

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

MACROURIDS (GADIFORMES:PISCES) COLLECTED
OFF ANGOLA BY THE R/V UNDAUNTED, WITH
THE DESCRIPTION OF A NEW SPECIES

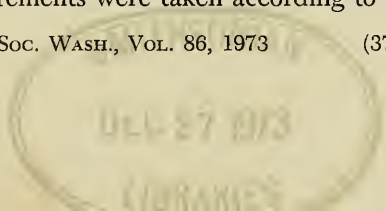
By TOMIO IWAMOTO

*Department of Ichthyology, California Academy of Sciences,
San Francisco, California 94118*

A trawl survey was made off the west coast of Africa from Angola to the northern border of South-West Africa in March and April of 1968 using the research vessel UNDAUNTED. The results of this survey, conducted under the Systematics Program of the Bureau of Commercial Fisheries (now National Marine Fisheries Service), Miami, Florida, has been compiled for publication by Miller (manuscript). Examination of the macrourid fishes collected in four hauls revealed specimens of an undescribed species of *Nezumia* and five other species, including representatives of two subspecies of *Coelorinchus coelorhincus* which have since been described by Marshall and Iwamoto (1973a).

Macrourid fishes from the Gulf of Guinea, the region immediately north of the area covered by the R/V UNDAUNTED, were reported in an earlier paper (Iwamoto, 1970). The present material helps to fill the gap in our knowledge of the macrourid fauna of the west coast of Africa, particularly in that important area around Mossamedes, where changes in hydrographic conditions greatly alter distributions of macrourids, as well as of other fishes (Ekman, 1953). Significant in this respect is the presence south of Mossamedes of three temperate west African macrourids (*Nezumia milleri*, *Coelorinchus coelorhincus polli* and *C. fasciatus* (Günther, 1878)) not found in the tropical Gulf of Guinea.

Counts and measurements were taken according to methods



described by Hubbs and Lagler (1958) with modifications by Iwamoto (1970), but with the following change: Postorbital length—taken on a horizontal line through the center of the eye from the posterior orbital margin to the posterior opercle margin.

In the "Material" sections, the depository and catalog number is given first, followed (in parentheses) by the number of specimens and range of head lengths. Abbreviations are as follows: BMNH—British Museum (Natural History); CAS—California Academy of Sciences; TABL—Southeast Fishery Center, National Marine Fisheries Service, Miami, Florida (specimens with these TABL numbers are now housed in the fish collections of the Florida State Museum (UF)); UF—University of Florida, Florida State Museum; UMML—University of Miami, Rosenstiel School of Marine and Atmospheric Sciences; UN—R/V UNDAUNTED; USNM—National Museum of Natural History, Smithsonian Institution.

Data for the four UNDAUNTED stations at which macrourids were captured are as follows:

UN cr. 6801, sta. 105—lat. $17^{\circ}13'S$, long. $11^{\circ}27'E$, off Kunene River, Angola, 155 m, 40-ft otter trawl, 24 March 1968.

UN cr. 6801, sta. 106—lat. $17^{\circ}18'S$, long. $11^{\circ}24'E$, off Kunene River, Angola, 229–274 m, 40-ft otter trawl, 24 March 1968.

UN cr. 6801, sta. 107—lat. $17^{\circ}23'S$, long. $11^{\circ}20'E$, off Kunene River, Angola, 366–412 m, 40-ft otter trawl, 24 March 1968.

UN cr. 6801, sta. 111—lat. $10^{\circ}36'S$, long. $13^{\circ}12'E$, north of Lobito, Angola, 366 m, 40-ft otter trawl, 12 April 1968.

I give special thanks to Mr. George C. Miller of the National Marine Fisheries Service, Miami, Florida, whose collecting efforts resulted in the material for this paper. He also made suggestions for improving the manuscript. I also thank William N. Eschmeyer and Lillian P. Dempster, California Academy of Sciences, for their comments and critical review of the manuscript.

Nezumia milleri, new species

Figures 1, 2

Holotype: USNM uncat. (♀ with gonads moderately enlarged, 28.1 mm HL, 175 mm TL), off Angola, in 366–412 m, UN cr. 6801, sta. 107.

Paratypes: USNM uncat. (1, 28 mm HL), UMML uncat. (5, 26–29 mm HL), BMNH uncat. (1, 27 mm HL), and CAS uncat. (2, 26–28 mm HL); all 9 specimens taken with the holotype.

Diagnosis: A species of *Nezumia* with 8 pelvic fin rays. Snout short, acute, 25.5–27 percent HL (1.47–1.64 into orbits). Orbits large, 40–42 percent HL. Scale spinules moderately slender, lanceolate. First dorsal fin long (98–109 percent HL), black tipped. Ventral surface of suborbital region completely and evenly covered with small scales; ventral surface of snout in front of premaxillary symphysis naked. Barbel short, 11–14 percent HL. Body depth 77–83 percent HL.

Counts: First dorsal fin rays II, 9–10; pectoral fin rays 18–21; pelvic fin rays 8. Gillrakers on first arch 2 + 8–9; on second arch 1–2 + 8–9. Scales below origin of first dorsal fin 8–9; below origin of second dorsal fin 6–7. Lateral line scales counted from the anteriormost scale posteriorly over a distance equal to predorsal length 31–37.

Morphometry: Total lengths of specimens examined ca. 134–180 mm; head lengths 26.2–28.9 mm. The following in percent of head length (measurements for holotype in brackets): snout length [26] 25–27; preoral length of snout [23] 20–25; orbit diameter [40] 40–42; suborbital width [11] 11–13; interorbital width [17] 16–23; postorbital length [34] 33–35; length orbit to angle of preopercle [35] 30.5–35; length upper jaw [32] 29–33; length barbel [12] 11–14; length first (outer) gill-slit [13] 11–15; predorsal length [113] 113–118; preanal length [142] 140–148; isthmus to anal [72] 57–77; outer pelvic to anal [37] 36–42; greatest body depth [82] 77–83; length longest dorsal ray [101] 98–109; length pectoral fin [57] 56–63; length pelvic fin 51–79; D_1 – D_2 interspace [48] 42–56.

Description: *Nezumia milleri* (Fig. 1) is a small species of macrourid with a short, moderately acute (in lateral view) snout that has moderately prominent scutes at the terminal and lateral angles. The dorsal profile has inflections over the snout and posterior portion of the orbits, the inflections being more prominent in the holotype than in most of the paratypes. A pale mesial streak marks the anterodorsal edge of the nape. The suborbital ridge is sharply delineated by a row of stout, scute-like scales. Much smaller and weaker-spined scales lie dorsal to the ridge row; these smaller scales are arranged in a single row at the narrowest part of the suborbital region. The narrow interorbital region showed considerable variation in width, ranging from about 0.4 to 0.6 of the orbit diameter. There was a tendency for the measurement to be greater in the males than in the females examined. The mouth is small with the posterior edge of the upper jaw extending back to a vertical just past the middle of the eye. The gill opening extends forward to a point below the

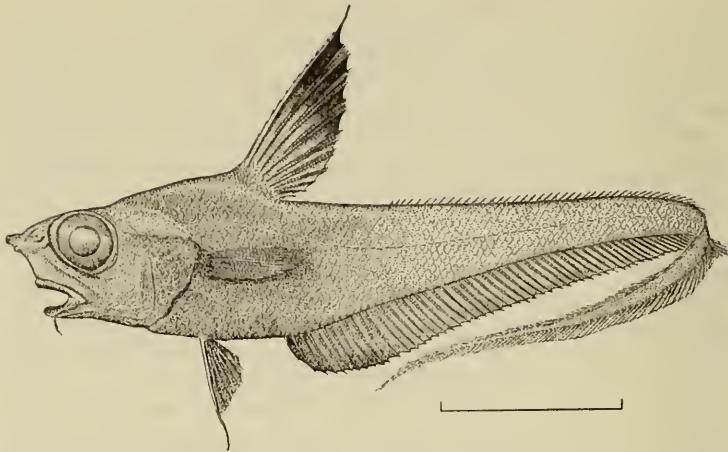


FIG. 1. *Nezumia milleri* Iwamoto, new species. Holotype, USNM uncat., 28 mm head length, from off Angola, R/V UNDAUNTED cruise 6801, station 107 in 200–225 fathoms (366–412 m). Scale represents 25 mm.

posterior margin of the orbits. The chin barbel is short and slender and about equal in length to the suborbital width.

The first dorsal fin is high and about as long as the head length. Its first ray is short, stout and thornlike; the second spinous ray is slightly longer than other rays of the fin and armed with slender sharp teeth along the leading edge. Pectoral and pelvic fins are rather small; the outer pelvic ray is slightly longer than the other rays of the fin and extends slightly beyond the anal-fin origin. Males appeared to have slightly longer pelvic rays, but this could not be substantiated with the small number of specimens available.

Body scales are similar to those of *N. aequalis* illustrated by Holt and Calderwood (1895). Spinules tend to be broader on chest scales than those on the dorsal surfaces of the trunk and tail. A small area on the leading ventral portion of the snout is apparently scaleless. Rami of the lower jaws, as well as the lower exposed margin of the interopercle, are scaled; but the gular and branchiostegal membranes are naked.

The anus is situated close behind the bases of the pelvic fins (as in most other species of the genus) and separated from the anal-fin origin by a considerable distance. A lenticular bulge of naked black skin surrounds the anal opening; a small, black, circular, dermal window of the light organ lies in front of this region and between the inner edge of the pelvic-fin bases.

Coloration (from color transparencies of fresh specimens): The head

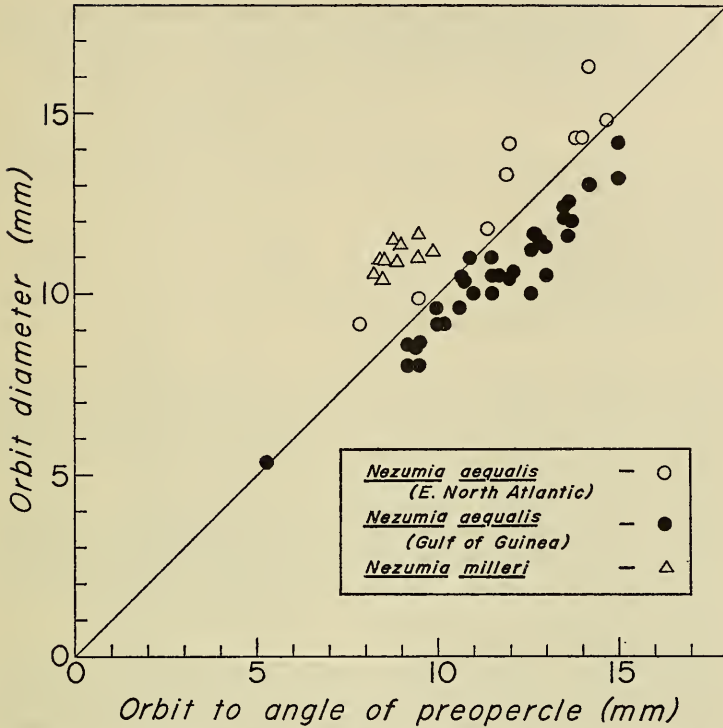


FIG. 2. Orbit diameter compared with distance orbit to angle of preopercle for *Nezumia milleri* and *N. aequalis*. Specimens of *N. aequalis* are distinguished according to two eastern Atlantic localities; the differences between various populations of *N. aequalis* are discussed by Marshall and Iwamoto (1973b). Diagonal line represents 1:1 ratio of two measurements.

is pale grayish brown dorsally, posteriorly on the occipital region and ventrally on the lower surfaces of the snout and the suborbital region. The rest of the head is mostly swarthy. Anteroventral rims of the orbits and the margins of the upper and lower lips are black. The nape, trunk and the anteriormost part of the tail are a dark brownish violet, but more posteriorly on the tail the color fades to medium brown. Median fins are mostly pale except for a prominent black blotch on the distal half or so of the first dorsal fin and dusky pigmentation on the anteriormost portion of the anal fin. Pelvic fins are black with the outermost ray on each fin whitish.

The oral cavity is almost entirely black, but small pale areas are

TABLE 1.—Pelvic finray counts of *Nezumia milleri* compared with those of two eastern Atlantic populations of *N. aequalis*. See Marshall and Iwamoto (1973b) for description of populations of *N. aequalis*.

	Pelvic finrays*			\bar{x}
	8	9	10	
<i>Nezumia milleri</i>	20	—	—	8.00
<i>Nezumia aequalis</i>				
Gulf of Guinea	9	93	1	8.92
E. North Atlantic	20	4	—	8.09

* Includes counts of both right and left fins.

present behind the angles of the jaws. Gill cavity walls are mostly black, with the anterior portion of the outer wall and an elongate strip along the hyoid muscle generally pale. The area around the anus (and between the pelvic fins) is black.

Size: The moderately developed gonads of the 175-mm holotype indicate that this is a small species in the size range of *N. aequalis* (Günther, 1878) and *N. sclerorhynchus* (Valenciennes, 1838) and smaller than species like *N. bairdii* (Goode and Bean, 1877), *N. micronychodon* Iwamoto, 1970, and *N. longebarbatus* (Roule and Angel, 1933), whose maximum lengths exceed 350 mm.

Relationships: *Nezumia milleri* is very closely related to the wide-ranging and morphologically diverse species *N. aequalis* and has probably been derived from that species. Some populations of *N. aequalis* appear to be strongly differentiated (particularly those of the Gulf of Guinea and the Gulf of Mexico), but Marshall and Iwamoto (1973b) chose to call them populations rather than subspecies or species because of the considerable overlap present in most of the characters they analyzed. *Nezumia milleri* shows in these same characters (especially snout length and orbit diameter) substantially greater differences from the various populations of *N. aequalis* than the populations show from each other—this led me to consider *milleri* as a full species rather than a population of *N. aequalis*. Moreover, the populations of *aequalis* most similar to *milleri* appear to be those from the eastern North Atlantic and western Caribbean Sea, while the Gulf of Guinea population, which lies geographically closest, appears to be the one least similar to *milleri*. Because of the pronounced differences in hydrographic conditions off Angola (created by extensive upwelling and the offshore movement of the Benguela Current), an effective zoogeographic barrier off Angola is developed (Ekman, 1953). This barrier probably allowed *N. milleri* to diverge from the *N. aequalis* line and develop its own species characteristics.

TABLE 2. Comparisons of orbit diameters of *Nezumia milleri* with those of eight populations of *N. aequalis*. Data for populations of *N. aequalis* from Marshall and Iwamoto (1973b).

	Orbit diameter (per cent HL)																\bar{x}
	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43		
<i>N. milleri</i>	—	—	—	—	—	—	—	—	—	—	—	6	2	2	2	40.6	
<i>N. aequalis</i>																	
Gulf of Guinea	1	3	11	9	17	5	3	1	—	—	—	—	—	—	—	32.4	
E North Atlantic	—	—	—	—	1	1	1	5	—	2	1	1	—	—	1	36.8	
W North Atlantic	—	2	—	7	8	6	4	2	1	—	—	—	—	—	—	33.4	
Gulf of Mexico	—	—	—	1	—	7	11	17	10	10	3	1	—	—	—	36.7	
Antilles	—	—	1	—	3	5	8	2	2	—	—	—	—	—	—	34.5	
W Caribbean	—	—	—	—	—	—	2	5	3	9	—	1	1	—	—	37.3	
Venezuela-Colombia	—	—	—	—	1	—	3	8	4	6	3	1	—	—	—	36.9	
NE South America	—	—	—	1	—	5	6	3	1	1	—	—	—	—	—	35.0	

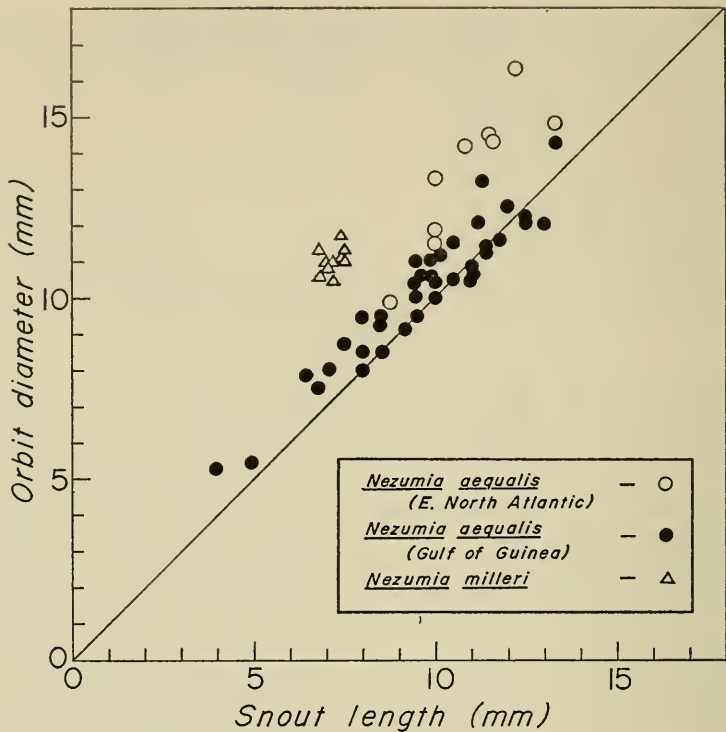


FIG. 3. Orbit diameter compared with snout length for *Nezumia milleri* and *N. aequalis*. Data for specimens of *N. aequalis* are distinguished according to two eastern Atlantic localities, the populational differences of which are discussed by Marshall and Iwamoto (1973b). Diagonal line represents 1:1 ratio of two measurements.

The large orbits of *N. milleri* in combination with the short snout and 8 pelvic fin rays distinguish the species from adult specimens of all other Atlantic members of the genus. Young specimens of *N. aequalis* from the eastern North Atlantic show overlap in orbit diameter measurements (Table 2), but they can be distinguished from the new species by their longer snout (28–32 percent HL vs. 25–27 percent for *milleri*) (Fig. 2), deeper body (greatest depth 88–91 percent HL vs. 77–83 percent for *milleri*), and broader suborbital region (14–16 percent HL vs. 11–13 percent for *milleri*). The population of *N. aequalis* from the Gulf of Guinea differs from *milleri* in having smaller orbits (Table 2), longer snouts (Fig. 2), and generally higher pelvic fin ray counts (usually 9) (Table 1). Western Atlantic populations of *aequalis* showing slight

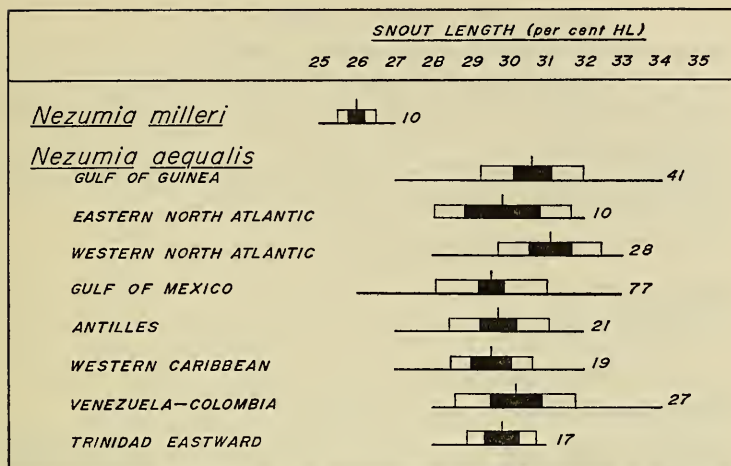


FIG. 4. Comparison of snout lengths of *Nezumia milleri* and eight populations of *N. aequalis*. Data for *N. aequalis* from Marshall and Iwamoto (1973b). Method of presentation of data from Hubbs and Hubbs (1953).

overlap with *milleri* in orbit diameter measurements include those from the Gulf of Mexico, the western Caribbean and the Venezuelan-Colombian region. Snout length measurements of these populations, however, show frequency distributions that are generally much higher than for *milleri* (Fig. 2). Some overlap with *milleri* can be seen for both snout length and orbit diameter measurements in these three western Atlantic populations, but the degree of overlap is very slight. The Gulf of Mexico population can further be distinguished by having predominantly 9 pelvic fin rays.

Distribution: Temperate waters off Angola and South-West Africa.

Etymology: This species is named for Mr. George C. Miller of the National Marine Fisheries Service, Miami, Florida, whose efforts resulted in the collections of the macrourids here reported.

Nezumia micronychodon Iwamoto

Nezumia micronychodon Iwamoto, 1970:385, figs. 17a, 18, 19, 20a, 21a, 22, 23.

Material: TABL uncat. (16, 24.5–46 mm HL), UN cr. 6801, sta. 107.

Remarks: These small specimens (most under 38 mm HL), captured with the type-specimens of *N. milleri*, showed well the size-related differences in physiognomy of the head noted by Iwamoto (1970).

Malacocephalus occidentalis Goode and Bean

Malacocephalus occidentalis Goode and Bean, 1885:597.

Material: TABL 107413 (6, 56–71 mm HL) and CAS 14536 (5 specimens), UN cr. 6801, sta. 111; TABL 107415 (24, 21–56 mm HL), UN cr. 6801, sta. 105.

Remarks: These specimens mark the southernmost area from which the species has been reported in the eastern Atlantic.

Malacocephalus laevis (Lowe)

Macrurus laevis Lowe, 1843:92.

Material: TABL 107414 (12, 45–50 mm HL), UN cr. 6801, sta. 111.

Hymenocephalus italicus Giglioli

Hymenocephalus italicus Giglioli in Giglioli and Issel, 1884:228.

Material: TABL 107416 (125, ca. 15–38 mm HL), UN cr. 6801, sta. 111.

Coelorhynchus coelorhynchus (Risso)

Lepidoleprus coelorhynchus Risso, 1810:200–201.

Remarks: Two recently described subspecies of this widespread species were captured. Subspecies *C. coelorhynchus geronimo* Marshall and Iwamoto was taken at the more northerly station (sta. 111) while subspecies *polli* Marshall and Iwamoto was captured at the two more southerly stations (sta. 105 and 107). The UNDAUNTED specimens constituted part of the type-material for the first subspecies and all of the type-material for the second subspecies.

Coelorhynchus coelorhynchus geronimo Marshall and Iwamoto

Coelorhynchus coelorhynchus geronimo Marshall and Iwamoto, 1973a: 124–218, figs. 11d, 14.

Material: USNM 205872 (holotype), TABL 107688 (36 paratypes, 45–65 mm HL), and UF uncat. (5 paratypes), all from UN cr. 6801, sta. 111.

C. coelorhynchus polli Marshall and Iwamoto

Coelorhynchus coelorhynchus polli Marshall and Iwamoto, 1973a:141–144, figs. 11e, 17.

Material: USNM 206490 (holotype, 50 mm HL), USNM 206491 (9 paratypes, 42–70 mm HL), and BMNH uncat. (2 paratypes, 47–61 mm HL), all from UN cr. 6801, sta. 105; TABL 107698 (7 paratypes, 41–59 mm HL) and CAS 13647 (2 paratypes, 46–54 mm HL), UN cr. 6801, sta. 106.

LITERATURE CITED

- EKMAN, SVEN. 1953. Zoogeography of the sea. [Translation from the Swedish]. Sidgwick and Jackson, London. 417 pp.
- GIGLIOLI, ENRICO H., AND A. ISSEL. 1884. Pelagos, saggi sulla vita et sui prodotti del mare. Genova. 433 pp.
- GOODE, G. BROWN, AND TARLETON H. BEAN. 1877. Descriptions of two new species of fishes (*Macrurus bairdii* and *Lycodes verrillii*) recently discovered by the U.S. Fish Commission, with notes upon the occurrence of several unusual forms. Amer. Journ. Sci. Arts, 14:470-478.
- . 1885. Descriptions of new fishes obtained by the United States Fish Commission mainly from deep water off the Atlantic and Gulf coasts. Proc. U.S. Nat. Mus. 8(37-38):589-605.
- GÜNTHER, ALBERT. 1878. Preliminary notices of deep-sea fishes collected during the voyage of H.M.S. CHALLENGER. Ann. Mag. Nat. Hist., Ser. 5, 2(7):17-28.
- HOLT, ERNEST W. L., AND W. L. CALDERWOOD. 1895. Survey of fishing grounds, west coast of Ireland, 1890-1891. Report on the rarer fishes. Sci. Trans. Dublin Soc., Ser. 2, 5(9):360-512, pls. 39-44.
- HUBBS, CARL L., AND CLARK HUBBS. 1953. An improved graphical analysis and comparison of series of samples. Syst. Zool., 2(2): 49-57.
- HUBBS, CARL L., AND KARL F. LAGLER. 1958. Fishes of the Great Lakes region. Rev. ed., Cranbrook Inst. Sci. Bull. 26:1-213.
- 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. Stud. Trop. Oceanogr. Miami, No. 4 (part 2):316-431.
- LOWE, RICHARD T. 1843. Notices of fishes newly observed or discovered in Madeira during the years 1840, 1841 and 1842. Proc. Zool. Soc. London, 11:91.
- MARSHALL, NORMAN B., AND TOMIO IWAMOTO. 1973a. Genus *Coelorrhynchus* Giorna 1809, pp. 542-567. In, Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res., No. 1 (part 6).
- , AND ———. 1973b. Genus *Nezumia* Jordan 1904, pp. 624-649. In, Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res., No. 1 (part 6).
- RISSE, ANTOINE. 1810. Ichthyologie de Nice, ou histoire naturelle des poissons du département des Alpes-Maritimes. Paris, xxxvi + 388 pp., 11 pls.
- ROULE, LOUIS AND FERNAND ANGEL. 1933. Poissons provenant des campagnes du Prince Albert 1^{er} de Monaco. Rés. Camp. Sci. Monaco, 86:1-116, pls. 1-4.
- VALENCIENNES, ACHILLE. 1837-44. Ichthyologie des îles Canaries. In, Philip Barker Webb and Sabin Berthelot, Histoire Naturelle des îles Canaries. Bethune, Paris. Zool., tome 2, partie 2, pp. 1-109, pls. 1-27.