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Results of the research cruises of FRV "Walther Herwig" to South America.

XXXIX. The Epigonine Fauna of the South Atlantic, with a Key to the Genera and a Redescription of *Rosenblattia robusta* Mead and De Falla.

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With 6 figures and 2 tables

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Kurzfassung

Ergebnisse der Forschungsreisen des FFS "Walther Herwig" nach Südamerika. XXXIX. Die Epigoninen-Fauna des Südatlantiks, mit einem Gattungsschlüssel und einer Wiederbeschreibung von *Rosenblattia robusta* Mead und De Falla.

Drei Arten der Unterfamilie Epigoninae (Osteichthyes, Perciformes, Apogonidae) wurden auf den Südatlantikreisen des FFS „Walther Herwig“ gefangen. *Epigonus telescopus* und *E. robustus* sind Bodenbewohner der Kontinentalabhänge. Ersterer ist bipolar verbreitet und im Nordostatlantik wohlbekannt, während der letztgenannte endemisch in den Gewässern des südlichen Subtropischen Konvergenzgebietes lebt.

Rosenblattia robusta ist ein subantarktischer, ozeanischer Fisch, dessen Vorkommen an das Antarktische Zwischenwasser gebunden ist. Die detaillierte Wiederbeschreibung der Art wird ergänzt durch Analysen seiner Verbreitung und Ontogenie. Inkorrektheiten in der Erstbeschreibung hinsichtlich der Strahlenzahl in der Rückenflosse, der Operkularbedornung und der Interorbitalregion werden berichtigt, ein verstümmeltes Exemplar diskutiert.

Ein Gattungsschlüssel für die Unterfamilie Epigoninae ergänzt den Bericht.

Abstract

Three species of Epigoninae were taken in the South Atlantic by recent cruises of the FRV "Walther Herwig". *Epigonus telescopus* and *E. robustus* are deep-dwelling slope forms. The former has a bipolar distribution but is best known from the northeast Atlantic. The latter is endemic to the Subtropical Convergence region.

Rosenblattia robusta is a subantarctic mid-water form found in association with Antarctic Intermediate Water. A detailed redescription of *R. robusta* accompanies analyses of its distribution and ontogeny. Inaccuracies in the original description pertaining to dorsal fin counts, opercular ornamentation and the interorbital region are corrected and a teratological specimen is described.

A key to the genera of Epigoninae is also provided.

A. Introduction

FRASER's revision and comments on the phylogenetic position of the Apogonidae (1972) have produced major changes in the conception and composition of the family. Among the most important is the realignment of problematical deep-sea genera that have been

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shuffled in and out of the Apogonidae by various authors. For example, SCHULTZ (1940) considered forms such as *Epigonus*, *Oxyodon*, *Synagrops*, *Brephostoma*, *Brinkmanella*, *Howella*, *Bathysphraenops* and *Neoscombrops* to be cardinalfishes. This view was shared by MEAD and DE FALLA (1965). NORMAN (1957), however, retained only the first five genera and placed the latter three in the Serranidae.

FRASER's monograph greatly reduces the number of deep-water apogonids. Today only three bathyphilic genera remain in the family: *Epigonus* and two oceanic forms described in 1965, *Rosenblattia* and *Florenciella*. *Oxyodon*, which was considered by FRASER to be of unknown affinity (p. 42), was recently shown to be a junior synonym of *Epigonus* (MAYER, 1974: 159). Because they are morphologically distinct from shallow water forms, deep-sea apogonids are placed in a separate subfamily, the Epigoninae (see FRASER, 1972: 6, 38–39 for details).

To a large extent, the revision of the deep-water Apogonidae was made possible by increased interest in oceanic faunas during the past twenty years. Aside from providing new material from previously surveyed areas, studies were undertaken in unsampled or poorly investigated regions such as the Southern Oceans and associated parts of the Indian, South Atlantic and South Pacific Oceans. Particularly important contributions were made by sampling programs conducted aboard the R/V "Anton Bruun" (Indian Ocean and eastern South Pacific off Chile), USNS "Eltanin" (Southern Oceans), and FRV "Walther Herwig" (South Atlantic).

It is the aim of this paper to report on the Epigoninae collected during the 1966–1971 cruises of the FRV "Walther Herwig" to South America and Africa and to provide a generic key of the subfamily. Data for specimens of *Epigonus* have already been presented as part of a world-wide revision of the genus; consequently no detailed descriptions of the group are included. The reader is referred to MAYER (1974) for keys, descriptions, synonymies and distributions of the species in the genus.

Collections of *Rosenblattia robusta* are the source of much new information. Together with material from other expeditions, the "Walther Herwig" collections are used to redescribe the fish, correct several inaccuracies in the original account, and provide in-depth discussions of the ontogeny and distribution of the species.

B. Methods

Measurements were made to the nearest tenth of a millimeter using Helios needle-point dial calipers. Meristic data were obtained with the aid of a dissecting microscope and dissecting needles or insect pins. Characters examined in this study are defined by MAYER (1974) and HUBBS and LAGLER (1958).

Methods for taking measurements and counts generally conform to those used in the original description of *R. robusta* by MEAD and DE FALLA (1965); however, several differences should be noted. In the present study head length is measured from the midline of the upper jaw to the posteriormost tip of the opercular spine. MEAD and DE FALLA defined this character as the distance from the tip of the snout (not necessarily at the midline) to the posterior edge of the gill flap exclusive of opercular spines (p. 262). In the present study, the number of scales above the lateral line represents the number of elements in an oblique, posteroventrally oriented row extending from the base of the first dorsal fin spine to the lateral line; pored lateral line scales are not included in the count. The count recorded by MEAD and DE FALLA extends from the base of the second dorsal fin spine (p. 262). Finally, the distance between the first and second dorsal fins (abbreviated $D_1 D_2$) is measured from the posterior edge of the seventh

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spine of the first dorsal fin to the anterior surface of the first spine of the second dorsal fin. This character is recorded but not defined by MEAD and DE FALLA.

Osteological data were obtained primarily from radiographs made at the Woods Hole Oceanographic Institution and Museum of Comparative Zoology. In addition, specimens were cleared and stained according to the enzyme method developed by TAYLOR (1967). The latter fishes are identified in specimen lists by a dagger (†). Specimens that have been radiographed are designated by an asterisk (*).

Statistical analyses were carried out on Wang programmable calculators at Harvard University and the University of South Florida. Package programs were used for calculating meristic parameters such as mean and standard deviation. Counts exhibiting little variability are reported in the body of the text as value, followed in parentheses by the number of specimens exhibiting the count. Data for characters with greater variability are presented in tabular form.

Mensural information is presented in ratio format and as linear regressions on standard length (SL). Regression equations were calculated using BARTLETT'S "Best Fit" Method (SIMPSON, ROE and LEWONTIN, 1960: 232–237). To insure linearity, scatter diagrams of trait value vs. standard length were plotted for all morphometric characters. Data with non-linear scatters (determined by inspection) were omitted from consideration. To further guard against non-linearity, data from specimens smaller than 33.0 mm SL were excluded from analyses.

Specimens for this study were provided by a number of institutions. The following abbreviations are used in the text:

ANSP — Academy of Natural Sciences of Philadelphia; Philadelphia, Pennsylvania.

FMNH — Field Museum of Natural History; Chicago, Illinois.

ISH — Institut für Seefischerei der Bundesforschungsanstalt für Fischerei; Hamburg, Germany.

LACM — Los Angeles County Museum of Natural History; Los Angeles, California.

MCZ — Museum of Comparative Zoology; Cambridge, Massachusetts.

SIO — Scripps Institution of Oceanography; La Jolla, California.

USNM — National Museum of Natural History; Washington, D. C.

UZM — Universitetets Zoologiske Museum; Copenhagen, Denmark.

Specimens without catalogue numbers are labeled UC.

C. Comparative Material

Florenciella lugubris: ANSP UC: Paratype, 1 specimen, 36.3 mm SL; R/V "Anton Bruun" Cr. III, Sta. 6, Coll. AE 13B; 01° 58' S, 60° 06' E — 02° 06' S, 60° 02' E; maximum calculated depth 510 m; 21 August 1963. MCZ 43089: Holotype, 1 specimen, 87.3 mm SL; data same as for preceding specimen. MCZ 49814: Paratypes, 11 specimens, 49.9–95.7 mm SL; data same as for ANSP UC. MCZ 49815: Paratype, 1 specimen, 88.7 mm SL; R/V "Anton Bruun" Cr. III, Sta. 5, Coll. AE 12A; 01° 23' N, 60° 11' E — 01° 22' N, 60° 04' E; maximum calculated depth 750 m; 19 August 1963. MCZ 49817: Paratypes, 2 specimens, 33.3–57.4 mm SL; R/V "Anton Bruun" Cr. III, Sta. 6, Coll. AE 14B; 02° 06' S, 60° 02' E — 01° 48' S, 59° 50' E; maximum calculated depth 1600 m; 21 August 1963. SIO UC: Paratypes, 3 specimens, 62.0–91.0 mm SL; data same as for ANSP UC.

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D. Key to the Genera of Epigoninae

- 1 A. Antrorse teeth present on premaxillae and mandibles; anal fin II, 8, rarely II, 9; second dorsal fin I, 7 or I, 8, rarely I, 9 2.
- B. Antrorse teeth absent from premaxillae and mandibles; anal fin II, 9, rarely II, 8; second dorsal fin I, 9 or I, 10 *Epigonus*.
- 2 A. Pored scales along midline of caudal peduncle forming lateral keel, body deep 35.9–42.5% SL; interorbital region broad, 12.3–16.1% SL *Rosenblattia*.
- B. Pored scales along midline of caudal peduncle flat; body shallow, 25.1–30.0% SL; interorbital region narrow, 9.0–10.5% SL *Florenciella*.

E. Species Accounts**1. *Epigonus telescopus* (Risso, 1810)**a) *Material*

ISH 132/67: 1 specimen, 510 mm SL; FRV "Walther Herwig" Sta. 194/67; 33° 47' S, 17° 14' E; 1000 m; 25 June 1967.

b) *Remarks*

E. telescopus is one of three congeners that occur in the temperate South Atlantic. The species is characterized by VIII–I, 10 dorsal fin elements (the eighth spine is generally reduced or rudimentary), 19–23 pectoral rays, 23–26 rakers on the first gill arch and 21–34 pyloric caeca. In addition, the fish bears a blunt, flat opercular spine surmounted by several spinelets. The latter trait readily separates *E. telescopus* from the other cold-temperate south Atlantic members of the genus — *E. robustus* and *E. denticulatus*. *E. robustus* is characterized by a pungent, bony opercular spine (see below), and *E. denticulatus* (not taken in "Walther Herwig" samples) bears a series of soft, poorly ossified spinelets.

E. telescopus has long been known from the slope waters of the eastern North Atlantic and Mediterranean between 20° N and 65° N; however, recent surveys have also taken this species off western South Africa and southeastern New Zealand. It thus appears *E. telescopus* has a bipolar distribution (MAYER, 1974).

Limited cold water tolerance may be responsible for the boreal and antiboreal limits of the species. In the North Atlantic, *E. telescopus* rarely occurs northeast of the Iceland-Faero Rise and Wyville Thompson Ridge. In these environs, cold, arctic water is present at depths usually occupied by the species (SVERDRUP et al., 1942). Occasional specimens that stray into the area are confined to waters warmed by the North Atlantic Current — e. g., in shallow water off Norway (DONS, 1938) or in the North Sea (EHRENBAUM, 1928; GRIMPE and WAGLER, 1929). Similar reasoning may explain the absence of *E. telescopus* from the coasts of Patagonia, Chile, eastern Canada and northern New England. The only specimen of *E. telescopus* from the Western Hemisphere was taken in the relatively warm waters off Block Island (MAYER, 1974).

2. *Epigonus robustus* (Barnard, 1927)a) *Material*

ISH 1132/66*: 3 specimens, 121.1–142.5 mm SL; FRV "Walther Herwig" Sta. 237/66; 32° 00' S, 52° 58' W; 800 m; 13 June 1966. ISH 1145/66*: 1 specimen, 129.9 mm SL;

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FRV „Walther Herwig“ Sta. 244/66; 33° 51' S, 54° 01' W; 800 m; 14 June 1966. ISH 1528/66*: 4 specimens, 129.2–162.1 mm SL; FRV „Walther Herwig“ Sta. 412/66; 35° 48' S, 52° 48' W; 800 m; 25 July 1966. ISH 133/67*: 2 specimens, 130.7–132.3 mm SL; FRV „Walther Herwig“ Sta. 194/67; 33° 47' S, 17° 14' E; 1000 m; 25 June 1967. ISH 136/67*: 1 specimen, 139.4 mm SL; FRV „Walther Herwig“ Sta. 195/67; 33° 49' S, 17° 13' E; 1000 m; 25 June 1967. ISH 189/71*: 9 specimens, 147.0–198.0 mm SL; FRV „Walther Herwig“ Sta. 121/71; 37° 44' S, 54° 43' W; 800 m; 31 December 1970. ISH 269/71*: 1 specimen, 147.5 mm SL; FRV „Walther Herwig“ Sta. 340/71, 38° 50' S, 54° 25' W; 1000 m; 25 February 1971. ISH 430/71*: 1 specimen, 124.1 mm SL; FRV „Walther Herwig“ Sta. 348/71, 38° 20' S, 54° 33' W; 997–1040 m; 5 March 1971, MCZ 48852†; 1 specimen, 126.8 mm SL; FRV „Walther Herwig“ Sta. 412/66, 35° 48' S, 52° 48' W; 800 m; 25 July 1966.

b) Remarks

E. robustus is characterized by VII–I, 9 (rarely VIII–I, 9 or VII–I, 10) dorsal fin elements, 16–18 pectoral rays, 30–33 gill rakers on the first branchial arch, 6–8 pyloric caeca and the presence of a pungent, bony opercular spine. Like all species of *Epigonus*, *E. robustus* is eurybenthic (*sensu* MEAD, 1970: 237) and occurs in association with the continental slope; however, it is the deepest-living and most cryophilic species in the genus. *E. robustus* is known from off eastern Argentina, western South Africa and southern Australia at depths of 800 to 1225 meters (MAYER, 1974), where temperatures range from 2.7° to 4.5° C. The form appears to be a member of the Subtropical Convergence fauna described by GIBBS (1968).

3. *Rosenblattia robusta* Mead and De Falla, 1965 (Fig. 1)

Rosenblattia robusta MEAD and DE FALLA, 1965: p. 263 (original description; SIO 'Monsoon' Expedition, IKMT haul 17, 46° 53' S, 179° 48' W – 46° 42' S, 179° 32' W, maximum calculated depth 1878 m; holotype examined, SIO 61–45–35 A); CRADDOCK and MEAD, 1970: 3. 32.

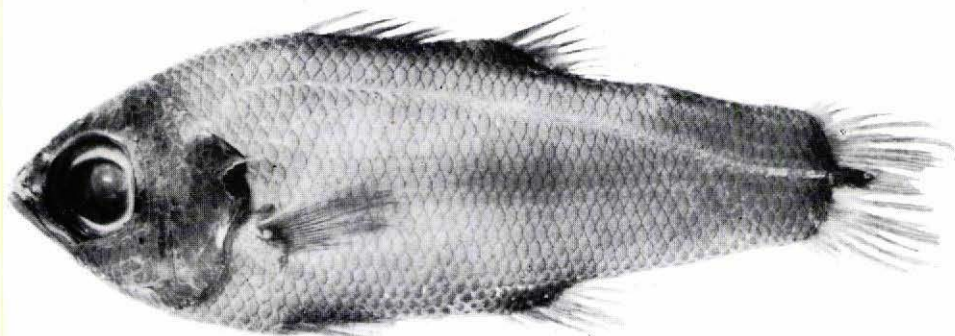


Fig. 1: *Rosenblattia robusta* adult. ISH 819/71, 101.6 mm SL.

a) Material

FMNH 74224*: 1 specimen, 40.0 mm SL; R. C. Wisner and party; 32° 42' S, 72° 02' W; 19–20 December 1965. FMNH 74225*: 1 specimen, 46.6 mm SL; R. C. Wisner and party; 33° 31' S, 75° 18' W; 17–18 December 1965. ISH 1591/68: 1 specimen, 73.5 mm SL; FRV „Walther Herwig“ Sta. 28–II/68; 34° 01' S, 47° 39' W; +2000 m; 14 February

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1968. ISH 336/71*: 2 specimens, 61.4–64.9 mm SL; FRV “Walther Herwig” Sta. 239/71; 54° 53' S, 59° 00' W; 1000–1200 m; 3 February 1971. ISH 353/71*: 1 specimen, 67.1 mm SL; FRV “Walther Herwig” Sta. 192/71; 46° 18' S, 59° 39' W; 1000 m; 17 January 1971. ISH 431/71*: 2 specimens, 67.8–72.5 mm SL; FRV “Walther Herwig” Sta. 348/71; 38° 20' S, 54° 33' W; 997–1040 m; 5 March 1971. ISH 586/71*: 3 specimens, 56.8–79.6 mm SL; FRV “Walther Herwig” Sta. 354–II/71; 39° 19' S, 48° 02' W; ca. 2000 m; 6 March 1971. ISH 644/71*: 1 specimen, 102.9 mm SL; FRV “Walther Herwig” Sta. 358–III/71; 39° 47' S, 43° 30' W; 1000–1015 m; 7 March 1971. ISH 715/71*: 1 specimen, 80.4 mm SL; FRV “Walther Herwig” Sta. 363–III/71; 40° 18' S, 39° 22' W; 785–800 m; 8 March 1971. ISH 819/71*: 2 specimens, 22.3–101.6 mm SL; FRV “Walther Herwig” Sta. 371–III/71; 40° 00' S, 30° 30' W; 672–700 m; 10 March 1971. ISH 875/71*: 4 specimens, 23.5–102.1 mm SL; FRV “Walther Herwig” Sta. 376/71; 39° 55' S, 26° 02' W; ca. 2000 m; 11 March 1971. ISH 1151/71*: 2 specimens, 28.5–92.1 mm SL; FRV “Walther Herwig” Sta. 409–II/71; 38° 14' S, 01° 15' E; 750–760 m; 20 March 1971. ISH 3062/71*: 1 specimen, 105.4 mm SL; FRV “Walther Herwig” Sta. 367/71; 40° 18' S, 35° 07' W; ca. 2000 m; 9 March 1971. LACM 10073*: Paratype, 1 specimen, 48.8 mm SL; USNS “Eltanin” Sta. 348; 54° 40' S, 58° 58' W — 55° 06' S, 59° 05' W; 664 m; 4 December 1962. LACM 10074*: Paratype, 1 specimen, 65.1 mm SL; USNS “Eltanin” Sta. 846; 57° 52' S, 74° 43' W — 57° 27' S, 74° 42' W; 1866 m; 10–11 November 1963. LACM 10075*: Paratype, 1 specimen, approximately 75 mm SL; USNS “Eltanin” Sta. 882; 56° 03' S, 114° 52' W — 56° 15' S, 114° 56' W; 1830 m; 30 December 1963. LACM 10076*: Paratype, 1 specimen, 50.1 mm SL; USNS “Eltanin” Sta. 1099; 57° 00' S, 89° 09' W — 57° 03' S, 88° 54' W; 759–1208 m; 22 May 1964. LACM 10077*: Paratype, 1 specimen, 62.6 mm SL; USNS “Eltanin” Sta. 1107; 58° 00' S, 90° 36' W — 58° 20' S, 90° 47' W; 714–851 m; 24 May 1964. LACM 10078*: Paratype, 1 specimen, 47.6 mm SL; USNS “Eltanin” Sta. 1380; 54° 01' S, 145° 02' W — 53° 53' S, 145° 13' W; 686–842 m; 17–18 November 1964. LACM 10873–1: 1 specimen, 49.6 mm SL; USNS “Eltanin” Sta. 1201; 56° 14' S, 160° 31' W — 56° 14' S, 160° 05' W; 1120 m; 8 August 1964. LACM 10905–1*: 1 specimen, 53.0 mm SL; USNS “Eltanin” Sta. 1299; 59° 01' S, 94° 47' W — 59° 03' S, 94° 01' W; 897–1190 m; 14 October 1964. LACM UC*: 1 specimen, 68.5 mm SL; USNS “Eltanin” Sta. 1167; 55° 28' S, 129° 45' W — 55° 06' S, 129° 52' W; 1047 m; 28–29 June 1964. LACM UC: 1 specimen, 50.0 mm SL; USNS “Eltanin” Sta. 1307; 61° 01' S, 100° 21' W — 60° 58' S, 100° 46' W; 1208–1373 m; 20 October 1964. LACM UC*: 1 specimen, 49.7 mm SL; USNS “Eltanin” Sta. 1608; 57° 56' S, 77° 20' W; 1682–1784 m; 3 April 1966. LACM UC*: 1 specimen, 43.8 mm SL; USNS “Eltanin” Sta. 1661; 61° 30' S, 108° 26' W — 61° 29' S, 108° 45' W; 600–700 m; 26 April 1966. LACM UC: 5 specimens, 23.3–34.6 mm SL; USNS “Eltanin” Sta. 1710; 41° 44' S, 178° 18' W — 41° 45' S, 178° 05' W; 750–900 m; 25 May 1966. LACM UC*: 1 specimen (teratological), approximately 100 mm SL; USNS “Eltanin” Sta. 1821; 40° 07' S, 161° 08' E — 40° 03' S, 160° 41' E; 2500–3150 m; 4 December 1966. LACM UC: 3 specimens, 28.3–30.2 mm SL; USNS “Eltanin” Sta. 1830; 42° 00' S, 160° 11' E — 42° 08' S, 160° 05' E; 700–800 m; 8 December 1966. LACM UC*: 2 specimens, 55.4–84.1 mm SL; USNS “Eltanin” Sta. 1834; 45° 10' S, 160° 10' E — 45° 19' S, 160° 11' E; 700–780 m; 11 December 1966. LACM UC: 1 specimen, 51.0 mm SL; USNS “Eltanin” Sta. 1836; 45° 29' S, 160° 12' E — 45° 38' S, 160° 12' E; 2030–2181 m; 11 December 1966. LACM UC: 1 specimen, 30.0 mm SL; USNS “Eltanin” Sta. 1839; 47° 00' S, 162° 00' E — 47° 16' S, 161° 55' E; 3500–3750 m; 12 December 1966. LACM UC: 1 specimen, 39.8 mm SL; USNS “Eltanin” Sta. 2191; 55° 06.6' S, 121° 04' W — 55° 12.8' S, 121° 58.9' W, 2290 fms. wire out; 29 April 1968. LACM UC: 1 specimen, 49.2 mm SL;

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USNS “Eltanin” Sta. 2204; 55° 58' S, 170° 07' E — 56° 37.3' S, 169° 59.5' E; 2740 m; 6 June 1968. LACM UC: 1 specimen, 68.8 mm SL; USNS “Eltanin” Sta. 2205*: 56° 37.7' S, 169° 59.5' E — 56° 59.0' S, 169° 57.5' E; 640 fms. wire out; 6 June 1968. LACM UC*: 2 specimens, 61.1—86.4 mm SL; USNS “Eltanin” Sta. 2221; 46° 53.0' S, 159° 55.5' E — 46° 52.1' S, 159° 52.0' E; 75 m; 22 June 1968. LACM UC: 1 specimen, 25.2 mm SL; USNS “Eltanin” Sta. 2224; 38° 21.5' S, 160° 19.9' E; 1050 m; 26 June 1968. LACM UC: 6 specimens, 25.3 — 54.2 mm SL; USNS “Eltanin” Sta. 2226; 44° 45.8' S, 145° 32.0' E — 44° 50.6' S, 145° 43.7' E; 800 m; 1 July 1968. LACM UC: 2 specimens, 23.8—34.9 mm SL; USNS “Eltanin” Sta. 2232; 47° 52' S, 145° 09' E; 900 m; 10 July 1968. MCZ 50016*: 1 specimen, 70.4 mm SL; R/V “Anton Bruun” Cr. XIII, Sta. 58; 33° 42' S, 72° 17' W — 33° 47' S, 72° 18' W; 0—400—0 m; 3 February 1966. MCZ 50017: 1 specimen, 19.0 mm SL; R/V “Anton Bruun” Cr. XIII, Sta. 19; 33° 51' S, 85° 00' W — 34° 01' S, 85° 58' W; 0—400—200—100—0 m; 15—16 January 1966. MCZ 50019: 1 specimen, 22.0 mm SL; R/V “Anton Bruun” Cr. XIII, Sta. 22; 33° 51' S, 87° 49' W — 33° 47' S, 87° 57' W; 0—200—375—0 m; 18 January 1966. MCZ 50020: Paratypes, 2 specimens, 26.3—26.6 mm SL; R/V “Anton Bruun” Cr. VI, Sta. 353 A, maximum calculated depth 2394 m; 2 July 1964. MCZ 50045†: 1 specimen, USNS “Eltanin” Sta. 1834; 45° 10' S, 160° 10' E — 45° 19' S, 160° 11' E; 700—780 m; 11 December 1966. MCZ UC*: Paratype, 1 specimen, 92.0 mm SL; SIO ‘Monsoon’ Expedition, IKMT haul 17; 46° 53' S, 179° 48' W — 46° 42' S, 179° 32' W; 1878 m; 28 February—1 March 1961. MCZ UC: 1 specimen, 32.5 mm SL; R/V “Anton Bruun” Cr. XIII, Sta. 6; 32° 57' S, 74° 57' W — 33° 05' S, 74° 59' W; 0—3182—0 m; 7 January 1966. SIO 61—41—35 A: Paratype, 1 specimen, 34.5 mm SL; SIO ‘Monsoon’ Expedition, IKMT haul 13; 49° 26' 30" S, 132° 18' 24" E — 49° 21' 00" S, 132° 39' 24" E; maximum depth 1878 m; 13 January 1961. SIO 61—45—35 A*: Holotype, 1 specimen, 89.8 mm SL; SIO ‘Monsoon’ Expedition, IKMT haul 17; 46° 53' S, 179° 48' W — 46° 42' S, 179° 32' W; maximum depth 1878 m; 28 February—1 March 1961. SIO UC*: Paratype, 1 specimen, 47.1 mm SL; station data identical with that of holotype. SIO UC: Paratypes, 2 specimens, 24.5—25.0 mm SL; R/V “Anton Bruun” Cr. VI, Sta. 345 B; 40° 51' S, 64° 49' E — 40° 56' S, 64° 25' E; maximum depth 885 m; 4 July 1964. USNM UC: Paratype, 1 specimen, 26.5 mm SL; R/V “Anton Bruun” Cr. VI, Sta. 354 A; 40° 48' S, 65° 03' E — 40° 51' S, 64° 49' E; maximum depth 1650 m; 4 July 1964. UZM UC*: 1 specimen, 38.6 mm SL; “Dana” Sta. 3640 VI; 41° 47' S, 176° 55' E; 3000 m wire out; 7 January 1929. UZM UC*: 1 specimen, 39.6 mm SL; ‘Galathea’ Expedition Sta. 601; 45° 51' S, 164° 32' E; 7500 m wire out; 14 January 1952. UZM UC: 1 specimen, 29.0 mm SL; ‘Galathea’ Expedition Sta. 634; 39° 05' S, 178° 20' E; 1700 m wire out; 25 January 1952.

b) *Diagnosis*

Rosenblattia robusta is a squat fish, characterized by dorsal fin counts of VII—I, 8 or VIII—I, 8 and anal fin counts of II, 8. Fin spines are stout and deeply sculptured with longitudinal striations. The most striking characteristic is the presence of 2—8 anteriorly projecting conical (antrorse) teeth on the premaxillae and mandibles. These unusual teeth distinguish *R. robusta* from all apogonids except the monotypic genus *Florenziella*.

R. robusta closely resembles *Florenziella lugubris* but may be differentiated on the basis of the former's deep body (33.9—42.5% SL) and wide interorbital region (12.3—16.1% SL). In addition, *R. robusta* is characterized by relatively few opercular spinelets and by lateral line scales on the caudal peduncle that are modified into lateral keels. Finally, although both *R. robusta* and *F. lugubris* are oceanic, their distributions are non-

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overlapping. *R. robusta* is a cold water, Southern Hemisphere form, while *F. lugubris* is known only from the equatorial Indo-West Pacific.

Table 1 *Rosenblattia robusta* meristic data. SD = standard deviation; n = number of specimens examined.

	Mean	Range	SD	n
Pectoral rays	18.15	16–19	0.62	55
Pyloric caeca	7.83	7–9	0.61	36
Gill rakers	23.29	21–26	0.98	49
Lateral line scales	49.45	47–51	0.98	44
Scales above lateral line	4.24	4–5	0.43	45
Scales below lateral line	15.42	14–17	0.72	45

Table 2 *Rosenblattia robusta* regression data. b = regression coefficient $\pm 95\%$ confidence interval; a = Y intercept; n = number of specimens examined; HL = head length; BH = body depth; HH = head height; SN = snout length; EYE = eye diameter; IO = interorbital width; CPW = caudal peduncle width; CPL = caudal peduncle length; D₁ D₂ = distance between first and second dorsal fins.

	b	a	n
HL	0.30 \pm 0.02	5.00	36
BH	0.34 \pm 0.04	3.00	33
HH	0.23 \pm 0.02	2.63	31
SN	0.06 \pm 0.01	4.32	34
EYE	0.10 \pm 0.01	1.26	34
IO	0.11 \pm 0.01	1.75	41
CPW	0.19 \pm 0.01	-2.04	41
CPL	0.32 \pm 0.02	-2.93	41
D ₁ D ₂	0.09 \pm 0.01	-0.60	41

c) Description

Morphometric data presented in Table 1; linear regressions of mensural data presented in Table 2.

Body thickset; anterodorsal profile strongly convex, particularly in large adults, rising steeply from tip of snout to occipital region, thereafter rising more gradually to base of first dorsal fin. Body deep, 33.9–42.5% SL; caudal peduncle broad, width 12.1–18.0% SL, length 22.5–31.5% SL.

Head broad and deep, head height 23.8–30.9% SL; head length 33.3–46.6% SL. Snout short, blunt, 6.6–10.3% SL; mouth terminal, oblique; angle of gape moderate to large; lower jaw approximately equal to upper jaw. Maxilla broad posteriorly, reaching $\frac{1}{3}$ – $\frac{1}{2}$ eye length. Eye large, round, diameter 13.8–24.3% SL. Interorbital region broad, 12.3–16.1% SL; numerous small spinelets on lateral margins of frontal bones above eyes. Nostrils paired; anterior opening prominent, oval, situated on papilla-like structure posterolateral to rostral cartilage. Posterior nostril crescent-shaped, less conspicuous, situated anterior to rostrrolateral edge of frontals.

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Fig. 2: Antrorse teeth on premaxillae of *Rosenblattia robusta*; view looking into open mouth. ISH 353/71, 67.1 mm SL.

Dentition variable with age. Specimens larger than 25 mm SL with one or more stout, conical, antrorse teeth projecting from anterior surfaces of each premaxilla and dentary. Upper jaw with 3–5 anterolaterally oriented antrorse teeth on either side of symphysis (Figure 2); lower jaw with 2–4 anteriorly directed antrorse teeth on each side of midline; when mouth closed mandibular antrorse teeth mesial to premaxillary antrorse teeth. Remaining dentition weak; single irregular row of small, inwardly recurved conical teeth on inner surface of premaxilla; teeth extending $\frac{1}{2}$ to $\frac{3}{4}$ length of bone. Analogous row of teeth along inner surface of dentary; dentition extending $\frac{1}{2}$ to entire length of coronoid surface. Vomerine teeth weak, variable, ranging from single recurved tooth to 1–3 irregular chevron-shaped rows. Palatines bearing few weak, conical teeth arranged in single row (rarely double row) on anterior half of bone. Tongue, ectopterygoids and endopterygoids edentulous.

Opercular armor variable. All specimens with pungent, bony opercular spine surmounted by smaller spinelet; additional spinelets occasionally associated with main spine and/or opercular margin dorsal and ventral to spine; no serrations on posteroventral half of opercle. Preopercular angle rounded and weakly produced; spinelets along posterior and ventral margins of preopercle, preopercular ridge, subopercle and interopercle.

Gill rakers simple, awl-like; rakers on upper portion of gill arch 5–8; rakers on lower portion of gill arch (including raker at angle) 15–19; branchiostegal rays 7 (10).

First dorsal fin VII (41), VIII (18); eighth spine small, splint-like, lacking membranous connection with preceding spines. Second dorsal fin I, 7 (3), I, 8 (55), I, 9 (1); anal fin II, 8 (58), II, 9 (1); pelvic fin I, 5 (57). Fin spines broad, pungent, bearing deeply incised longitudinal striations. Vertebrae 10+15 (40); epiplural ribs 8 (1), inserting on vertebrae 1–8; pleural ribs 8 (40), inserting on vertebrae 3–10.

Scales adherent, strongly ctenoid; squamation covering trunk and most of head, including maxillae and interorbital region; scales absent from snout and all fins except tail. Lateral line scales well developed, extending length of body and on to caudal fin. Color variable with age (see Ontogenetic Change). Preserved adults uniform brown gold-rust. Opercular regions occasionally highlighted by underlying black branchial membranes.

Description based on 41 specimens 34.5–105.4 mm SL.

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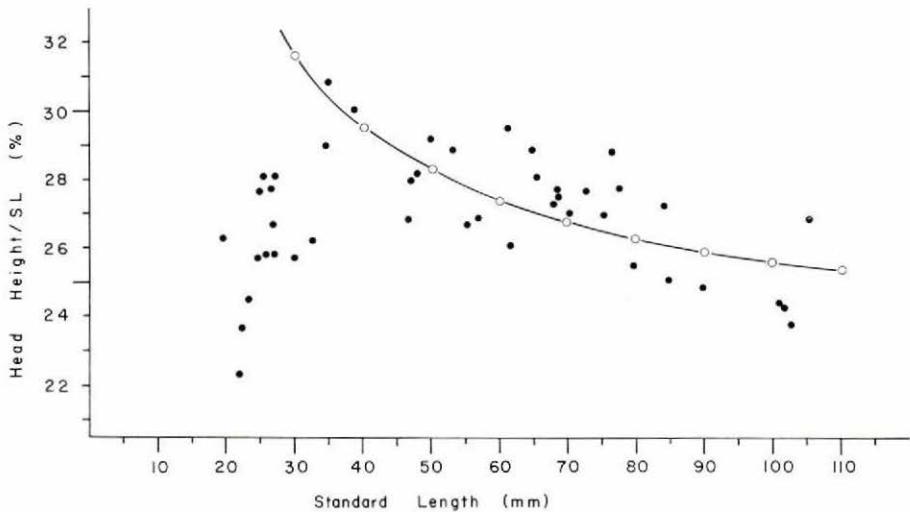


Fig. 3: Ratio-on-size diagram of *Rosenblattia robusta* head height/standard length vs. standard length. See text for explanation.

d) Ontogenetic Change

R. robusta young undergo a series of age-related changes as they approach maturity. For example, specimens exhibit alterations in allometry as they transform from pre-adult to adult. One instance is illustrated by Figure 3, which plots changes in the relative depth of the head with growth. Solid lines and open circles indicate the adult pattern predicted from the linear regression of head height on SL (Table 2). Solid dots represent values calculated from individual measurements. It is apparent that a sharp inflection occurs at approximately 35 mm SL. Ratios derived from small individuals are considerably below predicted values, while those from larger specimens conform with the expected pattern.

Ratio-on-size diagrams were plotted for five characters in addition to head height: head length, body height, interorbital width, caudal peduncle width and caudal peduncle length. Scatters for the first three features resemble that shown in Figure 3; however, adult growth patterns are achieved between 30 mm and 35 mm SL for head length, and between 40 mm and 47 mm SL for body height and interorbital width. Scatters derived from measurements of caudal peduncle width and length are inverse images of Figure 3 because the linear regressions of these characters have negative Y-intercepts (Table 2). Nevertheless, adult growth patterns first become apparent between 25 mm and 35 mm SL.

On the basis of these observations, it seems that *R. robusta* young develop adult body forms during a period involving 20 mm to 25 mm of growth. The transitional phase begins at approximately 25 mm SL and is complete by the time specimens reach 50 mm SL.

Perhaps the most striking demonstration of ontogenetic change is provided by pigment patterns. As might be expected, the shift from juvenile to adult coloration occurs in fishes 25 mm to 50 mm long. The smallest *R. robusta* (19–23 mm SL) are weakly pigmented and appear pale yellow in alcohol. Melanophores generally occur on the

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bases and proximal portions of median fins, on the abdomen and, to a lesser degree, on the opercular complex. Pigmentation on the latter two areas may be enhanced by underlying black peritoneal and branchial membranes.

The most conspicuous feature of small *R. robusta* is a heavily pigmented ring encircling the anterior portion of the caudal peduncle. The ring slopes anterodorsally between its origin behind the anal fin and a point approximately one third of the way up the side of the peduncle. The ring then turns posterodorsally and extends to the dorsal surface of the caudal peduncle. Melanophores forming the ring are deeply embedded in peduncle musculature.

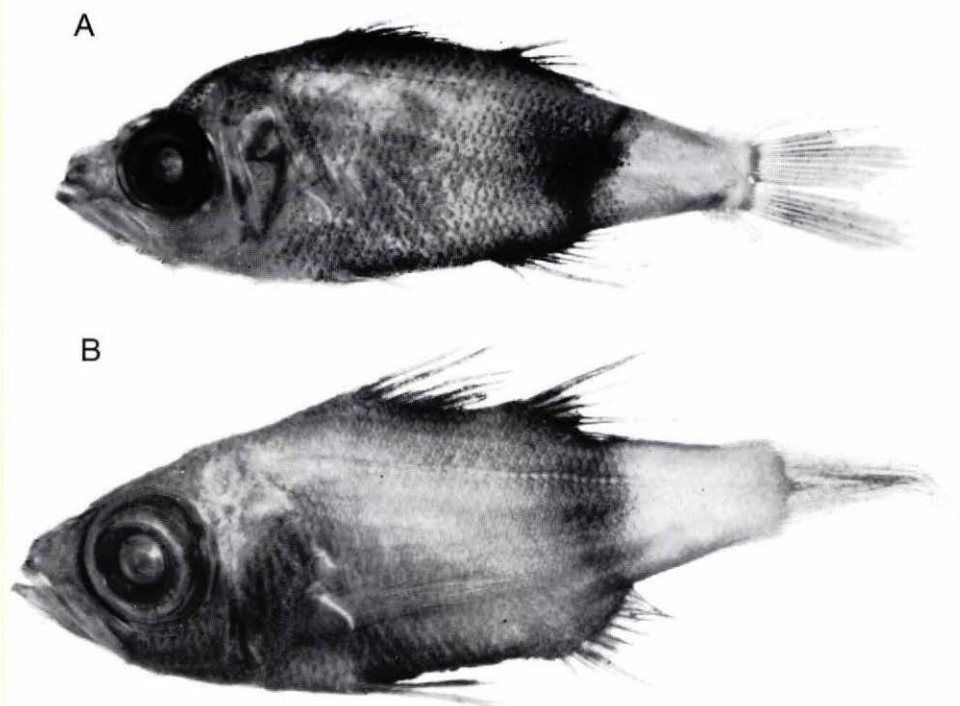


Fig. 4: *Rosenblattia robusta* young. A. ISH 875/71, 23.5 mm SL.

B. MCZ uncatologued, 32.5 mm SL.

Skin overlying the ring also bears pigment cells. In small specimens, dermal melanophores are clustered into a tight patch that straddles the ring ventral to the lateral line (Figure 4A). As the fish becomes older, the patch extends dorsoventrally to form a brown band that masks progressively larger portions of the caudal peduncle ring. At the completion of the process (in specimens 23–28 mm SL), the ring is no longer visible, and a band extends across most or all of the distance between the posterior margin of the anal fin and the posterior margin of the second dorsal fin (Figure 4B).

The caudal peduncle becomes darker once specimens reach 35 mm SL, and by the time individuals reach 45 mm to 50 mm SL, they have taken on the uniform coloration characteristic of adults (Figure 1).

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A major function of ontogenetic change is to gradually adapt young fishes to adult niches; however, it is often difficult to appreciate the ecological significance or functional consequences of specific alterations. For example, what are the effects of allometric changes detected by ratio-on-size diagrams? If the body shape of young *R. robusta* differs from that of adults, one might expect each group to have characteristic swimming abilities and perhaps to exhibit different distribution patterns. However, the data do not support the latter hypothesis and, in fact, suggest that young and adult forms occur in the same environment. At present, no appreciable differences have been detected in the horizontal and vertical ranges of adults and pre-adults. In addition, large trawls have taken individuals of widely divergent lengths from the same locality (e.g., FRV "Walther Herwig" Sta. 376/71 captured four *R. robusta* ranging between 23.5 mm and 102.1 mm SL).

Even more enigmatic are pigmentation changes. *R. robusta* young resemble those of two other epigonines, *Epigonus pandionis* and *E. macrops*, because they bear deeply

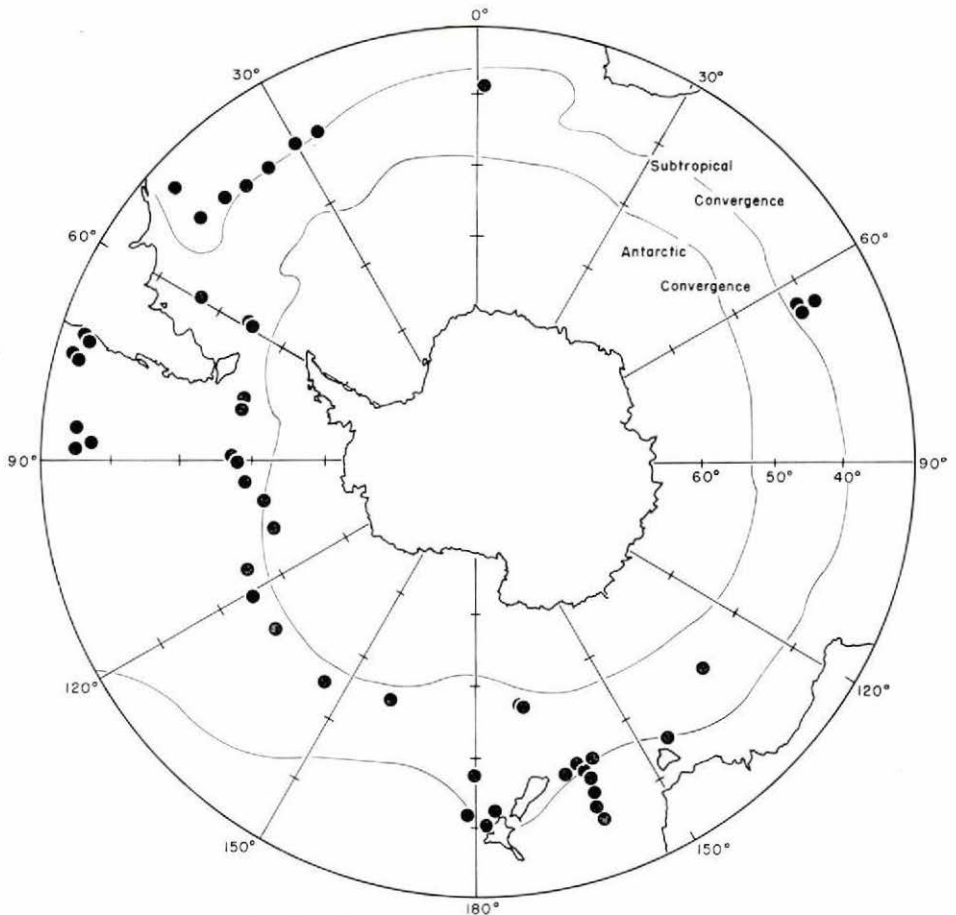


Fig. 5: Distribution of *Rosenblattia robusta*.
Water mass boundaries from *Hedgepeth* (1960)

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embedded rings that encircle the caudal peduncle. Although the function of the rings is poorly understood, it is interesting to note that all three species have pelagic juveniles. (Adult *Epigonus* are bottom oriented.) Perhaps caudal peduncle rings are a form of disruptive coloration that affords a modicum of protection to weakly swimming elements of the light-poor mid-water environment.

e) *Distribution*

Figure 5 indicates the locations at which *R. robusta* have been taken. The species appears to be one of the circumglobal, subantarctic forms described by CRADDOCK and MEAD (1970) and BRIGGS (1974) as occurring in association with, or south of, the Sub-tropical Convergence.

It is difficult to determine the vertical range of *R. robusta* because most sampling programs used mid-water nets not equipped with closing devices. Aside from three collections made in the Peru Current region by the R/V “Anton Bruun” (Cruise XIII), all *R. robusta* for which there are complete locality data were captured by trawls whose maximum depths ranged from 600 m to 3700 m. Most specimens were taken in tows between 700 m and 2000 m, and more than half of the successful trawls were made at depths shallower than 1200 m. It thus appears the center of *R. robusta* abundance straddles the boundary between the mesopelagic and bathypelagic zones.

Temperature-salinity diagrams for stations at which *R. robusta* were captured suggest the species is restricted to Antarctic Intermediate Water (*sensu* SVERDRUP et al., 1942: 741; DIETRICH, 1950: 38; and WILLIAMS, 1962: 113–115) or water derived from the mixing of Antarctic Intermediate Water and adjacent water masses (e. g., Subantarctic Upper Water or Southern Hemisphere central water masses). This explanation accounts for the occurrence of *R. robusta* off western New Zealand (Figure 5), since Antarctic Intermediate Water moves more strongly northward into the eastern Tasman Sea than to the west (BURLING, 1961: 51).

f) *Comments*

A teratological *R. robusta* was taken at USNS “Eltanin” Station 1821. The fish had been attacked by a predator and had lost the posterior half of its caudal peduncle including its tail (Figure 6). Radiographs indicate the attack came from above and

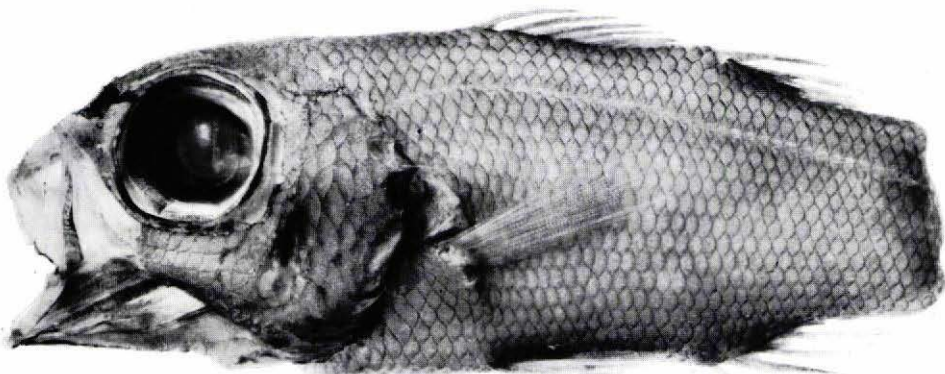


Fig. 6: Teratological *Rosenblattia robusta* lacking tail and part of caudal peduncle. LACM uncatalogued; 100 mm approximate SL.

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behind. Distal portions of neural spines of the ninth and tenth caudal vertebrae were broken off along with all elements beyond the anterior half of the eleventh caudal vertebra. The specimen would have been approximately 100 mm long (SL) had it not been injured.

The remarkable aspect of this fish is not its injury, but its survival and recovery. When the specimen was captured, the wound was completely closed and scale regeneration appeared to have begun on skin overlying the stump. Although no food was found in the stomach, the fish showed no signs of undernourishment. Partially digested items were visible in the intestine and sizeable fat deposits were present in association with the viscera. In addition, the specimen had well-developed testes.

It seems probable that (1) the specimen was in good condition prior to the attack; (2) the attack took place shortly before the fish was taken by the "Eltanin"; and therefore, (3) healing must occur relatively rapidly in *R. robusta*. The alternate hypothesis, that the specimen was capable of feeding effectively in spite of its serious injury, seems less likely because it assumes the tail and caudal peduncle are not as important for locomotion as might be expected. The teratological specimen was taken by a smaller net than other individuals of comparable size (i. e., ≥ 100 mm SL), suggesting the injury may have decreased the fish's ability to swim and maneuver.

g) Taxonomic Notes

A number of inaccuracies in the original description of *R. robusta* came to light during the present study. For example, locality data provided by MEAD and DE FALLA (1965: 263) for paratypes LACM 10073, 10074, 10075, 10076, 10077 and 10078 do not agree in all respects with data published for corresponding USNS "Eltanin" stations (SAVAGE and CALDWELL, 1965, 1966). The most serious discrepancies involve trawl depths. Maximum fishing depths differ by as much as 232 m for the same station between the two accounts (e. g., USNS "Eltanin" Station 348, LACM 10073). In other cases the range of possible fishing depths is extended by up to 155 m (e. g., USNS "Eltanin" Station 1380, LACM 10078). Information presented in the Materials section of this account was taken from "Eltanin" cruise reports and is considered accurate because it includes corrections to the original field data.

Several other discrepancies are present in MEAD and DE FALLA's account. The original description indicates type specimens have dorsal fin counts of either VII—I, 7, or VII—I, 8 (p. 265). In fact, five paratypes have eight, rather than seven, spines in the first dorsal fin (LACM 10073; LACM 10075; MCZ 50020 — both specimens; SIO UC — 75 mm SL specimen), and the holotype bears nine, rather than eight, soft rays in the second dorsal fin.

A problem also arises with respect to opercular ornamentation. MEAD and DE FALLA report that the "opercle, especially its lower half, [is] armed with small simple ctenii [p. 266]." As is stated in the Description (above), the opercle is unarmed along its posteroventral surface. MEAD and DE FALLA may have mistaken ctenii from scales overlying the opercle for serrations on the posterior edge of the bone. Only the preopercle, interopercle and subopercle bear ctenii along their posteroventral edges.

Finally, the original description presents a visual comparison of the interorbital regions of *R. robusta* and *Florenciella lugubris* (p. 270, Figure 3). The plate was accidentally rotated 180° during printing (B. NAFPAKTITIS, personal communication) and, as a result, the legend for the figure is incorrect. *R. robusta* is the broad-headed organism figured on the right.

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