PROCEEDINGS OF THE CALIFORNIA ACADEMY OF SCIENCES
Fourth Series

Volume 57, No. 11, pp. 379–386, 3 figs., 1 table. April 18, 2006

Paracetonurus flagellicauda (Koefoed, 1927) (Macrouridae, Gadiformes, Teleostei), new records from the Mid-Atlantic Ridge and Madagascar Plateau

Tomio Iwamoto[1] and Alexey Orlov[2]

[1] *Department of Ichthyology, California Academy of Sciences, 875 Howard Street, San Francisco, California 94103, USA; Email: tiwamoto@calacademy.org;*

[2] *Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), 17, V. Krasnoselskaya, Moscow, 107140, Russia; Email: orlov@vniro.ru*

Paracetonurus flagellicauda **is recorded from 41 specimens collected at four sites on the Mid-Atlantic Ridge in the North Atlantic and one specimen from the Madagascar Plateau in the southwestern Indian Ocean. All four previous records of the species were from the North Atlantic: the type specimens from near the recent captures on the Mid-Atlantic Ridge, 24 specimens from the Porcupine Seabight, a specimen from the Rockall Trough, and a small specimen from off the south coast of Portugal. The Indian Ocean specimen suggests a considerable disjunction in the distribution of the species or possible evidence of its ranging along the entire length of the Mid-Atlantic Ridge into the South Atlantic and east into the southwest Indian Ocean.** ***Echinomacrurus occidentalis*** **Iwamoto, 1979 from the eastern Pacific is placed in the genus** ***Paracetonurus*****.**

A workshop was held at the Espegrend Biological Station of the University of Bergen from 22 to 28 February 2005 with the purpose of identifying the demersal fishes collected during Leg 2 of the *R/V G.O. Sars* MAR-ECO Cruise. During that cruise a total of 22 hauls was made with a 29-m otter trawl over the Mid-Atlantic Ridge (MAR) at depths ranging from 826 to 3505 m; only three of the trawls were made shallower than 1000 m, with 13 hauls exceeding 2000 m. Among the more exciting finds from this cruise were 41 specimens of *Paracetonurus flagellicauda,* a little-known species of grenadier that had been recorded only four times before. In 1910 the Norwegian fishery research vessel *Michael Sars* collected four specimens close to the MAR-ECO site; those specimens formed the basis for the original description of *Macrurus flagellicauda* Koefoed, 1927. In 1946, a juvenile of 95+ mm length was taken in 2150 to 2300 m off the south coast of Portugal, west of the Strait of Gibraltar (Nybelin 1948). In 1987, Gordon and Duncan (1987) recorded a 235 mm specimen from 2975 m in the Rockall Trough. Merrett et al. (1991) recorded 24 specimens from nine stations in the Porcupine Seabight southwest of Ireland. Based on those captures, the species was thought to be confined to the higher latitudes of the North Atlantic Ocean. However, in 1988 during a cruise of the former Soviet Union research vessel *Vityaz' II* to the western Indian Ocean, one specimen was collected off the Madagascar Plateau. That specimen was unrecognized as to species until the first author examined the North Atlantic specimens and made the connection between the two. It is the purpose of this paper to record these new specimens and to add to the description of the species.

Methods and Materials

Counts and measurements were taken following Gilbert and Hubbs (1916), later modified by Iwamoto (1970) and Iwamoto and Sazonov (1988). Institutional abbreviations are as follows: CAS—California Academy of Sciences; IORAN (formerly IOAN)—P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences; NHM (formerly BMNH)—The Natural History Museum, London; SAIAB (formerly RUSI)—South African Institute of Aquatic Biology, Rhodes University, Grahamstown; ZMMGU—Zoological Museum, Moscow State University; ZMUB—Zoological Museum, University of Bergen.

Genus *Paracetonurus* Marshall, 1973

TYPE SPECIES: *Macrourus parvipes* Smith and Radcliffe, 1912, by original designation.

Paracetonurus flagellicauda (Koefoed, 1927)

Figs. 1–3

Macrurus flagellicauda Koefoed, 1927:99–100, pl. 5, fig. 8, text-figs. 34, 35 (original description; 4 syntypes, ZMUB 3383).

Grenurus flagellicauda: Nybelin, 1948:69–70, pl. 4, fig. 4 (1 spec., 95+ mm TL; 35°43′N, 8°16′W; 2150~2300 m).

Paracetonurus flagellicauda: Marshall, 1973:616 (in key). Gordon and Duncan, 1987:318, table 4 (1 spec., Rockall Trough, 54°27′N, 12°25′W; 2975 m). Merrett et al., 1991: table 2 (24 specimens listed from Porcupine Seabight; 2486–3098 m).

Specimens examined.— Syntypes: ZMUB 3383 (4 specimens, 55.2~67.8 mm HL, 294+~393+ mm TL); Mid-Atlantic Ridge, 45°26′N, 25°25′W, 3120 m; *Michael Sars* st. 88, 18 July 1910. Other material (44 spec.): ZMUB 16353 (1, 22.2 HL, 131+ TL), ZMUB 16354 (10, 31.5~59.7 HL. 179+~395 TL); Mid-Atlantic Ridge, 42°55′N, 30°20′W, 2670-2660 m; *R/V G.O. Sars* superstation 40, local station 367; 7 July 2004. ZMUB 16355 (1, 16.4 HL, 97+ TL); 42°49′N, 29°38′W, 2107-2063 m; *R/V G.O. Sars* superstation 42, local station 368; 8 July 2004. ZMUB 16356 (9, 37.5~58.3 HL, 205+~375+ TL) and ZMUB 16357 (1, 40.7 HL, 233+ TL); Mid-Atlantic Ridge, 42°46′N, 29°16′W, 3050-3005 m; *R/V G. O. Sars* superstation 46, local station 372; 11 July 2004. ZMUB 16358 (1, 62.0 HL, 379 TL), ZMUB 116359, O-1787, O-1788, O-1789 (7, 37.4~61.6 HL, 270+~392 TL) and ZMUB 16360 (11, 33.4~61.8 HL, 210+~383 TL); Mid-Atlantic Ridge, 42°55′N, 28°08′W, 2979–2973 m; *R/V G.O. Sars* superstation 52, local station 374; 13 July 2004. NHM 1996.8.12.1-2 (2, 28.3~29.1 HL, 142~147+ TL); Porcupine Seabight, 50°27′N, 12°59′W; *Discovery* station 5141101, 2470-2500 m. ZMMGU P-21618 (1, 47.9 HL, 287+TL); Madagascar Plateau, 30°30′S, 46°53′E, 2580–2680 m; R/V *Vityaz' II*, cruise 17, st. 2779; otter trawl; 26 Dec. 1988.

Counts and measurements (from 20 specimens; see also Table 1).— **Counts**. 1D II,7~9 (10 in 1 spec.); P i14~18; V 6 or 7 (8 in 1 spec.); total gill rakers 1st arch (lateral/mesial) 7~10 / 11~13, 2nd arch (8)10~12 / (9)10~12; scales below 1D about 12~15, below 2D 10~15; pyloric caeca 6 (1 spec.). **Measurements:** Head length 33~67.9 mm, total length 187+~393+ mm. The following in percent of head length: snout length 32~37; preoral length 22~29; internasal width 33~42; interorbital width 40~49; orbit diameter 20~26; suborbital width 13~18; postorbital length 47~52; distance orbit to angle of preopercle 41~48; upper jaw length 27~34; barbel length 11~17; length outer gill slit 12~18; preanal length 123~140; distance outer pelvic ray to anal origin 30~42; greatest body depth 65~92; 1D-2D interspace 27~70; height 1D 42~65; length P 51~61; length V 27~42.

Description.— Head broad, rounded, interorbital width almost twice (1.8~2.1 times) orbit diameter in most specimens; head length more than six times in total length in specimens with a complete tail. Body depth about 1.2~1.4 in head length; body tapering gradually to long, slender tail, which is almost string-like posteriorly. Snout broad, greatest width across lateral angles about

FIGURE 1. *Paracetonurus flagellicauda*, ZMUB 16357, from the Mid-Atlantic Ridge in the North Atlantic at a depth of 3050–3005 m.

FIGURE 2. *Paracetonurus flagellicauda*, ZMMGU P-21618 (47.9 mm HL, 287+ mm TL), from the Madagascar Plateau at a depth of 2580–2680 m: (left) dorsal and (right) ventral views of head.

equal to or slightly more than interorbital width; snout high, its tip on a longitudinal line passing through dorsal part of orbit and upper margin of operculum, the nasal fossa mostly above that line. Suborbital region deep; suborbital ridge prominent but not sharply demarcated, connected to leading edge of snout, the two ridges separating head into dorsal and ventral parts. Preopercle large, its diagonal length from orbit to posteroventral margin about two or more times orbit diameter. Opercle and subopercle small, the latter mostly hidden behind preopercle, which is adnate along its ventral margin to the mostly hidden interopercle. Mouth somewhat inferior, jaws relatively short, less than one-third HL, not restricted by lip folds at posterior angle. Chin barbel short and slender, its length about equal to suborbital width, about 0.5 length of upper jaw. Gill opening wide, extending ventrally to point slightly behind vertical through posterior end of mandible; gill membranes narrowly connected to isthmus. Gill rakers all small, tubercular; gill filaments short, fragile. Periproct broad, spanning a length about ⅔ orbit diameter, situated close before anal fin, the anus and urogenital opening surrounded by broad margin of black naked skin. Pyloric caeca fairly short, well devel-

oped, six in one female of 54 mm HL from ZMUB 16356.

Premaxillary teeth short, conical, little recurved, slightly larger anteriorly, in tapered band about five or six teeth wide anteriorly, becoming two or three, then one row wide posteriorly, the band spanning about half length of premaxillary. Mandibular tooth band slightly shorter but otherwise similar to that of premaxillary.

Scales on head and body small, densely covered with 5~12 short, erect, needle-like spinules, the bases of each forming low buttresses, as elegantly illustrated in Koefoed's (1927: text-figs. 34 and 35) original description. Almost entire head and body uniformly covered with small thin scales, the exceptions being naked lips, gular and branchiostegal membranes, anterior part of mandibular rami, nasal fossae, fins, cresent-shaped area behind pectoral-fin base, narrow to moderately broad triangular patch of naked skin under snout immediately in front of mouth (extending forward ventromesially to tip of snout in some specimens), and periproct. Head ridges lack modified scute-like scales characteristic of other related genera (e.g., *Nezumia, Sphagemacurus*), and terminal and lateral angles of snout not tipped with coarse, thick tubercles. No enlarged scales along dorsal and anal fins. Grooved lateral line not well developed on trunk, mostly occurring as short interrupted segments, better defined on tail.

TABLE 1. *Paracetonurus flagellicauda.* Comparison of measurements and counts of four syntypes, 15 Mar-Eco specimens, and one Madagascar Plateau. Figures in parentheses for counts represent peripheral values observed in only one or two specimens.

	Syntypes (4)	**Mar-Eco (15)**	**Madagascar**
Total length (mm)	294+~393+	97+~390	287+
Head length (mm)	55.2~67.8	16.4~62.5	47.9
in percent of HL			
Snout length	32~36	32~36	37
Preoral length	26~28	22~28	29
Internasal width	34~36	33~42	39
Interorbital width	40~42	41~49	44
Orbit diameter	20~25	20~26	22
Suborbital width	15~18	13~18	16
Postorbital length	47~50	48~52	49
Len. Orbit to preopercle	42~46	41~48	42
Len. Upper jaw	27~32	28~34	31
Len. Barbel	13~17	11~17	15
Preanal length	133~136	123~140	132
Outer V to A origin	34~38	30~42	38
Body depth	65~92	70~88	80
1D-2D interspace	42~70	27~48	31
Height 1D	58~64	42~65	40
Length P	51~61	–	–
Length V	27~42	–	–
Counts			
1D	II,7~9	II,(7)8~9(10)	II,9
P	i14~i18	i15~i19	i16
V	6~8	6(7)	6
GR-I (lateral)	9~10	7~10	9
GR-I (mesial)	11	11~13	11
GR-II (lateral)	12	(8)10~12	10
GR-II (mesial)	11	(9)10~12	11

First dorsal fin short based, its height about ⅖ to about ⅔ length of head; its spinous second ray with few to many serrations along leading edge in smaller specimens, but almost entirely smooth in some larger specimens. Second dorsal fin low throughout its length. Anal fin well developed and relatively high throughout. Pectoral fin of moderate size, its distal tip extending well beyond origin of anal fin. Pelvic fin small, narrow based and short, its distal tip extending to or slightly beyond anal-fin origin (to about 8th anal ray in 1 specimen). Origins of first dorsal and pelvic fins anterior to pectoral-fin base, the pelvic-fin base under gill cover; anal-fin origin slightly behind vertical through posterior end of first dorsal. Interspace between first and second dorsal fins highly variable,

usually less (considerably less in some specimens) than postorbital length of head.

Coloration in adults with pattern of black parts contrasting sharply with pale to white overall color of head, trunk, and anterior part of tail and anal fin. Coal black areas include narrow median strip on underside of snout, jaws (although posteriormost end of lower jaw pale), branchiostegal membranes, posterior part of anal fin, long spine of first dorsal fin and membrane immediately following, oral and gill cavities, gill arches and gill rakers. Blackish areas on chest and abdomen (within triangular area from behind gill cover posteroventrally to immediately behind anal-fin origin, including pectoral-fin base) often obscured by scale covering. Posteriorly, about one head length behind abdominal cavity, tail swarthy to blackish. Pectoral and pelvic fins white in most specimens, but in some, uppermost pectoral ray and outermost pelvic ray blackish. Barbel variably pale to dark. Smaller individuals generally darker overall, and black markings less pronounced as a consequence.

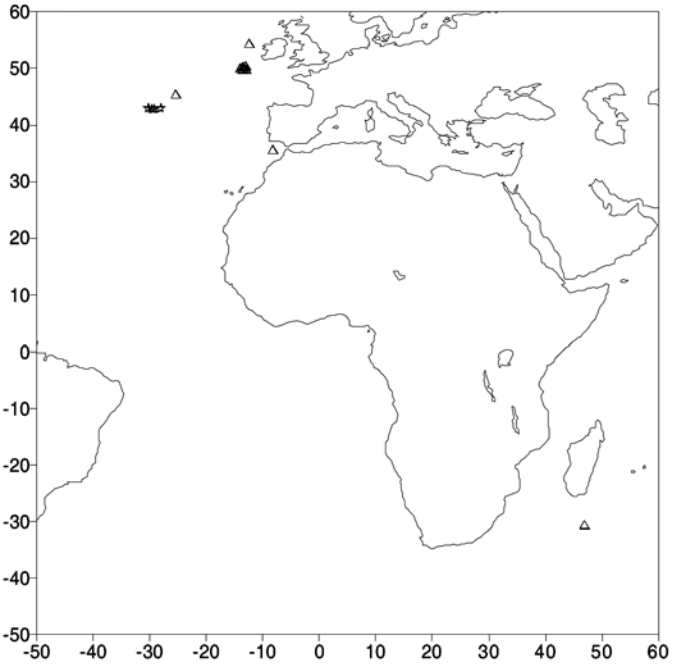

FIGURE 3. Capture localities of *Paracetonurus flagellicauda*. (1) Triangles represent non-Mar-Eco specimens; (2) stars indicate Mar-Eco localities.

SIZE.— The maximum size of specimens examined was more than 393 mm TL and almost 68 mm HL. The longest specimen and another of 335 mm TL (62.4 mm HL) were females with large gonads that appeared to have well-developed oocytes.

DISTRIBUTION.— Known only from the eastern North Atlantic (Mid-Atlantic Ridge, off Portugal, Rockall Trough, and Porcupine Seabight) and on the Madagascar Ridge in the southwestern Indian Ocean (Fig. 3), at mid-sounding depths of 2085–3120 m.

REMARKS.— The genus *Paracetonurus* was erected by Marshall (1973) to include *Macrurus parvipes* Smith and Radcliffe, 1912, *Lionurus cetonuropsis* Gilbert and Hubbs, 1916, and *M. flagellicauda.* Sazonov and Shcherbachev (1982:11), in their revision of genera related to *Cetonurus*, described a new species, *Paracetonurus pusillus*, and shifted *Macrurus fragilis* Garman, 1888, which Iwamoto (1979) had placed in *Paracetonurus*, into their new genus *Asthenomacrurus.* Marshall considered the genus to be most closely related to *Kumba* Marshall, 1973, but Sazonov and Shcherbachev considered it to be closest to *Cetonurus* Günther, 1887 and *Pseudonezumia* Okamura, 1970. More extensive discussions of the relationships within this group of genera were provided by Sazonov and Shcherbachev (1985) in their second paper on this group.

The material for this paper prompted a re-examination of the description of *Echinomacrurus occidentalis* Iwamoto, 1979. That species was distinguished from the only other species of the genus, *E. mollis* Roule, 1916, by a number of characters related to fin-ray counts, proportional measurements, and squamation. In particular, the pelvic fin-ray count was higher (12 vs. 9~10), the

orbit was larger (20% HL cf. 10~15%), and the scales on the abdomen were much smaller. Furthermore, the second spinous ray of the first dorsal fin was serrated along the leading edge in *E. occidentalis*, but entirely smooth in *E. mollis.* Almost all these differences are shared with *Paracetonurus flagellicauda*, with only the pelvic fin-ray count differing. It thus appears incontrovertible that *E. occidentalis* belongs in *Paracetonurus* and not in *Echinomacrurus.* The main character distinguishing *P. occidentalis* from all others of the genus is its pelvic fin-ray count of 11 or 12, compared with usually 6 or 7, rarely 8, in the other species.

Nigel R. Merrett (NHM, retired) informed us of the 24 specimens captured in 2486–3098 m in the Porcupine Seabight in the eastern North Atlantic (roughly 50°N and 13°W) and recorded in Merrett et al. (1991: table 2). He provided the following *Discovery* stations (for geographical coordinates and depths, see Merrett et al. 1991: Appendix 1) and number of *P. flagellicauda* specimens (which ranged 22-66 mm HL) from each station: 5051201 (2 spec.); 5071201 (2); 5081401 (2); 5090701 (1); 5101501 (1); 5141101 (2); 5141301 (5); 5161101 (1); 5180401 (8). In addition, five others were taken at three stations using an epibenthic sledge: station 5141201 (1), 50°16.9′N, 13°29.3′W, 2760–2790 m; 5141601 (1), 2780–2770 m; 5141701 (3), 50°10.3′N, 13°22.3′W, 2790-2770 m. Two of these *Discovery* specimens are deposited in the NHM where the second author examined them during a visit in February 2006; the disposition of the remaining specimens is unknown.

Discussion.— It was a propitious coincidence that the MAR-ECO Fish Taxonomy Workshop was held in Bergen, Norway, as it was on a Norwegian vessel that the type specimens of *P. flagellicauda* were taken, and those specimens were deposited in the Bergen Museum, where they were available for examination and comparison with the MAR-ECO material.

The many specimens captured at the three *G.O. Sars* stations and the 11 *Discovery* stations suggest that the species is not uncommon at appropriate depths on trawlable grounds. Mid-depth soundings of the *G.O. Sars* captures spanned 1035 m, while those of *Discovery* spanned only 614 m, suggesting a narrow vertical distribution that Merrett (in litt., Feb. 2006) considers as continental rise. The four *Michael Sars* specimens representing the types were captured about 2.5 degrees latitude farther north than the *G.O. Sars* specimens, and the total area of the MAR captures spanned 2°40′ north to south and 4°55′ east to west. The *Discovery* localities in the Porcupine Seabight spanned an area of only 33.5 minutes N-S and 38.0 minutes E-W. Although the highly restricted areas of capture suggest pockets of abundance, more likely the data are artifacts of collecting efforts.

The single specimen taken on the Madagascar Plateau is an enigma and leads one to wonder if the distribution of the species is continuous across the equator, from north to south along the MAR and then east into the Indian Ocean. Alternatively, the species may have a disjunct distribution, assuming that our calling the single Indian Ocean specimen the same species as our many North Atlantic ones is valid. Nigel Merrett (in litt., Feb. 2006) notes the similarity of the distribution with that of *Macrosmia phalacra* Merrett, Sazonov and Shcherbachev, 1983, which has been taken in the North Atlantic and the eastern Indian Ocean. It is probably safe to assume that the depth distribution of the *P. flagellicauda* lies between approximately 2000 and 3000 m, which coincides with depths of the middle North Atlantic Deep Water. That water mass, which originates in part from subpolar waters north of latitude 40°N, works its way south across the equator well into the South Atlantic where it is "...mixed with Antarctic components of the intermediate and bottom water" (Dietrich 1963:484). Could *P. flagellicauda* have become widely dispersed along the Mid-Atlantic Ridge within this water mass, and found its way into the Indian Ocean? In many stretches of the Ridge, the elevation does not rise above 3000 m—these large gaps could conceivably block demersal fishes that lack means of dispersing across such barriers. If the population of *P. flagellicauda*

is continuous along the MAR, how much genetic interchange is taking place at opposite ends of the ridge? It is perhaps too speculative to consider these questions at this time, and only after considerably more collecting along the entire MAR will it be possible to address these thoughts.

Acknowledgments

We give particular thanks to Franz Uiblein (Institute of Marine Research, Bergen) for organizing the MAR-ECO Workshop, inviting our participation, and providing travel support for the second author through the MAR-ECO program. Ingvar Byrkjedal (ZMUB) is thanked for his superb logistical support during the workshop and for providing data and the loan of specimens. Loan of the *Vityaz' II* specimen was made possible by Nikolai V. Parin and Yuri N. Shcherbachev (IORAN). Eric Anderson (SAIAB) took special care in preserving grenadiers for TI during *Vityaz' II* cruise 17. Patrick Campbell and Roberto Miguez (NHM) are thanked for assisting AO during his visit to the NHM. John E. McCosker (CAS) kindly reviewed an early version of the manuscript and provided useful advice. Nigel R. Merrett (NHM, retired) deserves special thanks for reviewing the manuscript and providing information on the *Discovery* specimens, saving us from an embarrassing omission. Jon D. Fong (CAS) photographed the *Vityaz' II* specimen of *Paracetonurus* and Mysi Hoang assisted with images and specimens.

Literature Cited

Dietrich, Günther. 1963. *General oceanography, an introduction.* Interscience Publishers, New York, New York, USA and London, UK. 588 pp.

Gilbert, Charles H., and Carl 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. *Proceedings of the United States National Museum* 51:135–214, pls. 8–11.

Gordon, J.D.M., and J.A.R. Duncan. 1987. Deep-sea bottom-living fishes at two repeat stations at 2200 and 2900 m in the Rockall Trough, northeastern Atlantic Ocean. *Marine Biology* 96:309–325.

Iwamoto, Tomio. 1970. The R/V *Pillsbury* Deep-sea Biological Expedition to the Gulf of Guinea, 1964–65. 19. Macrourid fishes of the Gulf of Guinea. *Studies in Tropical Oceanography* (4, pt. 2):316–431.

Iwamoto, Tomio. 1979. Eastern Pacific macrourine grenadiers with seven branchiostegal rays (Pisces: Macrouridae). *Proceedings of the California Academy of Sciences*, ser. 4, 42(5):135–179.

Iwamoto, Tomio. 1990. Macrouridae. Pages 90–317 *in* D.M. Cohen, T. Inada, T. Iwamoto, and N. Scialabba, eds., *FAO Species Catalogue, vol. 10. Gadiform Fishes of the World (Order Gadiformes). An Annotated and Illustrated Catalogue of Cods, Hakes, Grenadiers and Other Gadiform Fishes Known to Date*. FAO Fisheries Synopsis, No. 125.

Iwamoto, Tomio, and Yuri I. Sazonov. 1988. A review of the southeastern Pacific *Coryphaenoides* (*sensu lato*) (Pisces, Gadiformes, Macrouridae). *Proceedings of the California Academy of Sciences*, ser. 4, 47(7):207–233.

Koefoed, Einar. 1927. Fishes from the sea-bottom from the "Michael Sars" North Atlantic Deep-Sea Expedition 1910. *Report on the Scientific Results of the "Michael Sars" North Atlantic Deep-Sea Expedition 1910*, 4(part 1):1–148, pls. 1–6.

Marshall, Norman B. 1973. Family Macrouridae. Pages 496–665 *in* Daniel M. Cohen, ed., *Fishes of the western North Atlantic*. Memoir Sears Foundation for Marine Research no. 1, part 6.

Merrett, Nigel R., Richard L. Haedrich, John D.M. Gordon, and Mathias Stehmann. 1991. Deep demersal fish assemblage structure in the Porcupine Seabight (eastern North Atlantic): results of single warp trawling at lower slope to abyssal soundings. *Journal of the Marine Biological Association of the United Kingdom* 71:359–373.

Nybelin, Orvar. 1948. Fish collected by the Skagerak Expedition in the Eastern Atlantic1946. *Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handlingar. Sjätte Följden*, ser. B, 5(16):1–95, pl. 1–6.

OKAMURA, KAMURA. 1970. *Fauna Japonica. Macrourina* (*Pisces*). Academic Press, Tokyo, Japan. 216 pp., 64 pls.

SAZONOV, YURI I., AND YURI N. SHCHERBACHEV. 1982. A preliminary review of grenadiers related to the genus *Cetonurus* Günther (Gadiformes, Macrouridae). Descriptions of new taxa related to the genera *Cetonurus* Günther and *Kumba* Marshall. *Voprosy Ikhtiologii* 22(5):707–721, figs. 1–4. [In Russian, with English summary; see also English transl., *Journal of Ichthyology* 22(5):1–15.]

SAZONOV, YURI I., AND YURI N. SHCHERBACHEV. 1985. Preliminary review of grenadiers of the *Cetonurus* group (Gadiformes, Macrouridae). II. The genus *Cetonurus* Günther: taxonomic characters of the group. *Voprosy Ikhtiologii* 25(2):179–195, figs. 1–2. [In Russian, with English summary; see also English transl., *Journal of Ichthyology* 25(3):12–26, figs. 1–2., tables 1–2.]