+ TL); 15°42′N, 152°05′E, 1355–1381 m; CHRONOMETER tr. 59.

***Mataeocephalus tenuicauda* (Garman, 1899)**
Fig. 5

Macrurus tenuicauda Garman, 1899:216–217, pl. 49, fig. 1 (Gulf of Panama, 838 m; Albatross sta. 3384).
Mataeocephalus tenuicauda: Gilbert and Hubbs, 1916:146 (list). Iwamoto, 1979:145–147, figs. 8, 9a (Panama, Ecuador, Galapagos; 700–1159 m); 1990:247, fig. 557 (compiled).

DIAGNOSTIC DESCRIPTION.— Branchiostegal rays 6–7, usually 7; V 8–9; P i21-i25; precaudal vertebrae 13–14 (n=2); anal pterygiophores before first caudal vertebra 17–18 (n=2). Snout length 36–42% of HL; orbit diameter 26–30%; interorbital width 19–22%; orbit to angle of preopercle 28–33%; upper jaw 19–28%. Head shallow, about as wide as deep, dorsal surface of snout gently convex, essentially flat or slightly convex over orbits. Snout depressed and narrowly pointed in lateral view, broadly triangular in dorsal view, tipped with two spiny conical scutes pointing forward and adjoined at base. Leading edge of snout covered with coarse, tubercular, nonimbricate scales, with short, thick, sensory papillae filling interspaces between these scales. Above and behind scaled leading edge of snout, a deep groove followed by a broad naked area with a slender mesial arm extending posteriorly alongside median nasal ridge. Underside of head entirely naked except for small patch of scales on ventral surface of preopercle and a narrowly overlapping series of scales along leading edge of snout. Nasal fossa broadly naked. Suborbital shelf with two rows of coarsely modified scales; a line of free neuromasts separating each row. Mouth small, U-shaped, and inferior; a small short barbel below tip of lower jaw. Gill membranes broadly united across isthmus restricting opening of operculum; no free posterior fold. Gill arches restricted by membranes across upper and lower arms; outer gill slit narrow; outer rakers on first arch absent or reduced to three or four small plates. Jaw teeth in short, broad, cardiform bands, the upper tooth bands each truncated posteriorly, the two halves of the lower jaw forming a broad crescent. None of teeth enlarged. Spinous second ray of first dorsal fin with strong but widely spaced serrations along leading edge. Body scales with slender needle-like spinules in sharp ridgelike rows; in juveniles (CAS 86531) spinule rows parallel, giving striated appearance to body surfaces. Pyloric caeca short, thick, simple, with no branching, 16–21 total. Periproct relatively large; dermal window of light organ absent; anus situated within middle third of distance between origin of anal fin and base of pelvic fin. Two juveniles collected by the deep-submersible vehicle *Johnson Sea-Link* off the Galapagos had a polka-dotted color pattern (Fig. 5), much as has been recorded in *Malacocephalus* and *Mesobius.*

DISTRIBUTION.— Confined to tropical waters of the eastern Pacific, from Panama south to Ecuador and west to the Galapagos. Depth range about 700–1159 m.

REMARKS.— *Mataeocephalus tenuicauda* closely resembles *M. acipenserinus* but can be distinguished by features provided in the key to species. See also the discussion in the description of

FIGURE 5. Juvenile of *Mataeocephalus tenuicauda* (CAS 86531, 25.4 mm HL) collected off James Bay, Isla San Salvador, Galapagos, in 3000 ft [914 m] by the JOHNSON SEALINK deep-submersible vehicle.

M. acipenserinus. *M. cristatus* is also very similar to *M. tenuicauda*, but that species has scales on the underside of the snout and most scales dorsally on the trunk and anteriorly on the tail have the median spinule row slightly enlarged.

Material examined.— See Iwamoto (1979) for list of material examined of this species, to which add: CAS 86531 (2, 25.4–26.5 mm HL, 153–155 mm TL); Galapagos, Isla San Salvador, James Bay; 3000 ft [914 m]; collectors J.E. McCosker et al., *Johnson Sealink* sta. JSL 3977; 26 Nov. 1995. CAS-SU 57034 (61 HL, 290 TL); "Pacific. Deep-sea. Arcturus" [no other locality; mislabeled as from Chesapeake Bay].

Subgenus *Hyomacrurus* Gilbert and Hubbs, 1920

Diagnosis.— Branchiostegal rays 6; precaudal vertebrae 13–14; anal pterygiophores before first caudal vertebra 10–11. Anus remote from anal fin, usually within middle third of distance from insertion of pelvic fins to origin of anal fin. Body scales densely covered with lanceolate spinules. Underside of head almost entirely covered with scales.

Remarks.— In their 1920 revision of the macrouroid fishes, Gilbert and Hubbs (1920:423) commented on the remarkable nature of the fish they called *Coryphaenoides hyostomus* in its having six branchiostegal rays and an anus that was remote from the origin of the anal fin. All other species they included in *Coryphaenoides* had the anus immediately before the anal fin. Based on the anterior position of the anus, they erected the subgenus *Hyomacrurus*. *Macrurus heyningeni* Weber, 1913, from the Timor Sea, was described as having this same unique combination, and although Gilbert and Hubbs did not assign that species to *Hyomacrurus*, their implications were clear, and Marshall (1973:564) apparently agreed when he considered that species as a member of *Hyomacrurus*. (Two of the current authors (YIS,YNS), however, examined the holotype of *M. heyningeni* in April 1985 and determined that it belongs in the genus *Coryphaenoides*.) Marshall's concept of *Hyomacrurus* followed that of Gilbert and Hubbs in that he considered the genus "...most closely related to *Coryphaenoides* but differs in the position of the anus... and number of retia mirabilia in the swim bladder (2 *cf.* 4)." These two characters, however, are shared by members of the tribe Malacocephalini (*Malacocephalus, Ventrifossa, Nezumia, Lucigadus*) and most other macrourid genera with seven branchiostegal rays. We suspect that those authors were overly swayed by the branchiostegal ray count in allocating the species to the *Coryphaenoides*-related lineage.

The close relationship of *Mataeocephalus* and *Hyomacrurus* was suggested by Radcliffe (1912) when he described *M. nigrescens* and *M. adustus*. He noted two characters of importance, "the spinigerous tubercle that is normally bifid" at the tip of the snout, and "the submarginal groove anterior to" the side of the snout, and the presence of the latter in *Macrourus hyostomus*. These characters, however, are also developed to various degrees in many species of the related genera *Nezumia* and *Sphagemacrurus*, rendering them unusable as synapomorphies.

The presence or absence of a luminescent organ appears to vary within the genus, with species such as *M. acipenserinus* having a relatively large organ intruding into the abdominal wall anterior to the anus, with a well-developed external dermal window extending as a shallow fossa from the naked anal surround (the periproct). In other species the dermal window is lacking, and the luminescent organ is of moderate size (*M. tenuicauda, M. cristatus, M. hyostomus, M. kotlyari*) to almost indiscernible (e.g., *M. adustus*).

The branchiostegal ray count has been accorded considerable value in defining the genera and higher- category taxa within the grenadiers. *Coryphaenoides* and *Hyomacrurus* are characterized as having six branchiostegal rays as opposed to seven in *Mataeocephalus*. Bearing this in mind, it

is important to recall Garman's (1899:216) remark in his description of *Macrurus tenuicauda*: "Branchiostegal rays commonly seven, frequently six; in each case there are seven either on one side or the other or on both sides." We are uncertain as to how many specimens formed the basis of Garman's observation, but the MCZ lot (cat. no. 28555) containing the type specimens currently includes only three specimens. We have not had the opportunity of checking this character in all specimens of *Mataeocephalus* used in our previous studies, as they are now scattered to all corners of the earth. However, one specimen of *M. tenuicauda* (CAS-SU 57034) not previously recorded by us had six branchiostegal rays on each side. Should the branchiostegal ray count prove to be as variable as Garman's and our limited data suggest, its value as a phylogenetic character is seriously compromised for this group. It is for this reason that we treat *Hyomacrurus* as a subgenus within *Mataeocephalus*, and the only characters that appear to separate the two are the somewhat lanceolate scale spinules and the presumably invariable six branchiostegal rays in the former.

Mataeocephalus hyostomus (Smith and Radcliffe, 1912)

Fig. 2, 6; Table 3

Macrourus hyostomus Smith and Radcliffe, in Radcliffe, 1912:121–122, pl. 27, fig. 1 (type locality: se. Luzon, Philippines, 1024 m; also Sibuku Bay, Borneo, 750 m, and Buton Strait, Celebes, 1022 m).
Coryphaenoides (*Hyomacrurus*) *hyostomus*: Gilbert and Hubbs, 1920:422–424 (descr. compiled).
Coryphaenoides hyostomus: Gilbert and Hubbs, 1916:144 (listed). Weber and de Beaufort, 1929:33–34 (descr. compiled).
Hyomacrurus hyostomus: Marshall 1973:564 (listed).

Diagnostic description.— V 7–8, rarely 9; P i16-i20; pyloric caeca 8–13. (Most of the features described for *M. kotlyari* apply to this species and are generally not repeated here.) Head about as broad as high at level of posterior orbital margin; snout rather broad, moderately pointed and protruding more than half orbit diameter beyond mouth. Jaws extend posteriorly to below posterior one-third to one-quarter of orbit. Lips thick, papillaceous. Barbel short, rapidly tapered to filamentous tip. Terminal scute of snout small, bifid. Underside of snout and head scaled. Body scales densely covered with long, slender, somewhat flattened (lanceolate, with concave anterior surface), recurved, greatly reclined spinules arranged in somewhat convergent or divergent rows. Anus about

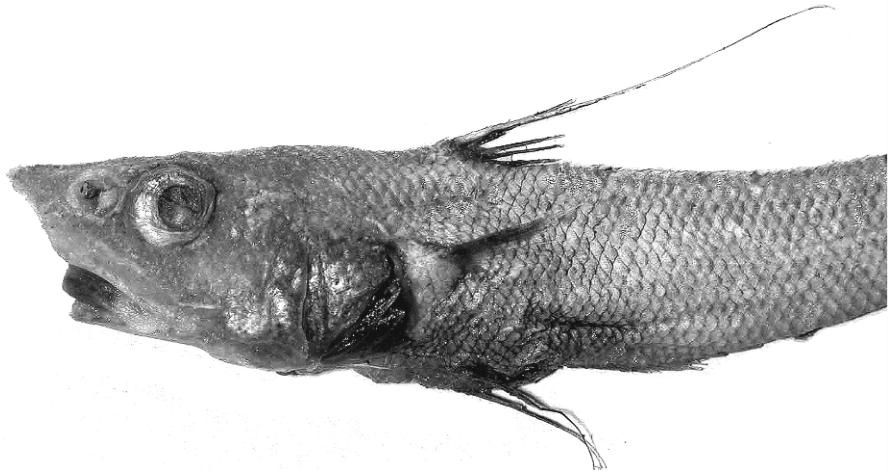


Figure 6. *Mataeocephalus* (*Hyomacrurus*) *hyostomus* (CAS 212549, 64 mm HL) taken from the type locality, Lagonoy Gulf, Luzon, Philippines, in 1037-1100 m.

TABLE 3. Counts and measurements of *Mataeocephalus cristatus* from different localities.

Locality	*South China Sea*	*Markus-Necker Ridge*		*Ninety East Ridge*			*Mascarene Plateau*
Cat. No.	CAS 38331	P-15344	P-19489	P-15316	P-15345	P-15347	(see text)
No. of spec.	n=1	n=1	n=1	n=1	n=1	n=1	n=26
TL, mm	214+	249+	243+	152+	215+	271+	152+–271+
HL, mm	44	52	58	33	48	57.5	42–58
	In percent of head length						
Snout len.	38	36	35	39	37	39	38–41
Preoral	31	33	30		35	33	30–40
Orbit	23	23	25	21	23	21	22–25
Interorb.	25	28	25	28	26	25	22–26
Postorb.	35						35–38
Orb-preop	35	35	36	38	37	38	33–38
Suborb.	12	15	13	15	13	11	12–16
Up. jaw	25	25	25	27	26	25	20–26
Barbel	10	8		6		5	7–10
Depth	55	63	67	56	58	63	54–62
1D. ht.	71	60	64	62	64		63–84
P. len.	47	51			48	44	38–50
V. len.	44	55	45	42	47	49	32–58
1D.-2D.	13	17	16	27	29	28	11–34
	Counts						
1D.	II,9	II,9	II,10	II,8	II,9	II,7	II,8–10
P.	i,18	I,20–21	i,19–20	i19	i18–17		i17–22
V.	7	7	7	7	7	7	7–8
GR-I(int.)	8	8	8	6	7	7	6–8
Scales 1D.	5	6	6		6	6	5–7
--mid-1D	4	3.5	5		4	4	4–5
--2D.	6	5	7		7	7	5–7
Pyl.caeca						16	10–14

midway between insertion of pelvic fin and origin of anal fin. Spinous second ray of first dorsal fin very long, 1.5 to more than twice length of head, with a few weak denticulations confined to basal portion. Teeth in both jaws in broad bands; dentary band tapered and ending at angle of mouth; premaxillary band falls slightly to well short of end of rictus and truncated or broadly rounded, outer premaxillary teeth not much larger than those more inward. Pyloric caeca count in four specimens 8, 11, 13, 13.

Overall color medium to light brownish, abdomen darker, somewhat purplish, with margin of

scale pockets almost black; operculum dark, overlain with silvery. Underside of head and snout generally lighter brown. Branchiostegal membrane black except along isthmus. Thin black eye ring, usually incomplete along ventral orbital margin. Upper jaw to end of rictus very dark, abruptly changing to pale posteriorly; lower lips faintly pigmented. Gums pale, mouth cavity dark gray but paler around mouth opening. Gill cavity dark. First dorsal fin black; pelvic and pectoral fins blackish; anal fin dusky.

OTHER COUNTS AND MEASUREMENTS.— 1D II,8–9; GR-I (inner) 5–8, GR-II (outer/inner) 5–7/6–9; scales below 1D 5–6 (one spec. with 8), below mid 1D 3.5–4.5, below 2D 5–7.5. Total length 185–383+ mm; head length 40.6–65.5 mm. The following in percent of head length: snout length 30–36; ventral length of snout 22–30; internasal width 23–26; interorbital width 22–26; orbit diameter 22–25; suborbital width 14–15; postorbital length 46–50; distance orbit to angle of preopercle 40–44; length upper jaw 28–31; length barbel 7–10; length outer gill slit 9–10; preanal length 152–171; body depth 57–68; interspace between first and second dorsal fins 17–27; height 1D 145–295; length P 31–52; length V 41–61.

DISTRIBUTION.— Known only from off Luzon, Philippines, Borneo, and Celebes (Fig. 2). Depth range 760–1100 m.

MATERIAL EXAMINED.— USNM 72938 (holotype: 58.8 mm Hl, 280 mm TL); Lagonoy Gulf, Luzon, Philippines; 13°37′30″N, 123°41′09″E; ALBATROSS sta. 5470; 1024 m. CAS 212549 (3 spec., 40.6–65.5 HL, 202–283 TL); Lagonoy Gulf, Luzon, Philippines: 13°21′19″N, 124°12′16″E; 1037–1100 m; FISHERY RESEARCHER I sta. TERI-Phi-5-95; 24 Sep. 1995. CAS 214046 (3 spec., 36.5–46.0 HL, 160+-205+ TL); Camarines Sur, Luzon, Philippines; 14°50′28″N, 123°17′18″E; 760–770 m; FISHERY RESEARCHER I sta. TERI-Phi-12-95; 27 Sep. 1995.

Mataeocephalus kotlyari Sazonov, Shcherbachev and Iwamoto, sp. nov.

Figs. 2, 7

Hyomacrurus sp. A: Williams et al., 1996:149 (listed; Western Australia, 685 m).

Mataeocephalus sp.: Iwamoto and Merrett, 1997:62–63, fig. 7 (Loyalty Is., Chesterfield and Bellona Plateau, Wallis and Futuna Islands; 412–970 m). Iwamoto and Williams, 1999: 189, fig. 39 (1 spec., NW Cape, Western Australia; 650–685 m). Merrett and Iwamoto, 2000: 771 (20 spec., Vanuatu; 690–1000 m). Iwamoto and Graham, 2001:484–485, fig. 99 (1 spec., New South Wales, Australia; 896–960 m).

DIAGNOSTIC DESCRIPTION.— V 7 (one specimen with 6 on right fin, 7 on left fin); P i17-i20; pyloric caeca 15–19. Snout sharply pointed in lateral view, broadly triangular in dorsal view; leading edges rounded and fleshy but fully covered with small, tightly adherent modified scales. Tip of snout armed with a pair of small, stoutly spined, somewhat cone-shaped scutes. A deep crease dorsally behind leading snout margins, each connected to a shallow longitudinal trough medial to each supranarial ridge. Interorbital broad, flat, about equal to orbit diameter. An angular ridge from tip of snout to anterior end of preopercle dividing dorsal and ventral head surfaces, with a row of small, slightly modified scales below orbit along dorsal edge of ridge and separated by a narrow gap from a second and third row of similar scales. Free neuromasts of sensory lateralis system scattered over head surfaces, but concentrated on snout; sensory pores small and poorly developed. Scales of body densely covered with relatively narrow to broadly lanceolate spinules (much as in *Nezumia aequalis*). No reticulate pattern on the anterior, unexposed field. Scales almost completely cover entire head; naked only along margin of jaws, anteriorly on lower jaws, medially on underside of snout, and over gill membranes. Premaxillary teeth in short broad band, extending less than half length of entire premaxillary and occupying somewhat more than half length of rictus; outer series scarcely larger than other teeth in jaw. Mandibular teeth in narrow band, about three teeth

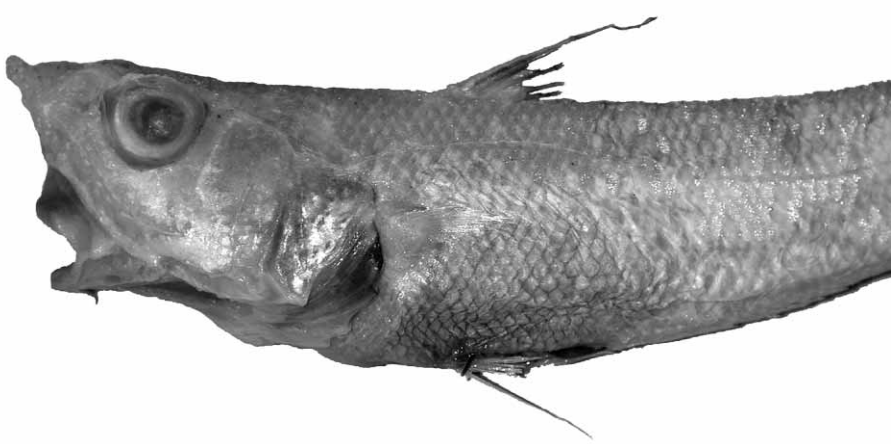


FIGURE 7. Paratype of *Mataeocephalus* (*Hyomacrurus*) *kotlyari* (CAS 86481, 48.1 mm HL) collected off the Chesterfield and Bellona Plateau, 412-430 m.

wide near symphysis, tapering to one or two laterally, ending just short of end of rictus. Dorsal fin high, second spinous ray somewhat longer than head length in some individuals, succeeding rays shorter, tapering rapidly; leading edge of spinous ray with a few rudimentary denticulations proximally (difficult to detect) in some, with as many as 14 serrae in others. Pectoral fin relatively broad and short, its distal tip falling at or short of anal fin origin. First dorsal and pelvic fin origins about on same vertical, that of pectoral slightly in advance. Pelvic fins small, most rays falling well short of anal fin origin; outer ray produced into slender filament extending to near fourth anal ray. Periproct region moderate in size, almost equal in diameter to that of pupil, far removed from anal fin and closer to pelvic fin insertions. Light organ scarcely discernible from exterior, but present in body wall as a small pocket with large lens-like structure immediately anterior to anus. Pyloric caeca long, slender, 15–19 total in eight specimens.

Color of first dorsal fin entirely black in some specimens, but in others black distally, pale along base; pectoral and pelvic fins also black, but free distal end of outer pelvic ray completely pale; base and lowermost portion of pectoral usually paler; anal fin with anterior four rays black or blackish, following rays with dusky distal margin, darker near end of tail. Body overall brownish to swarthy, much darker over abdomen, underside of head including barbel rather pale or dirty whitish; branchiostegal membrane blackish with purplish tinge, but mostly pale ventrally towards base of rays.

OTHER COUNTS AND MEASUREMENTS.— 1D II,8–9; total GR-I (outer/inner) 0–3/7–8, GR-II (outer/inner) 6–7/6–7; scales below 1D 4.5–7.0, below mid 1D 4.0–6.0, below 2D 4.5–6.5. Total length 120+-232 mm; head length 30–55 mm. The following in percent of head length: snout length 31–36; ventral length of snout 24–30; internasal width 22–25; interorbital width 20–25; orbit diameter 18–26; suborbital width 12–15; postorbital length 41–46; distance orbit to angle of preopercle 36–42; length upper jaw 26–31; length barbel 5–10; preanal length 155–167; body depth 59–74; interspace between first and second dorsal fins 13–24; height 1D 88–119; length P 42–50; length V 41–56.

DISTRIBUTION.— Known from northwestern and southeastern Australia, New Caledonia, Vanuatu (Fig. 2). Depth range 412–1000 m, most frequently captured between 700 and 900 m.

ETYMOLOGY.— Named after our colleague, Alexander Kotlyar, of the P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, for his contributions to the study of deep-sea fish-

es and for his untiring efforts in collecting fishes, including some of the specimens used in this study.

Remarks.— This species was the source of much confusion for us. We initially recognized its similarity in several fundamental features to species of *Mataeocephalus* but were impressed by how different it was compared to others of that genus, especially in its relatively deep head, short snout, poorly developed light organ, lanceolate scale spinules, and six branchiostegal rays. A subsequent search of the literature and examination of specimens led us to conclude that it was most closely related to *Hyomacrurus hyostomus*. We were fortunate to acquire a series of specimens of that species from near the type locality during a cruise of the Taiwanese vessel FISHERY RESEARCHER I in 1995. Our conclusions were immediate on comparison of the two taxa–they were very similar but distinct, and they represented a clade distinct from other *Mataeocephalus.*

Type specimens [note: complete collection data for these specimens are available in Iwamoto and Merrett (1997), Iwamoto and Williams (1999), Merrett and Iwamoto (2000) and Iwamoto and Graham (2001)].— Holotype: MNHN 1994–960 (55 HL, 225+ TL); Chesterfield and Bellona Plateau; 21°15.01′S, 157°51.33′E; 970 m. Paratypes: **Australia**: AMS I.29804-002 (1 spec.), Newcastle, NSW; 896–960 m. CSIRO H22549-13 (1 spec.) NW Cape, WA; 650–685 m. **Chesterfield and Bellona Plateau**: CAS 86481 (2, 39.2–48.1 HL, 180+-214+ TL); 412–430 m. **Loyalty Islands**: MNHN 1994-961 (40.5 HL), BMNH 1996.7.19:27 (51.5 HL); 760–790 m. **Vanuatu**: MNHN 1997-679 (33–44 HL, 160-192+ TL); 775–748 m. MNHN 1995-969 (33 HL, 148+ TL); 780–783 m. MNHN 1997-678 (12, 30–46 HL, 120+-221+ TL); 764–786 m. MNHN 1995-874 (41 HL); 690–750 m. MNHN 1995-856 (51 HL); 775–798 m. MNHN 1997-677 (39 HL); 764–786 m.

Acknowledgments

We thank the many curators and assistants at the following institutions and museums for their hospitality, assistance, and loans: J.R. Paxton, D.F. Hoese, M. McGrouther et al. (AMS), N.R. Merrett, D.J. Siebert, O.A. Crimmen (BMNH), P.R. Last, A. Williams, A. Graham, G. Yearsley (CSIRO), N.V. Parin, S.A. Evseenko, S.M. Dudarev, V.M. Tchuvasov (IORAS, formerly IOAN), M. Stehmann (ISH), R.J. Lavenberg, J.A. Seigel, D.M. Cohen et al. (LACM), M.F. Gomon (MOV, formerly NMV), K.E. Hartel (MCZ), G. Duhamel, J.-C. Hureau, B. Séret, P. Pruvost (MNHN), V.G. Springer, K. Murphy, B.B. Collette et al. (USNM), H. Nijssen (ZMA), H.-J. Paepke, P. Bartsch (ZMB), H. Wilkens, G. Schulze (ZMH), E.Bertelsen [late], J.G. Nielsen (ZMUC), T.K. Sen (ZSI). We thank J.E. McCosker (CAS) for his efforts in collecting two juveniles of *Mataeocephalus tenuicauda* while aboard the *Johnson Sea-Link* off the Galapagos and turning the specimens over to us for this report. We thank Jon Fong (CAS) for the x-radiographs used for vertebral and anal pterygiophore counts, and curatorial assistance; Mysi Hoang for assistance with the digital images. TI thanks Dr. K.-T. Shao of the Zoological Institute, Academia Sinica, Taiwan, and Dr. I.-C. Liao of the Taiwan Fisheries Institute for arranging the cruise of the FISHERY RESEARCHER I to the Philippines in advance of the FAO Species Identification Guide Workshop in September 1995. JG. de la Torre, Officer in Charge, Philippine Bureau of Fisheries and Aquatic Resources, D.B. Araullo, Director of the Philippine Ministry of Agriculture, and several other officials facilitated the issuance of permits for the ship to collect in Philippine waters. Emily Capuli of ICLARM was extremely helpful in providing information, contacts, and logistical support.

Support for study of this material was provided to YIS by the Smithsonian Institution (USNM), California Academy of Sciences, Australian Museum, and CSIRO, Australia; and to YIS and YNS by the Deutsche Forschungsgemeinschaft (Germany), the Carlsberg Foundation

(Denmark), the Russian Foundation for Basic Research (Project no. 00-15-98532, Scientific School "Oceanic Ichthyology") (Russia), and the International Science Foundation, grants MLJ 000 and MLJ 300 for 1994, 1995.

In Memoriam

Yuri Shcherbachev and Tomio Iwamoto dedicate this paper to the memory of the first author, Yuri Igorevich Sazonov, who passed away at the age of 51 years on 21 March 2002. He was struck down with a severe cold during a very chilly January and February, when his laboratory in the Zoological Museum of Moscow State University dropped to very low temperatures because of ongoing repairs to the roof of the building. Despite the extremely cold conditions in the unheated room, he continued his work unstinted. That behavior was typical of Yuri, who was always a strong, robust man inured to normal hardships and completely dedicated to his ichthyological studies. It was not until his condition deteriorated dangerously that he allowed himself to be taken to the hospital. He was there for less than a week before he succumbed.

Yuri was born on 14 Oct. 1950 in the city of Gorodok in Belorussia. He graduated from Moscow State University in 1972, after which he worked under Nikolai V. Parin in the Oceanic Ichthyofauna Laboratory of the Institute of Oceanology, Academy of Sciences of the SSSR (now Russian Academy of Sciences). Between 1974 and 1987 he participated in four expeditions to the Indian and Pacific oceans. In 1989 he defended his Ph.D. thesis "Morphology and classification of the fishes of the family Platytroctidae (Salmoniformes, Alepocephaloidei)." From 1990 until his death, Yuri was curator of the marine fish collection of the Zoological Museum of Moscow State University. He published extensively (more than 70 papers) and was known worldwide as an expert on the alepocephaloids, macrouroids, and morids, groups in which he described more than 60 new taxa. His expertise garnered him numerous invitations to visit museums in Europe, the United States, Australia, and India. Yuri was reaching the apex of his professional career and was widely recognized as one of the premier systematic ichthyologists in Russia. The ichthyological community has lost a productive, dedicated scientist with a keen eye and insightful mind, and his friends and colleagues around the world bemoan the loss. [Parts of this were extracted from a manuscript prepared by Nik Parin and Sergei Evseenko for publication in *Voprosy Ikhtiologii*, for which we thank the authors.]

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