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The Marine Fauna of New Zealand: Macrourid Fishes (Pisces : Gadida)

by

C. McCANN and D. G. McKNIGHT

New Zealand Oceanographic Institute Memoir 61

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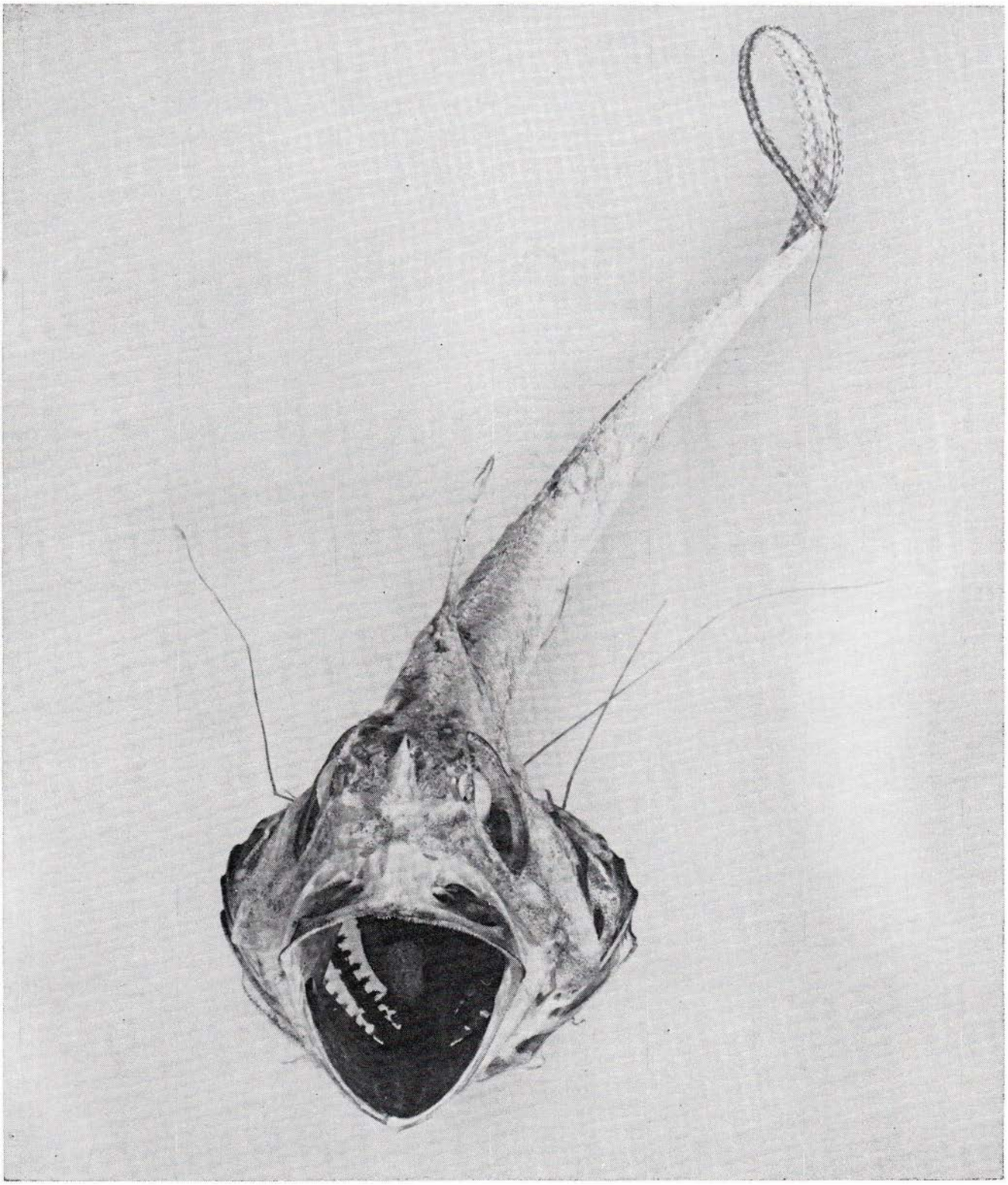
MACROURID FISHES
(PISCES : GADIDA)



Frontispiece. *Nezumia nigromaculata* (NZOI Stn E81; SL 58 mm).

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

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FOREWORD

Since the early nineteenth century there has been continuous marine biological research in New Zealand. Up to 1900 over 850 papers on the marine zoology of New Zealand had been published. Most of this and later work has appeared as discrete papers, there being relatively few monographic or serial comprehensive treatments of particular taxonomic groups. Despite some substantial contributions in this form, the lack of detailed accounts enabling the ready recognition of species in many other groups has hampered the development of ecological work dependent on such identification.

Since 1955 the N.Z. Oceanographic Institute has been developing a programme of research in benthic ecology in the New Zealand region, and the effects of this scarcity of systematic monographs of the marine fauna have been particularly evident. However, the opportunities that have arisen in the course of sampling programmes have provided additional material for systematic consideration, and a number of specialists have interested themselves in working on the New Zealand fauna.

The authors have examined the collections of macrourid fishes made by the Institute, and also supplementary material from Fisheries Research Division, Ministry of Agriculture and Fisheries; the National Museum, Wellington; and Zoology Department, Victoria University of Wellington. The descriptions and analyses of the material provide, for the first time, a comprehensive examination of this element of our marine fauna.

The work is a contribution to the studies on the marine fauna of New Zealand published in this memoir series.

Preliminary editing of the manuscript was carried out by Mrs R. J. Wanoa, N.Z. Oceanographic Institute.

J. W. Brodie, former Director
N.Z. Oceanographic Institute,
Wellington

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The Marine Fauna of New Zealand: Macrourid Fishes (Pisces : Gadida)

by

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ABSTRACT

Twenty-five species of macrourid fishes are recorded from the New Zealand region. They are described and illustrated, and their distribution and relationships are discussed. A key to the fauna is given. Most species are referred to the genus *Coelorhynchus*, in which 3 of the 10 species described are new. New species are also erected in the genera *Coryphaenoides*, *Gadomus*, and *Nezumia*, and a new genus is erected for a species more or less intermediate between *Abyssicola* and *Coelorhynchus*. Other genera represented are *Bathygadus*, *Cetonurus*, *Macrourus*, and *Trachyrhynchus; Cynomacrurus* and *Malacocephalus* may also be present. The fauna is composed of endemic, southern circumpolar, and Indo-Pacific elements, with the last predominant.

INTRODUCTION

Macrourid fishes, commonly known as grenadiers, rat-tails, or whip-tails, are mainly bottom-dwelling forms. They are known from most seas, and occur in depths from less than 200 m to over 4000 m. They are easily recognised by their relatively prominent head and long, tapering tail lacking a caudal fin. In contrast with the many bathypelagic fishes which have extensive horizontal ranges, most macrourids appear to be more or less restricted in range, and hence may have some value in zoogeographic studies. As at present delimited, the family Macrouridae is referred to the order Gadida, otoliths of which have been reported from Upper Cretaceous and Oligocene deposits (Berg 1940).

The first macrourid reported from the New Zealand region was *Macrourus armatus*, described by Hector (1875a, b) from material collected by HMS *Challenger*. Subsequently Günther (1878, 1887), in examining the *Challenger* collections, described a further nine species from local waters, one of which was *Macrurus denticulatus* Richardson, known previously from Australian seas. Since Günther, new species of *Coelorhynchus* have been described by Waite (1911) and Phillipps (1927b), and Moreland (1957) noted three additional macrourids in collections made by the Chatham Islands 1954 Expedition. Thus, Whitley (1968) was able to list 15 species from the New Zealand region. A further species – *Bathygadus longifilis* Goode & Bean – was added by McCann in 1972.

Since 1954 the New Zealand Oceanographic Institute has been carrying out a sampling programme designed to elucidate the nature and composition of the benthic fauna of the New Zealand region. Although the programme was not intended to cover adequately fish or other large, motile animals, macrourid fishes were present in many trawl hauls from the continental slope. A preliminary examination of these suggested the

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presence of several species previously unknown in the fauna, and resulted in the more detailed study presented here in which nine species are added to the fauna and one previously known form is redescribed as a new species. Twenty-five species of macrourids are now known from the New Zealand region, and a further two may be present. They include a new genus intermediate between *Abyssicola* and *Coelorhynchus* and new species in the genera *Coelorhynchus*, *Coryphaenoides*, *Gadomus*, and *Nezumia*, as well as previously described species of *Bathygadus*, *Coelorhynchus* (two of which are additions to the fauna), *Coryphaenoides*, *Lepidorhynchus*, *Macrourus*, *Nezumia*, and *Trachyrhynchus*. The two possible members of the fauna are in the relatively widespread genera *Cynomacrurus* and *Malacocephalus*.

For the purposes of this report, the New Zealand region has been defined as that area between latitudes 24°S and 57°30′S and longitudes 157°E and 167°W; these boundaries coincide with those of charts of bathymetry (Lawrence 1967) and inferred bottom temperatures (Ridgway 1969). Unfortunately, sampling is too limited to give a clear picture of the fauna of the Kermadec and Norfolk Ridges or the Lord Howe Rise. Similarly, sampling density below about 1200 m is low, and the abyssal fauna cannot be clearly defined.

ACKNOWLEDGMENTS

Specimens examined and reported on are mainly from the collections of the New Zealand Oceanographic Institute. Additional material was provided by the Fisheries Research Division, Ministry of Agriculture and Fisheries, and by Professor J. A. F. Garrick, Zoology Department, Victoria University of Wellington. Dr R. K. Dell (Director) and Mr J. M. Moreland, National Museum, Wellington, kindly allowed examination of some collections, and Mr Moreland also assisted greatly in obtaining some pertinent literature. Dr G. C. Hewitt, Zoology Department, Victoria University of Wellington, kindly identified parasitic copepods found on some specimens. Photographic illustrations have been prepared by Mr J. J. Whalan, Science Information Division, DSIR.

SYSTEMATIC POSITION

Macrourids are generally associated with other fishes in the order Gadida (Gadiformes, Anacanthini), though Svetovidov (1937) and Berg (1940) have segregated the macrourids into a separate order. Marshall (1965) referred the Macrouridae to the Anacanthini, recognising the subfamilies Trachyrhynchinae, Macrouroidinae, Bathygadinae, and Macrourinae; Norman (1966) similarly placed the Macrouridae (Coryphaeniodidae) in the Anacanthini, but recognised as subfamilies Bathygadinae, Macrouroidinae, Macrourinae, and Lyconinae, the last-named being removed to the Merluciidae by Marshall (1966). McAlister (1968) recognised two families, Macrouroididae and Macrouridae, in the suborder Macrouroidei (order Gadiformes). Okamaru (1970b) similarly separates *Macrouroides* and *Squalogadus* at the family level, the two families Macrouroididae and Macrouridae comprising the suborder Macrourina of the order Gadida, with the other suborders Ophidiina, Muraenolepina, and Gadina, and derives the macrourids from an early morid-like ancestor. The classification adopted herein follows that of Okamaru (1970b).

DIAGNOSTIC FEATURES

Members of the suborder Macrourina, in common with other Gadida, are characterised by soft fin rays, ventral or pelvic fins jugular to thoracic in position, dorsal and anal rays numerous (more numerous than the vertebrae), capacious gill-chambers, four gills with a slit behind the fourth, and cycloid or ctenoid scales. The most obvious feature separating the Macrourina from other members of the order is the absence of a caudal fin, though a pseudocaudal may arise following mutilation of the caudal region.

The family Macrouroididae has a single dorsal fin lacking spinous rays and with rays longer than the anal fin. The head is greatly enlarged owing to expansion of the sensory canals, and the trunk and tail are relatively small. The ventral fins are small or absent, the orbit is small, and the mouth is small and inferior, with teeth small and in bands. The gill-rakers are long and numerous, and there is no luminous organ. As yet the family is unknown from New Zealand waters.

The Macrouridae are distinguished by having two dorsal fins (the anterior with two spinous rays) and usually more ventral fin rays, and in several anatomical features (Okamaru 1970b).

In the Bathygadinae the second dorsal fin arises close to the first; the eight- or nine-rayed ventral fins are inserted directly below or just behind the pectorals; the gill-rakers are long and numerous; and there are seven branchiostegal rays. The mouth is wide and terminal with small teeth in many rows. There is no luminous organ.

The Trachyrhynchinae have a long snout; a small, inferior mouth with small teeth in bands; numerous relatively short gill-rakers and seven branchiostegal rays; two dorsal fins set close together; and enlarged scales bordering the bases of the dorsal and anal fins. There is no luminous organ.

In the Macrourinae the first gill slit is restricted by a fold of skin; the second dorsal fin is distinctly separated from the first, with rays shorter than those of the anal fin; the gill-rakers are tubercular; and there are six or seven branchiostegal rays. A luminous organ may be present.

Features of the head, fins, scales, and luminous organ if present, as well as several relative dimensions, are of special value in defining genera and species of Macrouridae. The head is usually relatively large, and the snout may be produced or not, compressed and narrow or depressed and wider, sometimes lanceolate, or inflated. The mouth is of variable size, and terminal or inferior; the teeth are small and villiform and in bands, or some or all may be enlarged and lamina-like, in one to three rows in one or both jaws. There is usually a barbel under the lower jaw. The orbit varies in size and shape: it is commonly circular, but often ellipsoidal, the horizontal diameter being greatest. The relative sizes of the snout, orbit, postorbital area, and interorbital space may vary between species.

In several genera distinct ridges are apparent on the head, being underlain by crests on the various bones of the head. The frontal ridge is median and dorsal, extending from the tip of the snout to between the orbits; the nasal ridges extend from above the nasal fossae towards the anterolateral margins of the snout, with which they may unite; the upper orbital margin may be carinate, forming the supraorbital ridge, which may be continuous anteriorly with the nasal ridges and posteriorly with the horizontal or gently declivous postorbital ridges; between the postorbital ridges are the occipital ridges, arising from about opposite the centre of the orbits and extending posteriorly. Below the orbit, and extending from the snout to at least the posterior orbital margin, is the infraorbital ridge, usually the most strongly developed, and usually dividing the head into subvertical upper and oblique or subhorizontal lower areas.

The postorbital area of the head is composed of various flattened bones. Behind the orbit is the preoperculum, the distal margin of which is commonly apparent and may extend to the posterior margin of the branchiostegal membrane in an angle, followed by the suboperculum, interoperculum, and operculum. The suboperculum may extend below the preoperculum, and the interoperculum may extend between the preoperculum and suboperculum as a fleshy flap.

Five sets of fins are usually present. The first dorsal fin is generally anterior; its first two rays are spine-like, the first very short, and the second smooth or serrate on its anterior margin. The second dorsal fin may follow the first closely or be separated by a distinct interspace, and has rays longer or shorter than those of the anal fin. The pectoral fins are inserted laterally behind the gill openings, with the ventral fins below them. The position of these fins and their ray counts are often important diagnostically; one ray on each may be produced, elongate, and filamentous. The anal fin may arise immediately behind the anus or be distinctly separated from it.

The scales are of variable size and shape, with spinules in rows or series or in irregular order and sometimes set on carinae or ridges. Head scales are commonly modified on the various ridges, often in distinct longiseries. When comparing scales from different fish, similar locations should be selected on each fish, because the shape and armature are variable over the body.

In several genera a luminous organ is present, usually associated with the anus and containing luminous bacteria (Haneda 1951, Singleton & Skerman 1973). Housed beneath the skin is a tube or bulb on the abdominal midline, and commonly a scaleless area is apparent on the surface. The shape of the organ and its duct to the opening near the anus may be significant. The duct is usually visible as a blackish streak on the abdominal midline, and may be short or elongate, sometines extending anterior to the bases of the ventral fins (Okamaru 1970a, b).

Macrourid fishes are generally benthopelagic, i.e., living habitually near the ocean floor (Marshall 1965), and can be divided into two ecological groups by various anatomical features. The more elongate rays of the anal fin indicate a generalised "head down" attitude for many species; this can be correlated with an elongate snout, inferior, protrusible mouth with small teeth, restricted first gill-slit, and relatively few tubercular gill-rakers. Species with relatively short anal fin rays commonly have a terminal, non-protrusible mouth, often with larger teeth, and a less restricted first gill-slit with longer and more numerous gill-rakers.

Okamaru (1970b) has correlated the size and protrusibility of the mouth with the amount of benthic animal life in the stomach contents of Japanese macrourids, showing that species in the first group contain much more benthos in the stomach contents than those in the second, though mud was present in stomachs from all 25 species examined.

TEXT CONVENTIONS

Measurements of specimens are given as percentages of the standard length (tip of snout to anus), unless otherwise indicated. Total length of macrourids is of doubtful significance since the extreme caudal region is often mutilated by predators or in the trawl bag. Where sufficient specimens have been examined the measurements are given as the mean $\pm$ the standard error of the mean; otherwise the range of the measurements is given. The summary of measurements for each species gives, when applicable, the range, mean, standard error of the mean (S.E.), standard deviation (S.D.), and the coefficient of variation (C.V.). Most measurements arise from the tip of the snout and are taken in a straight line, not projected on to an arbitrary axis. In general measurements are self-explanatory. However, it should be noted that the depth and width of the head have been measured at the posterior orbital margin; that "snout" refers to the preorbital length; and that interorbital width refers to the minimum distance between the orbits. Usually only the horizontal diameter of the orbit is given, though the vertical diameter may be of use in delineating the shape of the orbit.

Specimens are illustrated by line drawings in oblique lateral aspect (emphasising the head features), and by photographs in strictly lateral aspect.

Though individual characters vary in importance between species a standard descriptive method has been adopted. Synonymies are reduced to the more important references and taxonomic characters are described under five headings—general characters, head characters, scales, fins, and colouration. Under material examined are listed the station numbers at which a species was collected. Numbers in parentheses after station numbers indicate how many specimens in the sample.

LIST OF STATIONS

The following New Zealand Oceanographic Institute Station List is in abbreviated form, particularly in the field notes where records of individual occurrences of animals noted in the field but not relevant to this paper have been omitted.

"Z" numbers used within the New Zealand Oceanographic Institute denote material from other sources or material collected by staff members before their association with the Institute, but subsequently donated to the Institute.

Numbers enclosed in brackets following the species names indicate the number of specimens collected.

NEW ZEALAND OCEANOGRAPHIC INSTITUTE STATIONS

A759 43°16.0'S, 176°11'E. Depth 345 m.
Lepidorhynchus denticulatus (1)

A760 43°11.0'S, 176°09'E. Depth 369 m.
Lepidorhynchus denticulatus (1)

B175 50°26.5'S, 166°37.5'E. to 50°25.5'S, 166°35.5'E. Depth 95 m.
Coelorhynchus aspercephalus (3)

B196 46°20.6'S, 170°27.6'E. to 46°19.5'S, 170°28.3'E. Depth 135 m.
Coelorhynchus aspercephalus (1)

B684 40°00.0'S, 171°41.5'E. Depth 587 m.
Coelorhynchus oliverianus (2)

C605 43°40.0'S, 179°30.0'E. Depth 441–461 m.
Coelorhynchus fasciatus (1)

C637 39°02.0'S, 172°06.0'E. Depth 945 m.
Coryphaenoides serrulatus (1)

C683 42°28.1'S, 173°40.7'E. Depth 88 m.
Coelorhynchus oliverianus (1)

D35 52°56.4'S, 169°33.0'E. Depth 188 m.
Coelorhynchus aspercephalus (1)

D38 51°58.0'S, 165°28.0'E. Depth 188 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus aspercephalus (1)

D85 49°50.0'S, 170°13.0'E. Depth 611 m.
Nezumia nigromaculata (2)
Coelorhynchus fasciatus (1)
C. oliverianus (1)

D121 43°16.5'S, 177°10.5'E. Depth 210 m.
Coelorhynchus aspercephalus (5)

D134 48°16.0'S, 168°45.3'E. Depth 677 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus fasciatus (2)
C. oliverianus (3)

D136 48°33.5'S, 169°10.0'E. Depth 713 m.
Coelorhynchus fasciatus (2)
C. oliverianus (5)

D137 48°50.5'S, 169°.0.0'E. Depth 668 m.
Coelorhynchus fasciatus (4)

D138 48°32.0'S, 165°19.5'E. Depth 677 m.
Coelorhynchus fasciatus (1)

D145 48°42.0'S, 167°27.0'E. Depth 366 m.
Coelorhynchus fasciatus (1)

D172 51°00.0'S, 166°03.0'E. Depth 179 m.
Coelorhynchus aspercephalus (1)

D179 51°25.5'S, 167°21.0'E. Depth 629 m.
Coelorhynchus fasciatus (2)

D203 51°00.0'S, 169°29.5'E. Depth 565 m.
Coelorhynchus fasciatus (1)

D205 50°57.5'S, 171°16.0'E. Depth 519 m.
Coelorhynchus fasciatus (2)

D211 48°53.0'S, 172°17.5'E. Depth 519 m.
Lepidorhynchus denticulatus Richardson (1)
Coelorhynchus fasciatus (7)
C. oliverianus (1)

D231 37°53.5'S, 169°45.0'E, Depth 774 m.
Nezumia nigromaculata (1)

D232 38°30.0'S, 169°09.0'E. Depth 505 m.
Coelorhynchus oliverianus (8)

D233 38°50.0'S, 169°20.0'E. Depth 530 m.
Coelorhynchus oliverianus (1)

D234 39°07.0'S, 168°32.0'E. Depth 561 m.
Coelorhynchus oliverianus (3)

D243 38°50.0'S, 169°20.0'E. Depth 519 m.
Coelorhynchus oliverianus (1)

D244 39°31.0'S, 171°00.0'E. Depth 838 m.
Coryphaenoides quadripennatus n.sp. (1)

D868 43°54.0'S, 179°44.0'W. Depth 237 m.
Lepidorhynchus denticulatus (1)

D871 43°20.0'S, 178°40.0'W. Depth 420 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus oliverianus (1)

D895 43°40.0'S, 175°55.0'W. Depth 246 m.
Lepidorhynchus denticulatus (1)

D899 44°23.0'S, 176°49.0'W. Depth 345 m.
Lepidorhynchus denticulatus (4)

D902 43°55.0'S, 177°20.0'W. Depth 420 m.
Coelorhynchus oliverianus (1)

D903 43°55.0'S, 178°10.0'W. Depth 474 m.
Coelorhynchus oliverianus (3)

D904 43°58.5'S, 178°40.0'W. Depth 459 m.
Coelorhynchus oliverianus (1)

E80 43°23.0'S, 179°32.0'W. Depth 454 m.
Lepidorhynchus denticulatus (2)

E81 43°03.0'S, 179°30.0'W. Depth 529 m.
Nezumia nigromaculata (1)

E83 43°03.0'S, 179°30.0'E. Depth 532 m.
Coelorhynchus oliverianus (1)

E112 43°15.0'S, 176°30.0'W. Depth 393 m.
Lepidorhynchus denticulatus (1)

E118 43°15.0'S, 176°00.0'W. Depth 496 m.
Nezumia nigromaculata (1)
Coelorhynchus fasciatus (2)
C. oliverianus (1)

E119 43°10.0'S, 176°00.0'W. Depth 638 m.
Coelorhynchus oliverianus (1)

E120 42°59.0'S, 175°29.0'W to 43°02.0'S, 175°30.0'W. Depth 892 m.
Coryphaenoides quadripennatus n.sp. (1)

E148 44°30.0'S, 177°45.0'W to 44°30.2'S, 177°45.2'W. Depth 880 m.
Coelorhynchus innotabilis (1)

E149 44°15.0'S, 177°45.0'W to 44°16.0'S, 177°45.0'W. Depth 525 m.
Coelorhynchus oliverianus (1)

E152 44°15.0'S, 177°00.0'W to 44°15.8'S, 177°01.5'W. Depth 373 m.
Coelorhynchus oliverianus (2)

E399 46°00.0'S, 171°33.0'E. Depth 1222 m.
Macrourus carinatus (1)

E400 46°00.–'S, 171°02.0'E. Depth 622–768 m.
Coelorhynchus fasciatus (2)
C. oliverianus (6)

E401 46°00.0'S, 171°12.0'E. Depth 914–823 m.
Coryphaenoides quadripennatus n.sp. (1)

E405 47°20.0'S, 169°55.0'E. Depth 1004 m.
Coryphaenoides quadripennatus n.sp. (2)

E410 46°40.0'S, 170°44.6'E. Depth 1086 m.
Coryphaenoides quadripennatus n.sp. (1)
Coelorhynchus fasciatus (1)

E413 45°12.0'S, 171°44.0'E. Depth 594 m.
Nezumia nigromaculata (1)

E414 46°16.5'S, 171°49.0'E. Depth 999 m.
Macrourus carinatus (1)
Nezumia nigromaculata (1)

E421 44°00.0'S, 175°00.0'E. Depth 494 m.
Coelorhynchus oliverianus (1)

E422 44°15.0'S, 175°00.0'E. Depth 615 m.
Coelorhynchus fasciatus (1)
C. oliverianus (2)

E423 44°18.0'S, 174°31.0'E. Depth 640 m.
Nezumia nigromaculata (1)
Coelorhynchus fasciatus (2)
C. oliverianus (1)

E426 44°47.0'S, 172°48.0'E. Depth 1130 m.
Macrourus carinatus (1)

E428 44°16.0'S, 174°00.0'E. Depth 646 m.
Coelorhynchus oliverianus (2)

E433 43°43.0'S, 174°30.0'E. Depth 571 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus oliverianus (2)

E434 43°30.0'S, 174°30.0'E. Depth 556 m.
Coelorhynchus oliverianus (3)

E435 43°15.0'S, 174°29.0'E. Depth 574 m.
Lepidorhynchus denticulatus (2)
Coelorhynchus oliverianus (2)

E436 43°15.0'S, 174°00.0'E. Depth 695 m.
Coelorhynchus innotabilis (1)

E437 42°13.0'S, 174°33.0'E. Depth 1547 m.
Coryphaenoides armatus (1)

E705 40°08.0'S, 177°10.0'E. Depth 497–261 m.
Lepidorhynchus denticulatus (1)

E707 40°10.3'S, 177°18.3'E. Depth 951–834 m.
Coryphaenoides serrulatus (2)
Coelorhynchus innotabilis (1)

E711 39°18.8'S, 178°13.8'E. Depth 490–428 m.
Coelorhynchus oliverianus (1)

E712 39°20.0'S, 178°15.8'E. Depth 772–717 m.
Lepidorhynchus denticulatus (1)

E713 39°20.5'S, 178°17.0'E. Depth 932–858 m.
Trachyrhynchus longirostris (1)
Coelorhynchus innotabilis (1)

E714 39°19.6'S, 178°21.2'E. Depth 1284–1249 m.
Nezumia namatahi n.sp. (1)

E715 38°40.0'S, 175°29.3'E. Depth 322 m.
Coelorhynchus bollonsi n.sp. (1)

E717 38°42.0'S, 178°33.3'E. Depth 828–839 m.
Mahia matamua n.gen *et* n.sp. (1)
Coelorhynchus innotabilis (1)
C. oliverianus (3)

E718 38°41.0'S, 178°40.0'E. Depth 1040–1019 m.
Coryphaenoides quadripennatus n.sp. (1)

E719 38°46.0'S, 178°48.0'E. Depth 913–750 m.
Coryphaenoides serrulatus (2)
Nezumia nigromaculata (2)
Mahia matamua n.gen *et* n.sp. (2)
Coelorhynchus cookianus n.sp. (1)

E725 37°20.5'S, 178°00.5'E. Depth 1004–942 m.
Coryphaenoides serrulatus (2)

E735 37°28.0'S, 176°47.0'E. Depth 680–764 m.
Coelorhynchus bollonsi n.sp. (1)

E747 40°43.2'S, 176°48.4'E. Depth 554–569 m.
Coelorhynchus innotabilis (1)

E748 40°46.0'S, 176°55.0'E. Depth 739 m.
Coelorhynchus oliverianus (1)

E749 40°47.0'S, 176°57.0'E. Depth 913–997 m.
Nezumia toi n.sp. (2)

E750 40°48.5'S, 177°02'E. Depth 1353–1339 m.
Bathygadus cottoides (1)

E751 41°39.7'S, 175°15.0'E. Depth 300–399 m.
Coelorhynchus cookianus n.sp. (2)

E756 42°01.8'S, 174°26.5'E. Depth 885–969 m.
Coelorhynchus fasciatus (2)

E757 42°03.2'S, 174°27.2'E. Depth 1081–1125 m.
Trachyrhynchus longirostris (1)
Coryphaenoides serrulatus (3)
C. quadripennatus n.sp. (1)
Coelorhynchus innotabilis (2)

E758 42°08.5'S, 174°53.2'E. Depth 1917–2070 m.
Coryphaenoides serrulatus (2)

E771 42°00.0'S, 170°30.5'E. Depth 505 m.
Coelorhynchus oliverianus (1)

E772 42°00.0'S, 170°16.0'E. Depth 748 m.
Coelorhynchus innotabilis (1)

E776 42°43.0'S, 169°15.5'E. Depth 980–1070 m.
Coelorhynchus innotabilis (1)

E777 42°43.0'S, 169°45.0'E. Depth 731–712 m.
Coelorhynchus innotabilis (1)

E780 43°23.5'S, 169°27.0'E. Depth 248–202 m.
Coelorhynchus oliverianus (2)

E781 43°22.5'S, 169°17.0'E. Depth 474–450 m.
Coelorhynchus oliverianus (1)

E783 43°23.0'S, 168°56.5'E. Depth 970 m.
Coryphaenoides serrulatus (1)
Coelorhynchus innotabilis (1)

E793 44°40.5'S, 167°32.0'E. Depth 240–250 m.
Coelorhynchus cookianus n.sp. (1)

E804 45°58.5'S, 166°18.5'E. Depth 255–250 m.
Lepidorhynchus denticulatus (1)

E825 46°39.5'S, 166°40.5'E. Depth 914 m.
Coryphaenoides serrulatus (1)

E826 46°37.5'S, 166°44.2'E. Depth 823 m.
Nezumia nigromaculata (1)
Coelorhynchus innotabilis (2)

E856 32°11.0'S, 168°18.0'E. Depth 1171–1159 m.
Gadomus aoteanus n.sp.

E878 35°19.5'S, 172°31.5'E. Depth 495–531 m.
Coelorhynchus fasciatus (1)

E892 37°20.0'S, 173°35.0'E. Depth 1232 m.
Gadomus aoteanus n.sp. (1)

E893 37°19.0'S, 173°51.0'E. Depth 975 m.
Trachyrhynchus longirostris (1)

F80 49°00.0'S, 167°10.0'E. Depth 631 m.
Coelorhynchus fasciatus (1)

F90 49°30.5'S, 167°40.0'E. Depth 585 m.
Lepidorhynchus denticulatus (1)

F100 49°02.0'S, 168°53.5'E. Depth 733–746 m.
Coelorhynchus fasciatus (1)
C. oliverianus (4)

F102 48°39.0'S, 169°51.0'E. Depth 810 m.
Coelorhynchus fasciatus (1)

F104 48°40.0'S, 170°48.5'E. Depth 814–788 m.
Coryphaenoides quadripennatus n.sp. (1)
Coelorhynchus fasciatus (3)

F105 49°34.5'S, 170°57.0'E. Depth 499 m.
Coelorhynchus fasciatus (1)
C. oliverianus (1)

F107 48°45.0'S, 172°00.0'E. Depth 658 m.
Coelorhynchus fasciatus (1)

F108 48°19.0'S, 171°59.0'E. Depth 1108 m.
Coelorhynchus fasciatus (1)

F109 49°11.0'S, 173°00.0'E. Depth 501 m.
Coelorhynchus fasciatus (2)

F124 47°34.0'S, 179°56.0'W. Depth 476 m.
Coelorhynchus fasciatus (1)

F126 49°48.0'S, 176°01.0'E. Depth 1256 m.
Coryphaenoides murrayi (1)

F135 50°58.0'S, 173°57.0'E. Depth 832 m.
Coryphaenoides serrulatus (1)
Coelorhynchus fasciatus (2)

F144 53°29.0'S, 170°56.0'E, Depth 596 m.
Coelorhynchus fasciatus (3)

F149 50°31.0'S, 174°19.0'E. Depth 1026 m.
Trachyrhynchus longirostris (1)
Coryphaenoides quadripennatus n.sp. (1)
Coelorhynchus campbellicus n.sp. (1)

F150 49°29.0'S, 174°35.0'E, Depth 501 m.
Coelorhynchus fasciatus (1)
C. oliverianus (1)

F151 48°32.0'S, 174°50.0'E. Depth 814 m.
Coelorhynchus fasciatus (2)

F750 44°15.0'S, 175°26.0'E. Depth 594 m.
Coelorhynchus innotabilis (1)

F752 45°25.0'S, 174°30.0'E. Depth 1233–1222 m.
Macrourus carinatus (1)

F755 43°00.0'S, 174°30.0'E. Depth 854–748 m.
Coelorhynchus innotabilis (2)

F757 42°45.0'S, 175°30.0'E. Depth 911 m.
Coelorhynchus innotabilis (2)

F758 42°37.0'S, 175°30.0'E. Depth 1265 m.
Coelorhynchus oliverianus (1)

F760 42°45.0'S, 176°30.0'E. Depth 739 m.
Coryphaenoides quadripennatus n.sp. (1)
Coelorhynchus oliverianus (1)

F761 42°33.2'S, 176°23.5'E. Depth 1234–1205 m.
Coelorhynchus kermadecus (1)

F763 41°01.8'S, 176°32.3'E. Depth 711–814 m.
Coelorhynchus innotabilis (1)

F767 41°30.8'S, 176°07.0'E. Depth 1205–1293 m.
Coryphaenoides serrulatus (4)
C. rudis (1)

F868 37°28.5'S, 179°03.5'E. Depth 805–922 m.
Coelorhynchus fasciatus (1)

F873 37°19.5'S, 178°11.0'E. Depth 1050–1053 m.
Gadomus aoteanus n.sp. (1)

F877 37°31.0'S, 177°32.0'E. Depth 779–724 m.
Coelorhynchus innotabilis (1)

F892 36°58.5'S, 176°41.0'E. Depth 1280–1196 m.
Coryphaenoides murrayi (1)

F913 34°43.5'S, 174°31.5'E. Depth 739 m.
Lepidorhynchus denticulatus (1)

G142 42°24.8'S, 173°56.5'E to 42°24.5'S, 174°0.20'E. Depth 1212 m.
Coryphaenoides quadripennatus n.sp. (1)

G153 42°45.0'S, 173°40.0'E. Depth 137 m.
Coelorhynchus australis (2)
C. aspercephalus (1)

G154 42°46.0'S, 173°40.0'E. Depth 137–155 m.
Coelorhynchus aspercephalus (6)

G155 42°46.0'S, 173°39.0'E, Depth 137–155 m.
Coelorhynchus australis (2)
C. aspercephalus (3)

G157 43°09.0'S, 173°38.0'E. Depth 143 m.
Coelorhynchus australis (1)

G159 43°02.0'S, 173°38.0'E. Depth 146–192 m.
Coelorhynchus aspercephalus (2)

G165 43°01.0'S. 173°38.0'E. Depth 167 m.
Lepidorhynchus denticulatus (1)

G169 42°04.0'S, 174°20.0'E. Depth 146–182 m.
Coelorhynchus aspercephalus (1)

G224 43°46.0'S, 179°50.0'E. Depth 446 m.
Coelorhynchus oliverianus (3)

G247 43°32.0'S, 179°34.0'E. Depth 399 m.
Lepidorhynchus denticulatus (1)

G249a 43°20.0'S, 179°29.0'E. Depth 424 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus oliverianus (1)

G254a 43°33.0'S, 179°22.0'E. Depth 410 m.
Lepidorhynchus denticulatus (1)

G259a 43°33.0'S, 179°22.0'E. Depth 410 m.
Lepidorhynchus denticulatus (3)
Coelorhynchus oliverianus (1)

G268 43°22.0'S, 179°22.0'E. Depth 424 m.
Lepidorhynchus denticulatus (1)
Nezumia nigromaculata (1)

G276a 43°36.0'S, 179°15.0'E. Depth 410 m.
Lepidorhynchus denticulatus (1)

G283 43°31.0'S, 179°07.0'E. Depth 413 m.
Nezumia nigromaculata (1)

G292 43°42.0'S, 179°48.0'E. Depth 453 m.
Lepidorhynchus denticulatus (1)

G293 43°40.0'S, 179°28.0'E. Depth 421 m.
Coelorhynchus oliverianus (1)
C. bollonsi n.sp. (1)

G294a 43°34.0'S, 179°20.0'E. Depth 410 m.
Coelorhynchus oliverianus (1)

G305 43°13.0'S, 179°00.0'E. Depth 455 m.
Coelorhynchus oliverianus (1)

G335a 43°39.0'S, 178°56.0'W. Depth 399 m.
Coelorhynchus oliverianus (2)

G345 43°35.0'S, 175°45.0'W. Depth 446 m.
Lepidorhynchus denticulatus (2)

G403 43°54.0'S, 179°44.0'W. Depth 391 m.
Lepidorhynchus denticulatus (1)

G651 44°00.0'S, 174°31.0'E. Depth 572 m.
Coelorhynchus oliverianus (1)

G652 44°00.0'S, 174°10.0'E. Depth 557 m.
Coelorhynchus oliverianus (1)

G675 45°27.0'S, 171°24.0'E. Depth 792 m.
Coelorhynchus bollonsi n.sp. (1)

G699 46°20.2'S, 171°00.0'E. Depth 1116 m.
Macrourus carinatus (1)

G700 46°20.0S, 171°15.0'E. Depth 1116 m.
Coryphaenoides serrulatus (1)

G821 33°18.5'S, 162°35.5'E. Depth 792 m.
Coryphaenoides serrulatus (2)

G822 33°20.4'S, 162°49.2'E. Depth 816 m.
Lepidorhynchus denticulatus (1)

G830 38°47.8'S, 171°54.5'E. Depth 1150–1145 m.
Coryphaenoides serrulatus (1)

H284 44°38.08'S, 167°53.7'E. Depth 278 m.
Coelorhynchus oliverianus (1)

J28 38°50.0'S, 169°39.0'E. Depth 548 m.
Nezumia nigromaculata (1)

J29 38°40.0'S, 169°39.0'E. Depth 550 m
Coelorhynchus oliverianus (3)

J31 38°39.0'S, 169°15.0'E. Depth 511 m.
Lepidorhynchus denticulatus (1)
Coelorhynchus oliverianus (1)

J35 38°30.0'S, 169°26.0'E. Depth 546 m.
Coelorhynchus oliverianus (1)

J36 38°30.0'S, 169°39.0'E. Depth 569–566 m.
Coelorhynchus fasciatus (2)
C. oliverianus (1)

Z2076 S.E. of Bare Island. Depth 106–110 m.
Coelorhynchus australis (3)

Z2077 8 km S.E. of Flat Point. Depth 113 m.
Coelorhynchus australis (5)
C. aspercephalus (1)

Z2078 Off Greymouth. Depth 106–110 m.
Coelorhynchus australis (2)

Z2141 VUW Trawl 4
Coelorhynchus australis (3)

Z2363 37°21.0'S, 176°26.0'E. Depth 311 348 m.
Coelorhynchus australis (1)

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VUZ89———
Coryphaenoides serrulatus (1)

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VUZ96———
Coelorhynchus fasciatus (3)

CHECKLIST OF MACROURID FISHES RECORDED FROM THE NEW ZEALAND REGION (24°S to 57° 30'S, 157°E to 167°W)

(Bold type indicates species new to the recorded fauna.)

Family MACROURIDAE
- Subfamily BATHYGADINAE
  - *Bathygadus cottoides* Günther
  - **Gadomus aoteanus** n.sp.
- Subfamily TRACHYRHYNCHINAE
  - *Trachyrhynchus longirostris* Günther
- Subfamily MACROURINAE
  - *Cetonurus crassiceps* Günther
  - *Coelorhynchus (Oxygadus) kermadecus* Jordan & Starks
  - **Coelorhynchus (Oxymacrurus) bollonsi** n.sp.
  - **Coelorhynchus (Oxymacrurus) cookianus** n.sp.
  - *Coelorhynchus (Paramacrurus) aspercephalus* Waite
  - *Coelorhynchus (Paramacrurus) australis* (Richardson)
  - *Coelorhynchus (Paramacrurus) fasciatus* (Günther)
  - **Coelorhynchus (Paramacrurus) innotabilis** McCulloch
  - *Coelorhynchus (Paramacrurus) mirus* McCulloch
  - *Coelorhynchus (Paramacrurus) oliverianus* Phillipps
  - **Coelorhynchus (Quincuncia) campbellicus** n.sp.
  - *Coryphaenoides (Chalinura) murrayi* Günther
  - **Coryphaenoides (Coryphaenoides) quadripennatus** n.sp.
  - *Coryphaenoides (Coryphaenoides) rudis* Günther
  - *Coryphaenoides (Coryphaenoides) serrulatus* Günther
  - *Coryphaenoides (Nematonurus) armatus* Hector
  - *Lepidorhynchus denticulatus* Richardson
  - **Macrourus carinatus** Günther
  - **Mahia matamua** n.gen. & sp.
  - **Nezumia namatahi** n.sp.
  - **Nezumia nigromaculata** (McCulloch)
  - **Nezumia toi** n.sp.

KEY TO NEW ZEALAND MACROURIDAE

1 (6) No fold of membrane attached to first gill-arch and restricting the gill-slit, gill-rakers not tubercular; 7 branchiostegal rays; 2 dorsal fins close together or more or less confluent, second dorsal rays longer than anal.

2 (5) Mouth terminal. Gill-rakers long and numerous. Scales cycloid, not modified along bases of dorsal and anal fins. . . . . BATHYGADINAE

3 (4) Barbel absent. First dorsal, pectoral, and ventral fins without elongate rays. Orbital diameter less than two-thirds interorbital width (about half, or half length of snout) . . . . . *Bathygadus cottoides*

4 (3) Barbel present. First dorsal, pectoral, and ventral fins with an elongate ray, longer than head. Horizontal diameter of orbit about equal to interorbital width . . . . . *Gadomus aoteanus* n.sp.

5 (2) Mouth inferior, snout greatly produced. Gill-rakers short and numerous. Scales with a sharp longitudinal ridge, enlarged and conspicuous on series flanking dorsal and anal fins. . . . . *Trachyrhynchus longirostris* (TRACHYRHYNCHINAE)

6 (1) First gill-slit restricted by a fold of membrane, gill-rakers tubercular; 6 or 7 branchiostegal rays. A distinct interspace separating first and second dorsal fins, rays of second dorsal usually shorter than anal. . . . . MACROURINAE

7 (28) Second spine of first dorsal serrate on anterior margin.

8 (19) Luminous organ absent; anus close to anal fin. 6 or 7 branchiostegal rays.

9 (18) Snout relatively short, infraorbital ridge extending to just past posterior orbital margin, preopercular angle rounded. Mouth subterminal to inferior. 6 branchiostegal rays.

10 (13) Teeth in one or both jaws uniserial or biserial.

11 (12) Teeth uniserial or biserial in both jaws . . . . . *Coryphaenoides armatus*

12 (11) Teeth in a band in upper jaw, the outer series enlarged, large and uniserial in lower jaw . . . . . *Coryphaenoides murrayi*

13 (10) Teeth in both jaws in a band, usually villiform, though outer series may be enlarged.

14 (15) Outer ray of pectoral and ventral fins produced and filamentous, much longer than head . . . . . *Coryphaenoides quadripennatus* n.sp.

15 (14) Outer ray of pectoral and ventral fins shorter than head.

16 (17) Snout with 3 prominent sclerites, at tip and antero-lateral angles; 5–6 scales between first dorsal fin and lateral line. 7 ventral-fin rays . . . . . *Coryphaenoides serrulatus*

17 (16) Sclerites on snout rather diffuse; 7–8 scales between first dorsal fin and lateral line. 9–10 ventral-fin rays . . . . . *Coryphaenoides rudis*

18 (9) Infraorbital ridge strong, extending to preopercular angle. Mouth inferior. 7 branchiostegal rays..... ..... *Macrourus carinatus*

19 (8) Luminous organ present; anus remote from anal fin. 7 branchiostegal rays.

20 (21) Teeth canine-like, biserial in upper jaw, uniserial in lower jaw. Lower portion of interoperculum exposed over entire length, scaled. Luminous organ with 2 photophores, the anterior large, crescentic, between bases of ventral fins, the posterior circular, connected to vent by a blackish, scaleless area..... ..... *Malacocephalus laevis*

21 (20) Teeth conical in a broad band in both jaws or sometimes in irregular series in lower jaw. Interoperculum hidden by preopercular or only slightly produced beyond it. Luminous organ with small photophores, none crescentic.

22 (23) A scaleless area surrounding vent and preceding anal fin, scales enlarged in a series along base of dorsal fin, spinules on scales directed upward. Head soft and massive, sensory canals and ridges excessively developed. Body robust, rigidly constructed behind anus. Lateral line consisting of widely spaced short grooves. Luminous organ very short, indistinct, appearing as a tiny scaleless area just anterior to anus, not extending to bases of ventral fins..... ..... *Cetonurus crassiceps*

23 (22) No scaleless area surrounding vent and preceding anal fin, scales not enlarged along base of dorsal fin, spinules directed posteriorly. Head not soft and massive, sensory canals and ridges moderately developed. Lateral line continuous. Luminous organ small to medium, usually distinct .... *Nezumia* spp.

24 (25) Body rapidly tapering behind vent. Ventral fins with 13 rays, the outermost produced, extending beyond origin of anal fin. 14–15 scales between base of first dorsal fin and lateral line .... *Nezumia nigromaculata*

25 (24) Body gradually tapering behind vent. Ventral fins with 9 or 10 rays, the outermost ray not so long. 9 or fewer scales between base of first dorsal fin and lateral line.

26 (27) Orbit smaller than postorbital length. Interdorsal space 34–36% SL, base of D_1 24% SL. 8 or 9 scales between base of first dorsal fin and lateral line .... *Nezumia namatahi* n.sp.

27 (26) Orbit larger than postorbital length. Interdorsal space 40% SL, base of D_1 18% SL. 6 scales between base of first dorsal fin and lateral line .... *Nezumia toi* n.sp.

28 (7) Second spine of first dorsal fin smooth. Luminous organ usually present.

29 (32) Mouth more or less terminal.

30 (31) Barbel absent. Teeth of upper jaw in a narrow band, separated from the marginal series, which is small, except for one enlarged anterolateral canine. Rays of anal fin about equal in length to those of second dorsal fin..... ..... *Cynomacrurus pirei*

31 (30) Barbel present. Teeth large, uniserial in lower jaw. Scales large, rather deciduous, densely covered with minute spinules. Head compressed, ridges indistinct... ..... *Lepidorhynchus denticulatus*

32 (29) Mouth inferior. Teeth in bands in both jaws, the outer series sometimes enlarged. Head compressed or depressed; infraorbital ridge conspicuous, entire. Scales smaller, with fewer spinules on ridges.

33 (34) Upper jaw longer than one-third length of head; mouth relatively large; teeth acicular, outer 2 series enlarged in upper jaw. Area below infraorbital ridge oblique to subvertical. Luminous organ small, covered by scales, situated midway between bases of ventral fins and anus..... ..... *Mahia matamua* n.gen. & sp.

34 (33) Upper jaw shorter than one-third length of head; mouth smaller; teeth in bands, usually villiform, the outer series sometimes enlarged. Area below infraorbital ridge oblique to subhorizontal. Luminous organ usually distinct..... ..... *Coelorhynchus* spp.

35 (36) Blackish streak of duct of luminous organ elongate, extending from anus to in front of bases of ventral fins, length much more than orbital diameter. Snout greatly produced, lanceolate, underside of anterolateral region scaled, remainder scaleless. Anus near origin of anal fin .... *Coelorhynchus (Quincuncia) campbellicus* n.sp.

36 (35) Blackish streak of duct of luminous organ not extending forward of bases of ventral fins, length not greater than orbital diameter. Snout variable in length, underside scaleless or completely scaled, not just anterolateral region.

37 (48) Anus more or less remote from origin of anal fin. Luminous organ about equal to orbital diameter or less, extending to between or behind bases of ventral fins. Spinous carinae of scales subparallel.

38 (41) Underside of head completely scaled.

39 (40) Interdorsal space 15–22% SL, base of first dorsal fin 18–22% SL. 3 (rarely 4) scales between first dorsal fin and lateral line ....*Coelorhynchus (Paramacrurus) australis*

40 (39) Interdorsal space 8–18% SL, base of first dorsal fin 19–27% SL. 6 scales between first dorsal fin and lateral line..... .....*Coelorhynchus (Paramacrurus) aspercephalus*

41 (38) Underside of head almost or completely scaleless.

42 (43) Snout pointed, lanceolate. Preorbital length longer than orbit, postorbital area shorter than either, interorbital width about half orbital diameter. Infra-orbital ridge more or less straight. 5 (sometimes 6) scales between first dorsal fin and lateral line..... .....*Coelorhynchus (Paramacrurus) innotabilis*

43 (42) Snout blunter in dorsal aspect. Preorbital length shorter than orbit, longer than or subequal to postorbital area. Infraorbital ridge curved in front of orbit. 3 or 4 scales between first dorsal fin and lateral line.

44 (45) Orbital diameter subequal to postorbital length. Underside of head with scales behind mouth angle. Interorbital width smaller than postorbital length..... .....*Coelorhynchus (Paramacrurus) mirus*

45 (44) Orbital diameter larger than postorbital length. Underside of head completely naked. Interorbital width subequal to or larger than postorbital length.

46 (47) Interorbital width larger than postorbital length, subequal to preorbital length ....*Coelorhynchus (Paramacrurus) oliverianus*

47 (46) Interorbital width subequal to postorbital length, smaller than preorbital length..... .....*Coelorhynchus (Paramacrurus) fasciatus*

48 (37) Anus relatively close to origin of anal fin. Luminous organ short, half or less of orbital diameter, the superficial blackish streak not extending to base of ventral fins. Scales with strong spinules in definite series, the median usually strongest. Head ridges well developed.

49 (52) Spinules on scales on divergent ridges, the median series not greatly enlarged. Luminous organ subrectangular, usually longer than half diameter of pupil. No spinous scute near posterior end of occipital sensory canal (between occiptal and postorbital ridges).

50 (51) Scales with 8–17 divergent series of spinules. 5 scales between first dorsal fin and lateral line, 6 between second dorsal fin and lateral line. Pectoral fins with 17 rays..... .....*Coelorhynchus (Oxymacrurus) cookianus* n.sp.

51 (50) Scales with 5–7 divergent series of spinules. 4 scales between first dorsal fin and lateral line, 4.5 between second dorsal fin and lateral line. Pectoral fins with 15 rays..... .....*Coelorhynchus (Oxymacrurus) bollonsi* n.sp.

52 (49) Spinules on scales with median series especially enlarged, others in parallel or subparallel rows. Luminous organ small, immediately before anus, length less than half pupil diameter. A strongly spinous scute at posterior end of occipital sensory canal. Snout acutely pointed, longer than orbit, postorbital, or interorbital, which are subequal. Underside of head scaled..... .....*Coelorhynchus (Oxygadus) kermadecus*

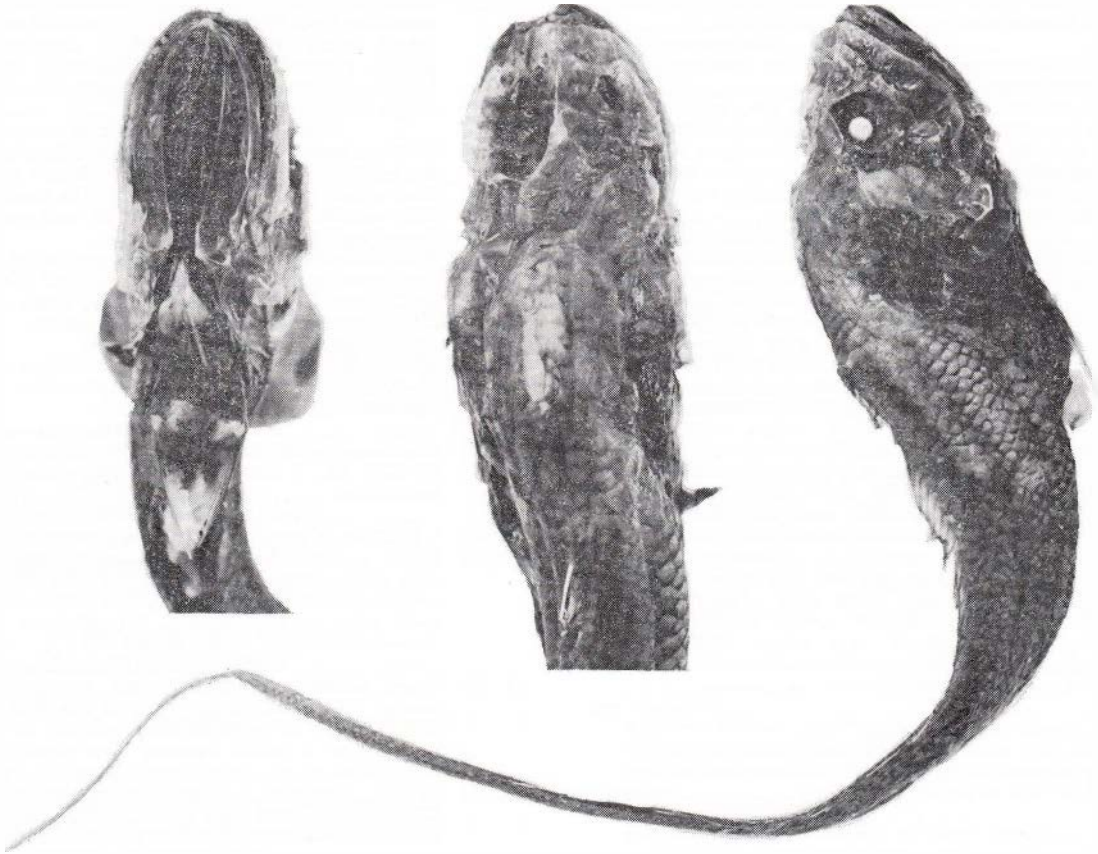

Fig. 1. *Bathygadus cottoides* (Stn E750; SL 55 mm).

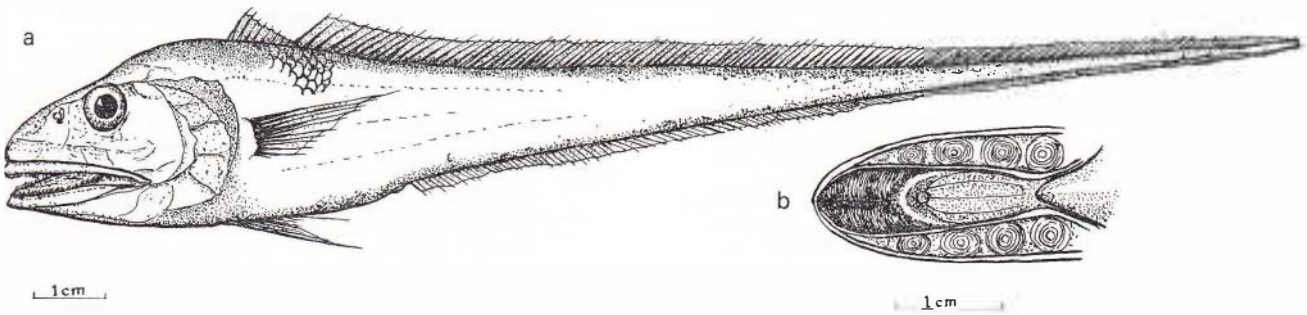

Fig. 2. *Bathygadus cottoides* (Stn E750; SL 55 mm): a, profile; b, underside of head.

SYSTEMATICS

Family MACROURIDAE

Body elongate, tapering into a long, compressed, more or less pointed tail. Premaxillary more or less protractile, teeth variable in shape and arrangement on both jaws, none on vomer or palatines. Branchiostegal rays 6–8, gill-rakers less than 40. First gill-slit usually restricted by a membranous fold, pseudobranchiae present, usually granular and concealed by a membrane. Scales variable in size and shape, keeled or spinigerous but sometimes cycloid. Lateral line present, usually continuous. Dorsal and anal fins continuous around tail, caudal absent. One or two dorsal fins, with two pseudospiny rays; if two dorsal fins, ventral fins small, thoracic in position, usually with seven or more rays, exceptionally five or six.

Subfamily BATHYGADINAE

Mouth terminal and wide, jaws slightly protrusible, teeth numerous, small. Second ray of first dorsal fin a flexible spine. Interdorsal space small or absent. Ventral fins with eight or nine rays, directly under or just behind pectorals. Gill-rakers long and numerous, branchiostegal rays seven. Second dorsal fin rays longer than anal. Teeth villiform or granular on both jaws, in bands. Gill opening very wide. First gill-slit not restricted by a membrane. Scales cycloid with fine reticulate structure of circular and transverse ridges. No luminous organ.

Bathygadus Günther

Head and body compressed, moderately robust. Two dorsal fins, the first with two spiny rays, the second with rays longer than on anal; second ray of first dorsal and outer pelvic ray slightly produced. Snout obtuse, not projecting; mouth large, terminal and lateral, teeth granular, in bands in both jaws. Barbel, if present, shorter than diameter of orbit. Interoperculum slender and rod-like, not fringing lower margin of opercula, posterior one-third directed posteroventrally. Gill opening wide, branchiostegal membranes uniting below about posterior margin of orbit. First gill-slit not restricted by a membraneous fold. Scales cycloid, elongate-oval. Pyloric caeca short, 14–49 in number.

TYPE-SPECIES: *Bathygadus cottoides* Günther.

Bathygadus cottoides Günther. (Figs 1, 2)

Bathygadus cottoides Günther, 1878: 23; 1887: 154, pl. 42 (A). Whitley, 1968: 39. McCann, 1972: 624, figs 6, 7.

GENERAL CHARACTERS: Head and body compressed, head relatively conspicuous. Dorsal contour rising from snout to about base of first dorsal fin, body then tapering relatively rapidly at first; caudal region elongate. Gill openings wide, first gill with 5+15 elongate, denticulate, slender outer rakers and 2+16 shorter inner rakers with bluntly expanded, thorny tips.

HEAD CHARACTERS: Snout obtuse in dorsal and lateral aspects, short; orbit slightly ellipsoidal, vertical diameter slightly less than horizontal diameter. Head rather soft, bones conspicuous. Frontal ridge broad anteriorly, narrower posteriorly, extending almost to centre of orbit Nasal ridge conspicuous, not extending to infraorbital ridge, confluent with the more or less straight postorbital ridge, which extends almost to posterior end of head. Occipital ridges short, arising behind orbit, divergent anteriorly. Infraorbital ridge extending to just past posterior orbital margin, overhanging. Between infraorbital ridge and orbit a suborbital ridge extends from anterior portion of nasal ridge to near posterior orbital margin. Upper jaw extending to just beyond posterior orbital margin, lower jaw closing within it. Mouth terminal and lateral, wide; teeth villiform, in narrow bands in both jaws. Barbel absent.

SCALES: Thin and deciduous, almost all missing.

FINS: Interdorsal space absent. Pectorals inserted directly under first dorsal. Ventrals inserted slightly anterior to pectorals. Anal rays shorter than those of second dorsal. Ray counts: D_1II 6; P 10–11; V 8; D_2 128+; A 112.

COLOUR: (ex alcohol) Brownish; dorsal and anal fins, abdominal region, and head blackish, head also with grey markings on ridges.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	187
Standard length (mm)	55
Depth of body at anterior end D_1	47
Depth at anus	33
Length of head	62
Depth of head	29
Width of head	38
Snout to nostril	16
Snout to orbit	18
Horizontal diameter of orbit	13
Length of postorbital area	31
Interorbital width	22
Length of upper jaw	33
Snout to D_1	65
Length of base of D_1	11
Length of rays of D_1 (broken)	7
Snout to pectoral	65
Length of pectoral rays	15
Snout to ventral	62
Length of ventral rays	20
Snout to anal	102

MATERIAL EXAMINED:
NZOI Stn E750 (1).

OTHER RECORDS:
Challenger Stns 169, 170–170a (14); 171 (6).

DISTRIBUTION: From off the Kermadec Islands to the eastern New Zealand slope off Cape Turnagain. Depth range 951–1353 m.

REMARKS: *B. spongiceps* Gilbert & Hubbs, a Philippine species, is closely related but distinguished by its larger orbit and more numerous gill-rakers. *B. antrodes* (Jordan & Gilbert), from Japanese waters, differs in having elongate filamentous rays (longer than the head) to the first dorsal, pectoral, and ventral fins.

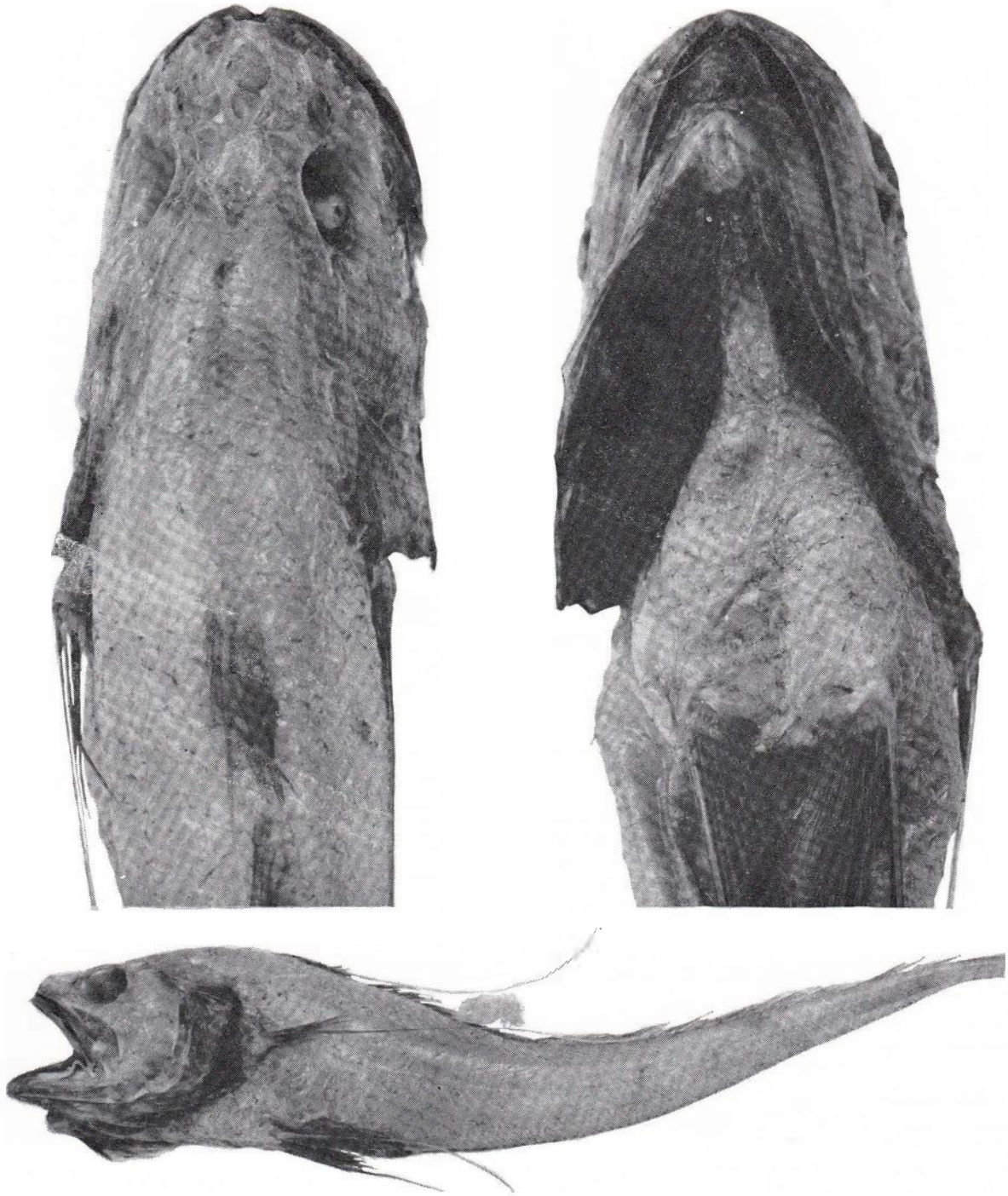

Fig. 3. *Gadomus aoteanus* n. sp. (holotype, Stn E856; SL 82 mm).

Gadomus Regan

Head and body compressed, not robust, tapering; tail slender, elongate. Two dorsal fins, the first with two spiny rays; interdorsal space small or absent. Second dorsal spine, second pectoral ray, and outer ventral ray usually greatly elongate, filamentous. Snout obtuse; mouth large, terminal and lateral. Teeth minute, villiform, in bands in both jaws. Barbel slender, longer than half length of head. Gill openings wide, branchiostegal membranes uniting approximately below pupil. First gill-slit not restricted by a fold of membrane. Gill-rakers slender, numerous. Interoperculum fringing lower margin of opercular region, with the preoperculum trapezoidal. Lateral line distinct, descending below anterior part of second dorsal fin. Scales usually small, elongate-ovoid or finely reticulate. Pyloric caeca of moderate size, the number varying from 14 to over 100.

TYPE-SPECIES: *Bathygadus longifilis* Goode & Bean

Gadomus aoteanus n.sp. (Figs 3, 4)

Bathygadus longifilis McCann, 1972 (*non* Goode & Bean, 1885).

GENERAL CHARACTERS: Head and body compressed, head of moderate size. Dorsal contour rising from snout to just anterior of base of first dorsal fin, body then gradually tapering. Lateral line descending rapidly behind first dorsal fin. Gill openings wide, first gill-arch with 7+25 elongate, slender outer gill-rakers and 5+18 shorter rakers with bluntly expanded thorny tips on inner side.

HEAD CHARACTERS: Snout obtuse in dorsal and lateral aspects, short; orbit subcircular. Ridges of head poorly defined. Frontal ridge broad and rounded on top, infraorbital ridge extending slightly past posterior orbital margin. Upper jaw extends beyond posterior orbital margin. Teeth small, villiform, in bands in both jaws.

SCALES: Thin and deciduous, cycloid, imbricate, ovate, wider than long, reticulate with fine circular and transverse ridges over exposed area but only circular ridges on basal part; about four scales between first dorsal fin and lateral line, and about four between second dorsal fin and lateral line.

FINS: First spine of first dorsal concealed, second elongate and filamentous. Interdorsal space short or absent. Pectorals and ventrals with one ray produced, filamentous. Anal rays shorter than those of second dorsal. Ray counts: D_1II 10; P 14–15; V 9.

COLOUR (ex alcohol): Generally brownish; abdominal region, branchiostegal membrane, and mouth blackish; fins blackish, the elongate rays becoming white distally.

SUMMARY OF MEASUREMENTS (2 specimens):

Total length (mm)	300–380±
Standard length (mm)	79–111
Depth of body at anterior end D_1	43–50
Depth at anus	33–39
Length of head	54–59
Depth of head	38–39
Width of head	23–24
Snout to nostril	9–10
Snout to orbit	14–16
Horizontal diameter of orbit	12–14
Length of postorbital area	29–31
Interorbital width	13
Length of barbel	9–11
Length of upper jaw	28–30
Snout to D_1	63–65
Length of base of D_1	9–14
Length of D_1 rays	100–112
Interdorsal space	0–4
Snout to pectoral	56–62
Length of pectoral rays	110–140
Snout to ventral	65–73
Length of ventral rays	104–127
Snout to anal	102–106

MATERIAL EXAMINED:
Holotype: NZOI No. 189 (Stn E856). Paratypes: NZOI No. P262 (Stn E892), P263 (Stn F873).

OTHER RECORDS:
Nil.

DISTRIBUTION: The southern Norfolk Ridge near the Wanganella Bank; west of Cape Maria van Diemen; and west of Raglan. Depth range 970–1232 m.

PARASITES: One parasitic copepod was present on the specimen from Stn F873.

REMARKS: *G. aoteanus* n.sp. is related to *G. introger* Gilbert & Hubbs, a Philippine species differing in having a slightly shorter head and upper jaw, fewer pectoral rays, and one more ventral ray. *G. marginifilis* Gilbert & Hubbs, *G. denticulatus* Gilbert & Hubbs, and *G. colleti* Jordan & Gilbert have a narrower interorbital width and lack the dark branchial cavity. *G. multifilis* (Günther), *G. melanopterus* Gilbert, and *G. longifilis* (Goode & Bean) have larger teeth and 26 or more elongate, pointed gill-rakers. *G. aoteanus* has been referred to *Bathygadus longifilis* Goode & Bean by McCann (1972); however, on re-examination it has been concluded that the species belongs in the genus *Gadomus*, and is not referable to any described species.

Subfamily TRACHYRHYNCHINAE

Trachyrhynchus Giorna

Snout produced, depressed, lanceolate; infraorbital ridge prominent. Mouth crescentic, inferior; teeth in villiform bands. Barbel present. Head – except for gular and gill membranes and a pit on either side of nape – covered with scales bearing a sharp or toothed longitudinal ridge. Body scales flanking dorsal and anal fins enlarged, with an erect, posteriorly directed keel, diminishing distally. Second ray of first dorsal fin segmented; second dorsal with longer rays than anal, arising close behind first dorsal. First gill-slit unrestricted, first gill-arch with numerous rather short gill-rakers. Seven branchiostegal rays. No luminous organ.

TYPE-SPECIES: *Lepidoleprus trachyrincus* Risso.

Trachyrhynchus longirostris Günther (Figs 5–7)

Macrurus longirostris Günther, 1878: 23.
Trachyrhynchus longirostris Günther, 1887: 152, pl. 41 (B).
Trachyrincus longirostris Whitley, 1968: 38.

GENERAL CHARACTERS: Head large, produced anteriorly into a long, depressed snout, lanceolate in dorsal aspect.

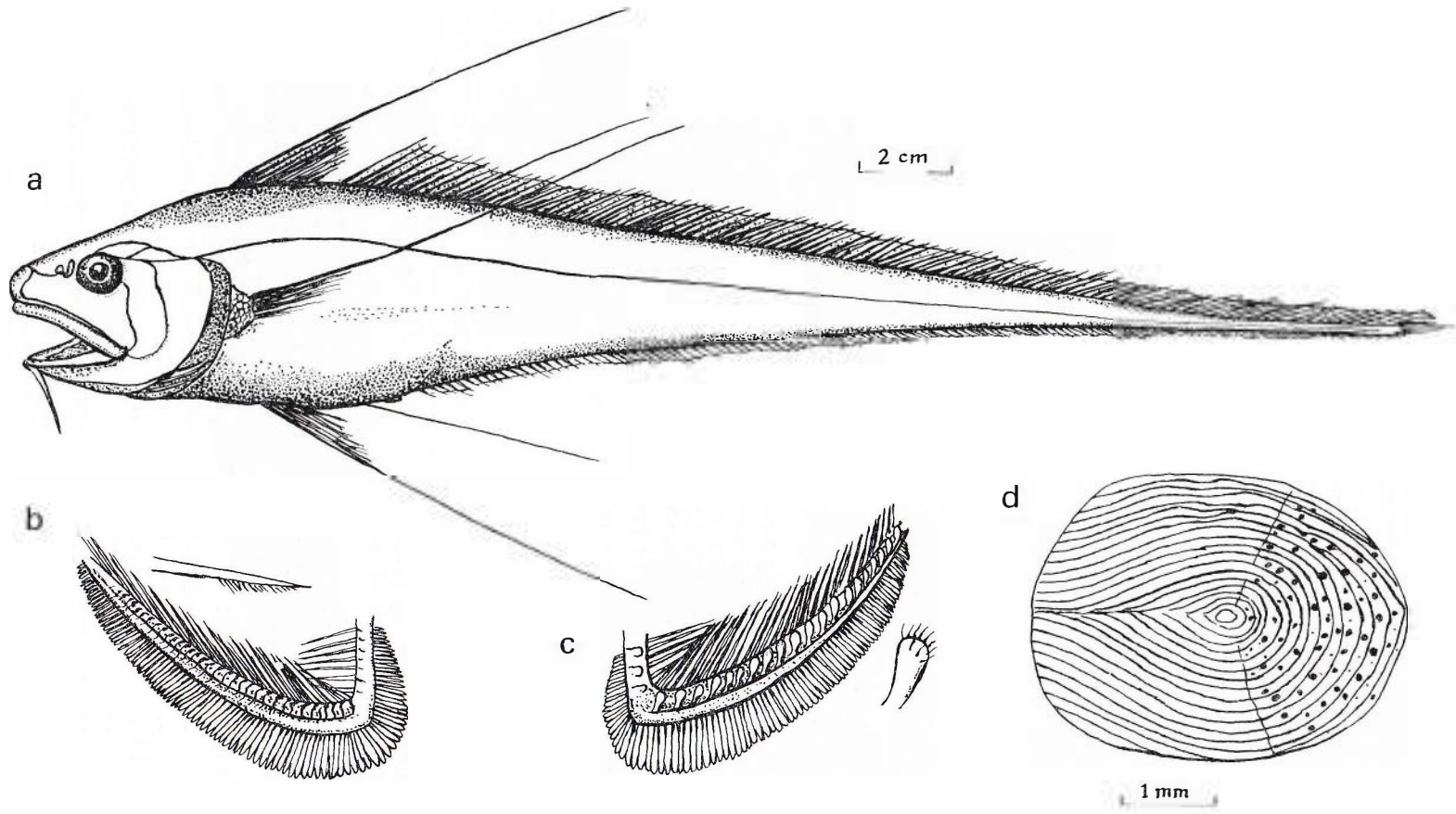

Fig. 4. *Gadomus aoteanus* n. sp. (holotype, Stn E856; SL 82 mm): a, profile; b, c, first gill-arch, with enlargement of raker (b, anterior face; c, posterior face); d, scale.

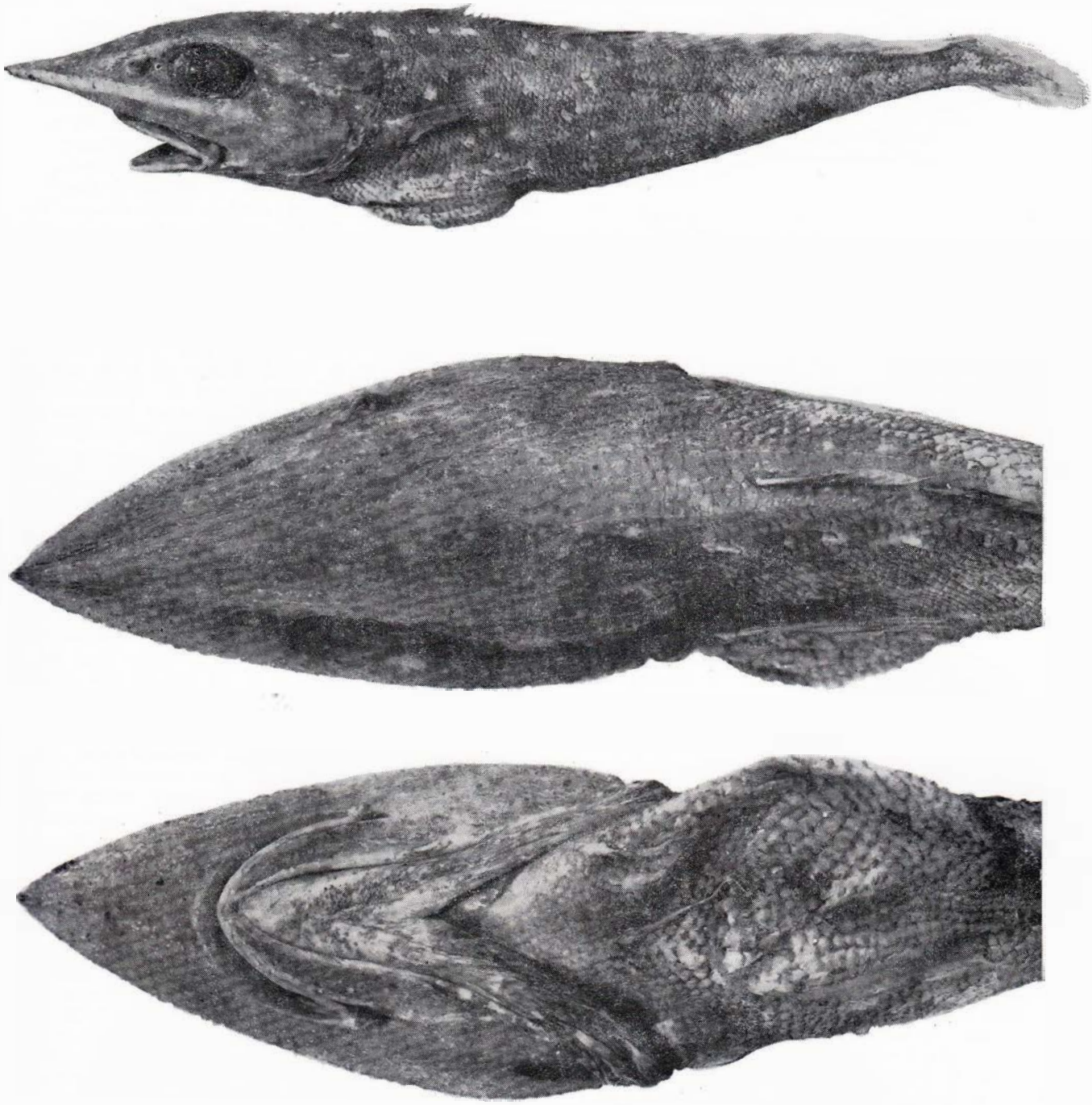

Fig. 5. *Trachyrhynchus longirostris* (Stn E893; SL 244 mm).

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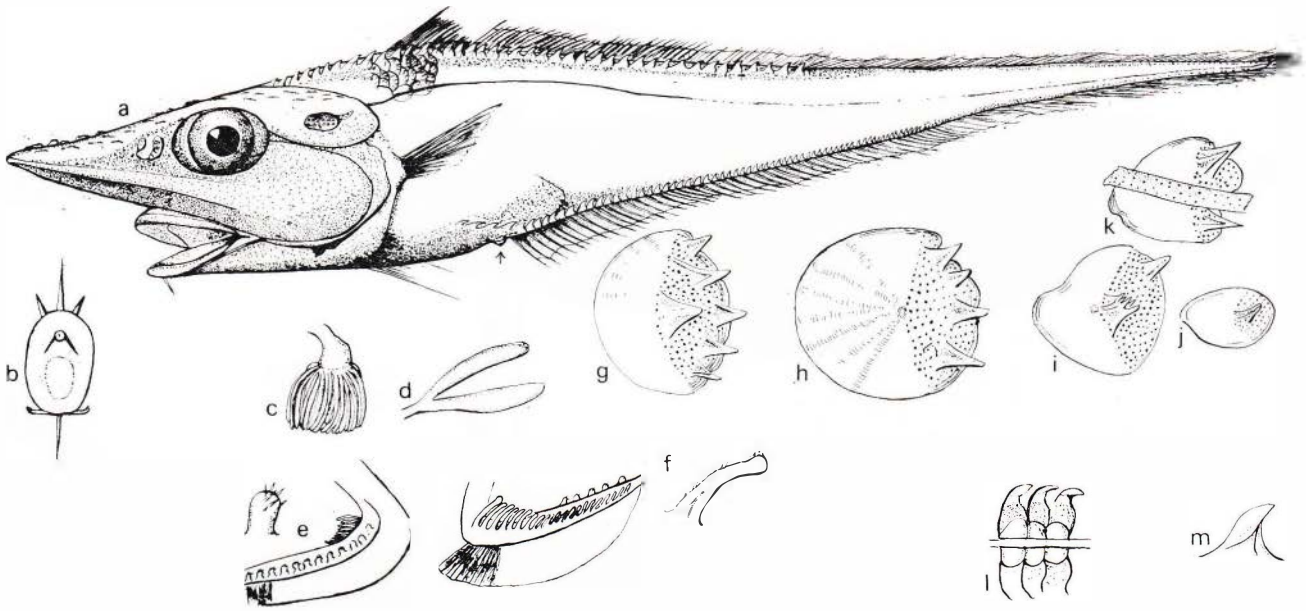

Fig. 6. *Trachyrhynchus longirostris* (♂, Stn F149; SL 159 mm): a, profile (anus arrowed); b, diagrammatic TS of body showing enlarged dorsal and ventral scales; c, pyloric caeca; d, testes; e, f, first gill-arch, with enlargement of raker (e, posterior face; f, anterior face); g–m, scales (g, above LL; h, below LL; i, j, gular; k, LL; l, enlarged ventral scale, ventral aspect; m, tip of enlarged dorsal scale. Scales (approx.)–a-f, x0.4; g–k x2; l, m, x5.

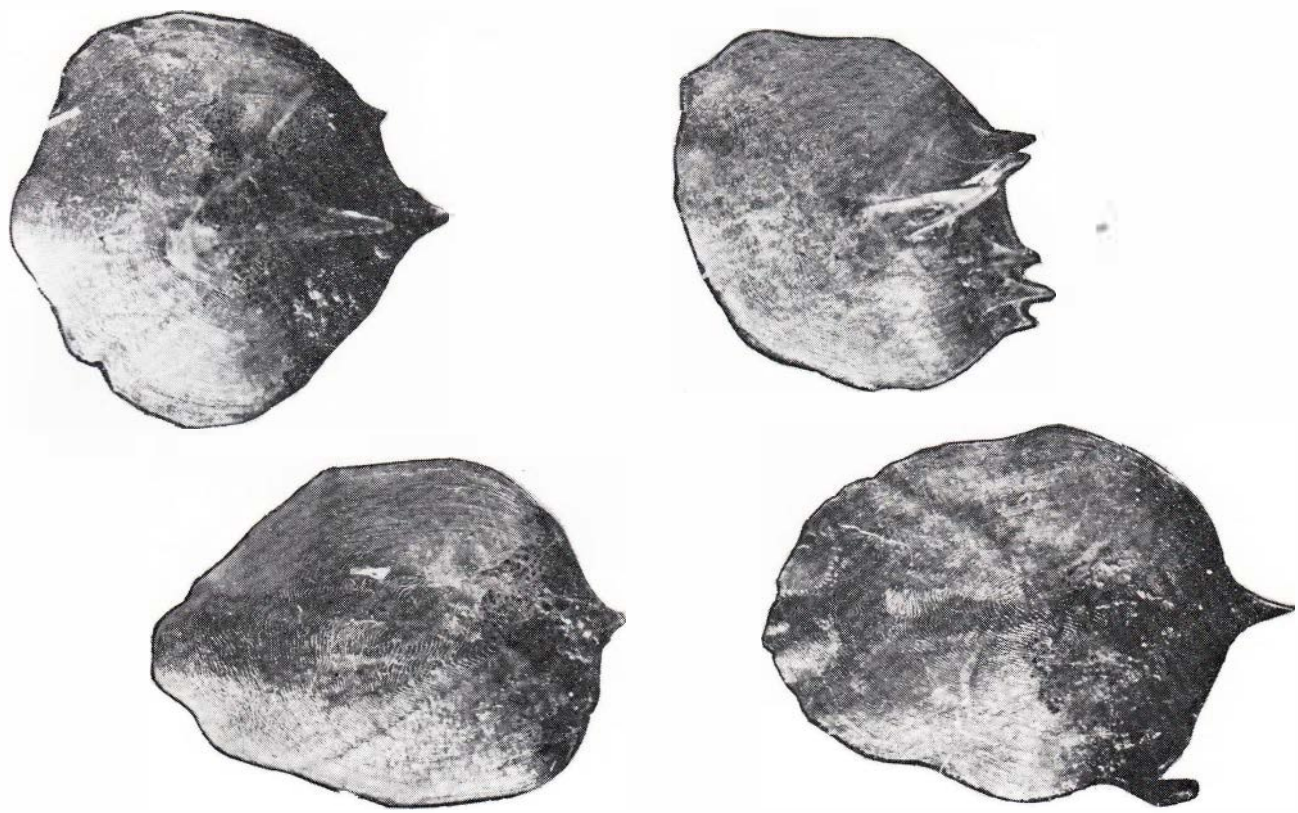

Fig. 7. *Trachyrhynchus longirostris* (Stn E893; SL 244 mm): various body scales, showing variation in form (enlarged).

Body compressed, tapering distally. Lateral line weakly arched, highest at anterior end of second dorsal fin. Anus adjacent to origin of anal fin. Pyloric caeca numerous, about half diameter of orbit in length. About 20 rakers on either side of lower limb of first gill-arch, posterior series styliform, anterior series tubercular.

HEAD CHARACTERS: Snout elongate and lanceolate; orbit ovoid, slightly shorter than postorbital area. Infraorbital ridge prominent anteriorly, becoming broader and less conspicuous behind posterior margin of orbit. Other ridges on head weakly defined. Mouth ventral, crescentic, the cleft extending to beyond midline of orbit. Teeth villiform, in bands in both jaws. Barbel short. A large, ellipsoidal fossa, papillate within, lies about midway between orbit and first dorsal fin, on the nape. Preopercular margin rounded.

SCALES: Body scales moderate in size, variable in shape and armature, four or five between base of first dorsal fin and lateral line. One to seven spinules on body scales, generally subtriangular in profile, sometimes 'castle-shaped'. In large specimens the spinules may be obsolete and the scale margins crenulate. Second series of scales below dorsal fins enlarged and falcate, forming an erect crest on either side, beginning above posterior margin of orbit and extending for about 36 scales. Ventrally, similar scales flank the anal fin, beginning at about the anus and extending for about 62 scales. Both series diminish posteriorly. Head scales produced into an elongate, serrate ridge, occasionally with shorter, radiate ridges as well. Underside of head scaled.

FINS: Second ray of first dorsal smooth on anterior margin, segmented. Interdorsal space negligible or absent. Anal rays equal to or shorter than those of second dorsal. Ray counts: D_1 11–(12); P 26; V 7; D_2 110±; A 106±.

COLOUR: Fresh specimens generally greyish; fins, anal area, branchiostegal membranes, mouth and margin of orbit blackish, as are mucus tubules and scattered snout scales. Preserved specimens sometimes become yellowish.

SUMMARY OF MEASUREMENTS (4 specimens):

	Mean	Min.	Max.
Total length (mm)		305±	470±
Standard length (mm)		137	244
Depth of body at anterior end D_1	41.0	38	47
Depth at anus	32.8	30	35
Length of head	71.5	67	75
Depth of head	30.0	25	33
Width of head	33.5	30	36
Snout to nostril	24.3	23	26
Snout to orbit	29.8	28	32
Orbital diameter	19.5	18	20
Postorbital length of head	22.3	21	24
Interorbital width	19.0	18	20
Length of barbel	2.7	2.5	3
Snout to D_1	76.5	70	84
Base of D_1	14.3	12	17
Length of D_1 rays	16.0	13	18
Interdorsal space	0.0	0	2
Snout to pectoral	73.0	69	76
Length of pectoral rays	22.3	20	24
Snout to ventral	66.3	66	69
Length of ventral rays	17.8	11	23
Snout to anal	102.3	101	104

MATERIAL EXAMINED:
NZOI Stns E713(1), E757(1), E893(1), F149(1♂).

OTHER RECORDS:
Challenger Stn 169(2).

RANGE: From off East Cape to the Campbell Plateau. NZOI records are from off Manukau Harbour, off Hawke's Bay, north-east of Kaikoura, and north-east of Campbell Island. Depth range 858–1280 m.

REMARKS: *T. longirostris* is easily distinguished from all other local macrourids by the elongate snout and the enlarged scales flanking the dorsal and anal fins. *T. trachyrhynchus* Risso has three or four spinules on the scales, *T. murrayi* Günther has the area between the anus and bases of the ventral fins scaleless, and *T. helolepis* Gilbert has a shallower body and head, a smaller orbit, and a large postorbital area.
The specimen from Stn F149 contained remains of small crustaceans, probably amphipods, as well as other unidentifiable material.

Subfamily MACROURINAE

Two dorsal fins, the first with two spiny rays; second separated from first by an interspace, rays shorter than on anal. Mouth rather small, subterminal to inferior; head usually compressed. Teeth conical to canine-like, in a single series or a sometimes broad band. Gill openings restricted, branchiostegal membranes united from about below posterior margin of orbit, a membraneous fold attached to first gill-arch and restricting first gill-slit. Gillrakers usually tubercular, usually less than 20 on outer side of first gill-arch. Six to seven branchiostegal rays. Scales usually with spinules on the exposed area (absent in some forms). Luminous organ present or absent.

Macrourus Bloch

Head relatively large; ridges prominent, infraorbital extending to preopercular angle. Body scales large, with a conspicuous median keel. Scales on head ridges modified, scute-like, conspicuous. Suboperculum not emarginate, interoperculum hidden behind preoperculum. Teeth in irregular double row in lower jaw, and in a band in upper. Second ray of first dorsal fin serrate. Interdorsal space short, second dorsal fin arising in front of anus. Ventral fins with eight rays. Seven branchiostegal rays, the uppermost not exposed. Anus adjacent to anal fin. No luminous organ. Gill-rakers reduced, less than 15 on lower limb of second arch. Eye comparatively large; snout produced, with an enlarged scale (sclerite) at tip and each anterolateral angle. Underside of snout scaled or scaleless. Snout prominent, mouth inferior. Pyloric caeca 20 or fewer.

TYPE-SPECIES: *Macrourus berglax* Lacépède.

Macrourus carinatus Günther

(Figs 8–10)

Macrurus (Macrurus) carinatus Günther, 1878: 28; 1887: 137, pl. 33 (A).
Coryphaenoides carinatus Barnard, 1925: 336. Smith, 1961: 134.

GENERAL CHARACTERS: Head moderately large. Dorsal contour rising only slightly to first dorsal fin, then tapering gradually. Lateral line directed upward from posterior end of postorbital ridge, slowly descending behind first dorsal fin. Luminous organ absent. Eighteen pyloric caeca about 25 mm in length. Nine gill-rakers on inner side of first gill-arch, eight on outer side, all short and wart-like.

HEAD CHARACTERS: Ridges of head well developed. Frontal ridge rather broad, extending almost to midline of orbit. Occipital ridges distinct, extending to preopercular angle. Nasal ridge scarcely defined; infraorbital distinct, extending to preopercular angle. Snout subconical; orbit subcircular. Mouth inferior, ventral, cleft extending almost to midline of orbit. Teeth small, in a band in upper jaw, in an irregular double row in lower. Barbel slender and tapering.

SCALES: Body scales with a strong, conspicuous, median, spinulous ridge, flanked on either side by one to three smaller, divergent series of spinules. Scales large, subovoid, longer than wide. Six scales, rarely seven, between base of first dorsal fin and lateral line, a similar number between second dorsal fin and lateral line. Scales on ridges of head and upper orbital margin scute-like, median keel conspicuous. Ill-defined sclerites at tip of snout and anterolateral angles. Nasal fossa and adjacent area naked. Underside of head and jaw sparsely scaled from behind anterior orbital margin, underside of snout naked.

FINS: Second spine of first dorsal serrate. Outer pectoral ray slightly produced. Outer ventral ray elongate. Ray counts: D_1 (10)–11; P (17)–18–(19); V 8–(9); D_2 100–130±; A 105–138±.

COLOUR (ex alcohol): Light brown, with blackish fins.

SUMMARY OF MEASUREMENTS (4 specimens):

	Mean	Min.	Max.
Total length (mm)		250±	635±
Standard length (mm)		88	215
Depth of body at anterior end D_1	46.8	43	54
Depth at anus	40.0	36	46
Length of head	66.0	63	67
Depth of head	40.8	38	47
Width of head	36.8	35	40
Snout to nostril	14.8	11	16
Snout to orbit	20.8	19	22
Orbital diameter	24.5	21	28
Postorbital length of head	26.8	19	27
Interorbital width	11.3	11	12
Length of barbel	9.0	6	11
Snout to D_1	75.5	71	81
Base of D_1	16.0	12	18
Length of D_1 rays	38.3	34	41
Interdorsal space	14.0	10	17
Snout to pectoral	67.5	64	71
Length of pectoral rays	34.3	31	38
Snout to ventral	68.5	66	70
Length of ventral rays	28.8	24	36
Snout to anal	104.5	101	113

MATERIAL EXAMINED:
NZOI Stns E399(1), E414(1♂), E426(1), F752(1).

OTHER RECORDS:
Nil.

DISTRIBUTION: Upper slopes of Bounty Trough. Depth range 999–1233 m.

PARASITES: Two species of parasitic copepods – *Calvella* sp. and *Chondracanthus* sp. – were found on the specimen from Stn E414.

REMARKS: *M. carinatus* Günther has previously been reported from off Prince Edward Island (southern Indian Ocean) at 549 m, and off South Africa in deep water. The character of the scales—with a conspicuous median ridge—easily distinguishes it from the other New Zealand macrourids. The scalation below the infraorbital ridge appears rather variable. Barnard (1925) states that the underside of the head and the lower jaw are scaled; Günther (1887) does not mention this feature, though his figure suggests scattered scales on the lower jaw and a continuous series immediately below the infraorbital ridge. *M. berglax* Lacépède has a few scattered scales below the infraorbital ridge, a shorter head, and more anteriorly placed fins. *M. whitsoni* Regan and *M. holotrachys* Günther are more closely related, the former differing in having only one spinous ridge on the body scales, seven scales between the first dorsal fin and lateral line, and a larger interorbital space, and the latter in having a slightly smaller head and shorter interdorsal space.

Cetonurus Günther

Body robust and high, strongly compressed, rapidly constricted behind origin of anal fin. Head soft, massive, broadened anteriorly, with subvertical sides bluntly angulated at the infraorbital ridge, sensory canals and crests well developed. Snout short and high, without rostral tubercles. Mouth small, oblique, upper jaw equal to or just less than one-third head length. Teeth small and conical, in bands in both jaws. Gill openings not extending to below posterior orbital margin; gill-rakers tubercular, few. First gill-slit restricted, less than half orbital diameter. Seven branchiostegal rays. Scales ovoid, wider than long, imbricate, with suberect spinules in irregular order. Enlarged scales with stronger spinules flanking base of second dorsal fin. Head scales not specialised. Lateral line represented by short, widely spaced grooves. Anus in a naked area preceding anal fin. Luminous organ short, visible as a naked, blackish area immediately before anus, produced into a whitish, triangular area anteriorly but not extending to base of ventral fins. Second spine of first dorsal fin serrate.

TYPE-SPECIES: *Coryphaenoides (Cetonurus) crassiceps* Günther.

Cetonurus crassiceps Günther

Coryphaenoides crassiceps Günther, 1878: 25.
Macrurus (Cetonurus) crassiceps Günther, 1887: 143, pl. 37.
Cetonurus crassiceps Whitley, 1968: 37.

GENERAL CHARACTERS: Head large and deep. Dorsal contour slowly rising from snout to base of first dorsal fin, rapidly constricted from origin of anal fin.

HEAD CHARACTERS: Ridges of head poorly indicated. Frontal ridge broad and indistinct; nasal ridge similar.

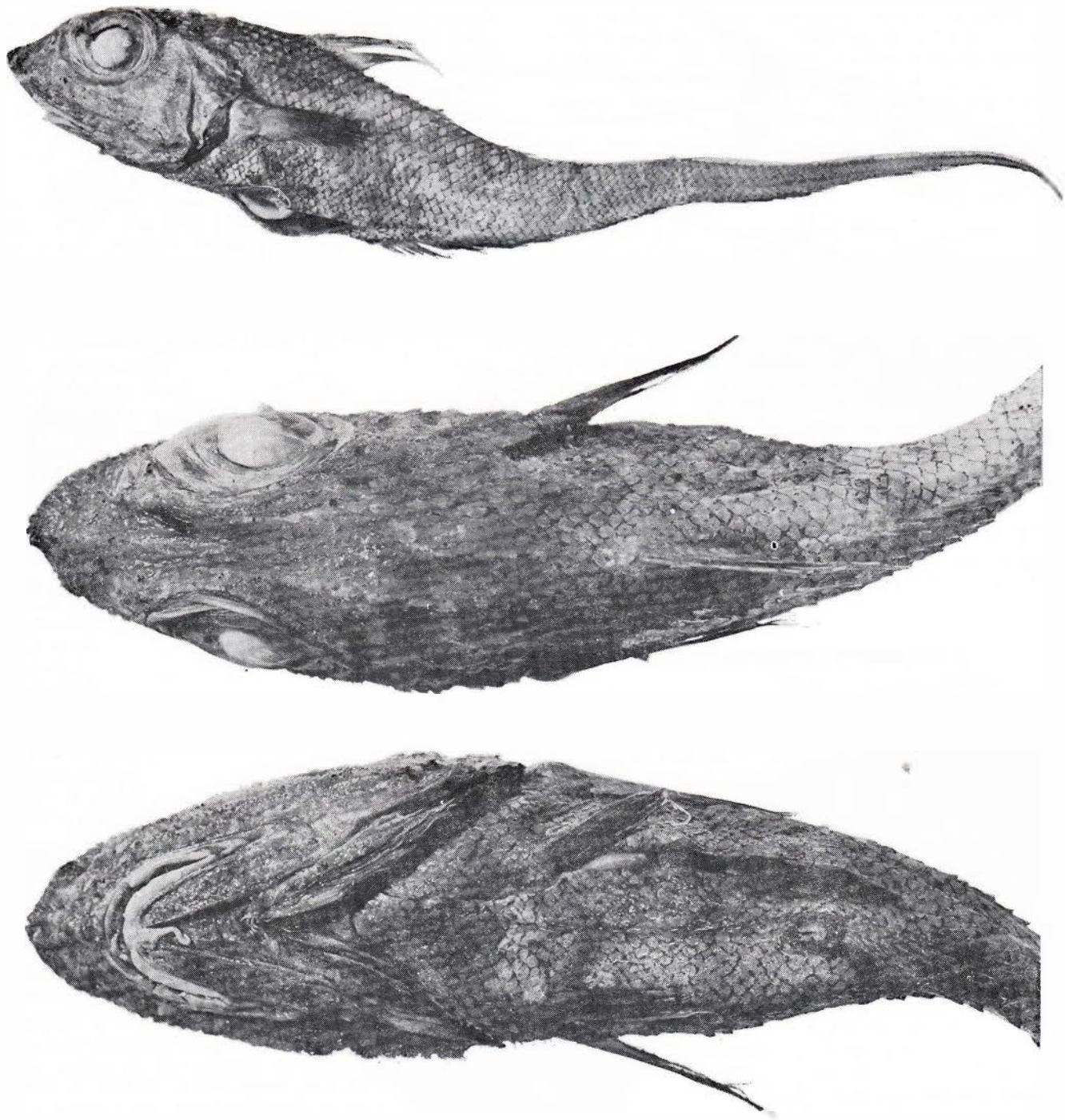

Fig. 8. *Macrourus carinatus* (♂, Stn E414; SL 105 mm).

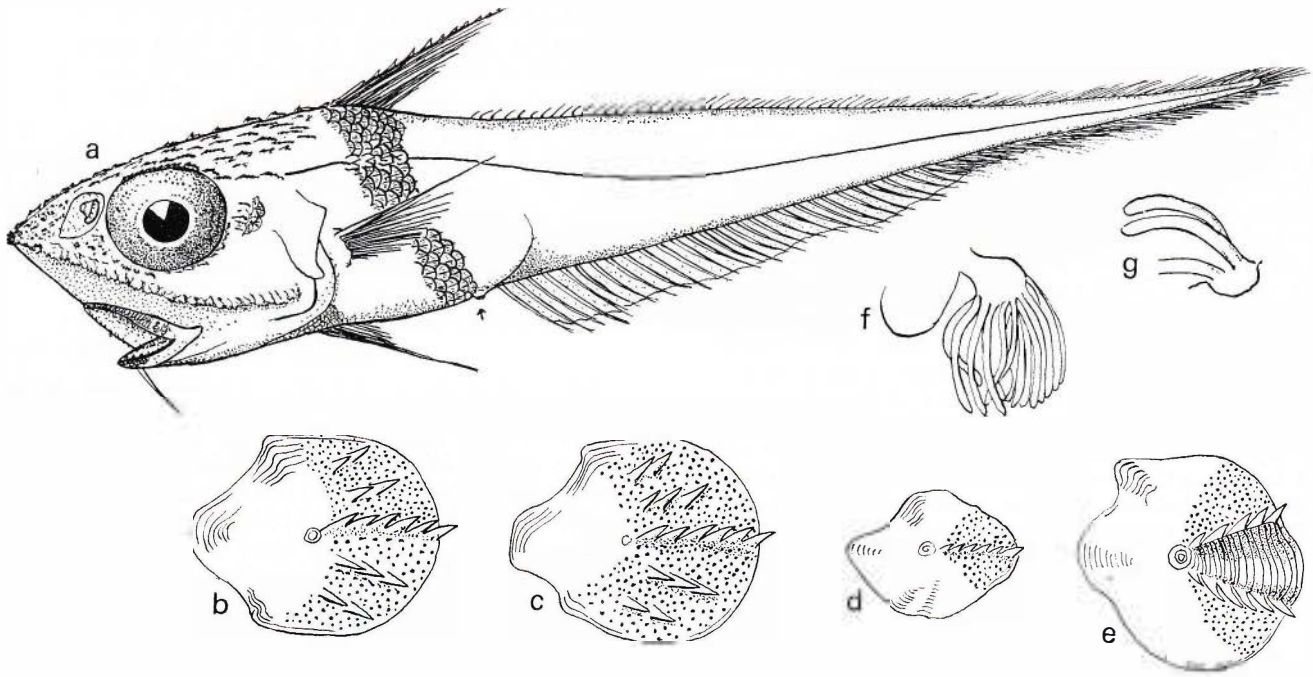

Fig. 9. *Macrourus carinatus* (♂, Stn E414; SL 105 mm): a, profile (anus arrowed); b–e, scales (b, above LL; c, below LL; d, gular; e, LL); f, pyloric caeca; g, testes. Scales (approx.)–a, f, g, x0.6; b–e x2.

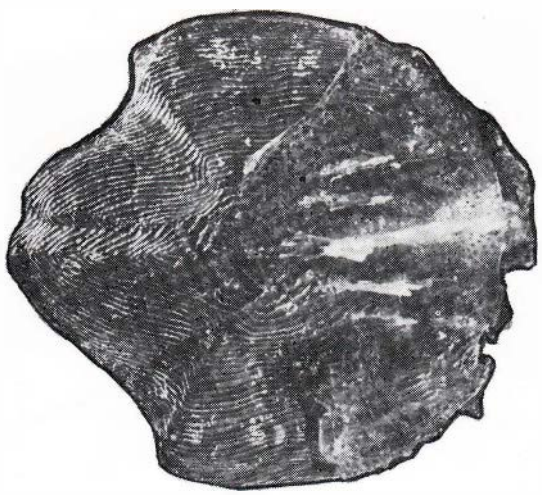

Fig. 10. *Macrourus carinatus* (Stn E414; SL 105 mm): body scale (enlarged).

Occipital ridges convergent posteriorly, infraorbital straight anterior to anterolateral angle, then directed posteriorly. Interorbital width much greater than orbital diameter. Area between orbit and infraorbital ridge wide, upper jaw extending to beyond anterior orbital margin. Snout short, obtuse in dorsal and lateral aspects, with prominent, obtuse anterolateral angles. Orbit smaller than snout, circular; postorbital area large.

SCALES: Scales transverse-ovoid with suberect spinules in no particular arrangement. Scales bordering second dorsal fin enlarged, with larger spinules. About 12 scales between base of first dorsal fin and lateral line.

FINS: Second spine of first dorsal obscurely serrate, base of fin about equal to orbital diameter, interdorsal space longer. Pectorals inserted posterior to origin of first dorsal; ventrals inserted anterior to first dorsal, rays almost twice as long as orbit. Ray counts: D_1 10; P 16; V 10.

COLOUR: Brownish, abdominal area black.

SUMMARY OF MEASUREMENTS (from Günther 1887, pl. 37):

Total length (mm)	325±
Standard length (mm)	100
Depth of body at anterior end D_1	47
Depth at anus	55
Length of head	75
Depth of head	59
Width of head	39
Snout to nostril	15
Snout to orbit	20
Orbital diameter	16
Length of postorbital area	39
Interorbital width	38
Length of barbel	–
Snout to D_1	75
Base of D_1	15
Length of D_1	45
Interdorsal space	22
Snout to pectoral	83
Length of pectoral	41
Snout to ventral	82
Length of ventral	11
Snout to anal	105

MATERIAL EXAMINED:

Nil.

OTHER RECORDS:

Challenger Stn 170 (1).

DISTRIBUTION: Known only from off the Kermadec Islands at 951 m.

REMARKS: *C. crassiceps* Günther is unlikely to be confused with any other local macrourid, the salient features being noted in the generic description. *C. robustus* Gilbert & Hubbs, a Philippine and Japanese species, has a larger orbit, smaller mouth, shorter ventral fins, and a more distinctly serrated spine on the first dorsal fin. *C. globiceps* Vaillant, an Atlantic species, has enlarged scales bordering the base of the anal fin.

Coryphaenoides Gunnerus

Head and body compressed, tail tapering gradually. Ridges of head indistinct or at least not strongly developed except for infraorbital, which does not extend to preopercular angle. Interoperculum thin, sometimes exposed behind preoperculum. Projection of snoiu variable. Teeth conical to canine-like, in bands, biseralt or uniserial. Gill-rakers on outer side of first gill-arch degenerative but always present. Scales of head not greatly modified except sometimes on orbital rim and infraorbital ridge. Body scales usually with spinules on keels. Anus immediately before anal fin. Luminous organ absent. Branchiostegal rays six. Second spine of first dorsal fin serrate, interdorsal space present. Intestine with four or six bends; pyloric caeca long or short, if short, directed anteriorly.

TYPE-SPECIES: *Coryphaenoides rupestris* Gunnerus

REMARKS: Following Gilbert & Hubbs (1916: 162) and Okamura (1970a: 115–16), *Nematonurus* is distinguished at the subgeneric level only. Parr (1946) has separated *Nematonurus*, *Chalinura*, and *Coryphaenoides* at the generic level, but Gilbert & Hubbs (1916) and Okamura (1970a) have shown that variation within *Coryphaenoides* is sufficient to include *Nematonurus*. The inclusion of *Nematonurus* in *Coryphaenoides* suggests that *Chalinura* cannot be maintained as a distinct genus, although the dentition appears sufficiently distinct for subgeneric separation.

Subgenus **Nematonurus** Günther

Differing from *Coryphaenoides* sens. str. in having the teeth uniserial or biserial in both jaws, not in bands; pyloric caeca directed posteriorly; and intestine with a canal between third and fourth bends, situated on right side of stomach.

Coryphaenoides (Nematonurus) armatus (Hector)

(Figs 11–13)

Macrurus armatus Hector, 1875a: 249, pl. 11 (78a); 1875b: 81.
Macrurus (Nematonurus) armatus Günther, 1887: 150, pl. 40 (A).
Nematonurus armatus Parr, 1946: 54c. Nybelin, 1957: 260, pl. 4 (5). Whitley, 1968: 39.

GENERAL CHARACTERS: Head relatively small. Dorsal contour rising to base of first dorsal fin, then gradually tapering. Lateral line only slightly arched proximally. Luminous organ absent. Ten simple, relatively stout pyloric caeca, directed posteriorly, about 30 mm in length.

HEAD CHARACTERS: Snout obtuse, subconical; orbit small, circular. Ridges of head moderately distinct. Frontal ridge extending to beyond posterior margin of orbit, occipital ridges extending slightly further, postorbital ridge elongate. Nasal ridge slightly sinuous. Infraorbital ridge extending to beyond distal orbital margin, lateral portion almost straight, arching upward below nasal fossa; rather diffuse sclerites at tip of snout and anterolateral angle. Mouth large and lateral, slightly inferior, the cleft extending beyond posterior orbital margin. Teeth biserial in both jaws, the outer series largest. Twelve tubercular gill-rakers on inner side of first gill-arch, and eight more slender rakers on outer side.

SCALES: Body scales relatively small, subcircular, with fine spinules in subparallel or weakly divergent series, 11–12 series on flank scales, fewer elsewhere. Seven or eight scales between dorsal fins and lateral line. Head

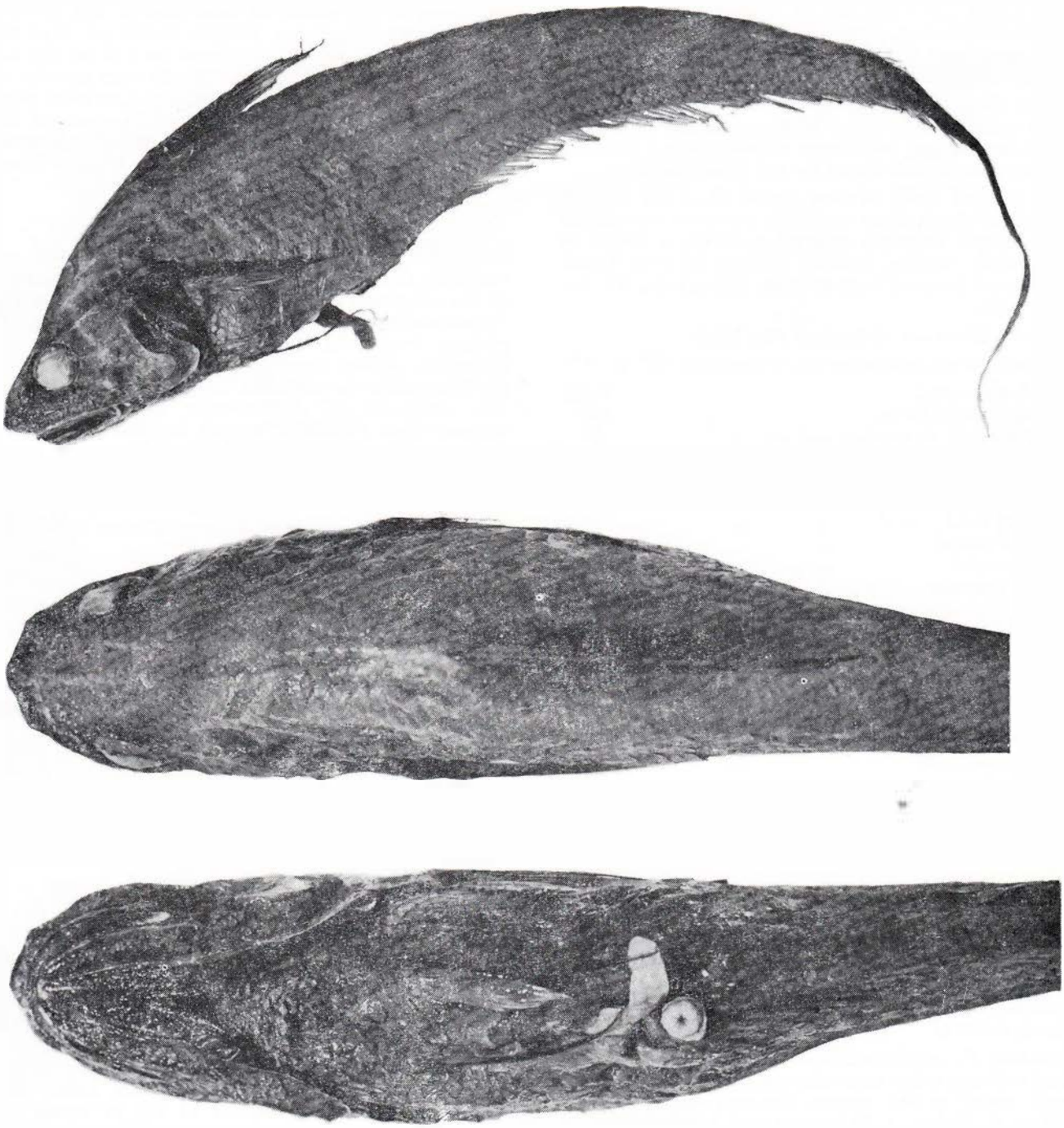

Fig. 11. *Coryphaenoides (Nematonurus) armatus* (Stn E437; SL 87 mm).

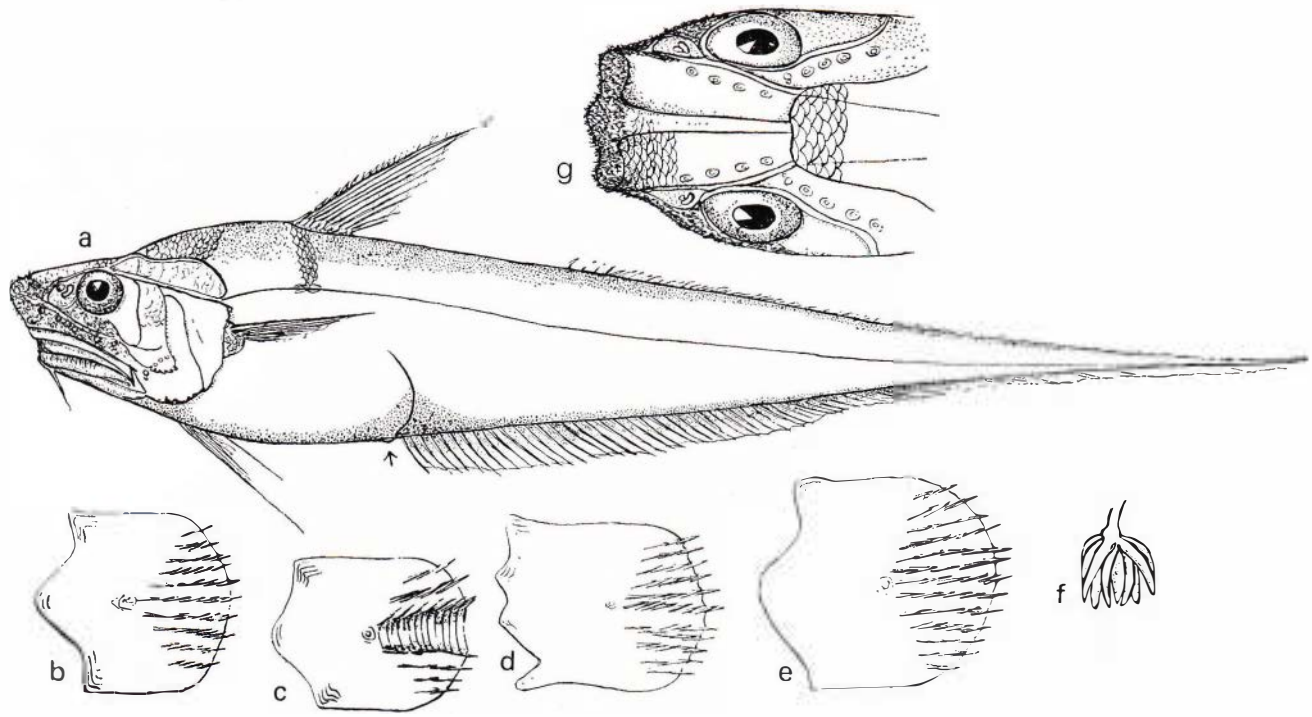

Fig. 12. *Coryphaenoides (Nematonurus) armatus* (Stn E437; SL 87 mm): a, profile (anus arrowed); b–e, scales (b, above LL; c, LL; d, gular; e, below LL); f, pyloric caeca; g, head, dorsal aspect. Scales (approx.)–a, f, x0.6; b–e, x3; g, x0.9.

scales smaller, of varying shape and size, spinules often directed upwards. Nasal fossa naked. Scales present on most of underside of head and lower jaw.

FINS: Second spine of first dorsal serrate. Ventrals inserted anterior to pectorals from snout (cf. summary of measurements), outer ray filamentous, produced, extending a little beyond anus. Ray counts: D_1 10; P 19–20; V 11 ; D_2 125±; A 135±.

COLOUR: Light yellow brown, darker over abdominal region; mouth and opercular plate with black margins.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	325±
Standard length (mm)	87
Depth of body at anterior end D_1	64
Depth at anus	37
Length of head	62
Depth of head	29
Width of head	35
Snout to nostril	13
Snout to orbit	20
Orbital diameter	13
Length of postorbital area	19
Interorbital width	16
Length of barbel	15
Snout to D_1	80
Base of D_1	18
Length of D_1	56
Interdorsal space	63
Snout to pectoral	61
Length of pectoral	41
Snout to ventral	63
Length of ventral	49
Snout to anal	105

MATERIAL EXAMINED:
NZOI Stn E437 (1).

OTHER RECORDS:
Off Cape Farewell at 732 m.

DISTRIBUTION: Widely distributed in the Pacific, Indian, and Atlantic Oceans, at bathyal and abyssal depths.

REMARKS: This appears to be one of the few widely ranging macrourids, being recorded from the three major oceans, mainly in abyssal depths. *C. pectoralis* (Gilbert) and *C. longifilis* Günther have 10–13 scales between the base of the first dorsal fin and the lateral line, with weakly developed spinules only. No other species appear at all closely related.

Subgenus **Chalinura** Goode & Bean

Differing from *Coryphaenoides* and *Nematonurus* in having the teeth uniserial and large in the lower jaw and in a villiform band in the upper jaw, with the outer series enlarged and canine-like.

Fig. 13. *Coryphaenoides (Nematonurus) armatus* (Stn E437; SL 87 mm): body scale (enlarged).

Coryphaenoides (Chalinura) murrayi Günther
(Figs 14, 15, 18)

Coryphaenoides murrayi Günther, 1878: 26.
Macrurus (Chalinurus) murrayi Günther, 1887: 144, pl. 34(A).
Chalinura murrayi Goode & Bean, 1895: 412. Phillipps, 1927a: 22.
Coryphaenoides murrayi Gilbert & Hubbs, 1916: 143.
Fuyangia murrayi Whitley, 1968: 38.

GENERAL CHARACTERS: Head of moderate size. Dorsal contour rising to just anterior of base of first dorsal fin, body then gradually tapering. Lateral line weakly arched proximally, descending behind first dorsal fin. Eight tubercular gill-rakers on outer side of first gill-arch, 14 larger, 'hairy' rakers on inner side. Twelve slender elongate pyloric caeca up to 32 mm in length.

HEAD CHARACTERS: Snout short, blunt, with obtuse terminal and anterolateral angles; orbit more-or-less circular, small. Ridges of head weakly developed. Frontal ridge subcarinate, narrow, extending to about anterior orbital margin; nasal ridge subcarinate, narrow, slightly sinuous, extending anteriorly to anterolateral angle, posteriorly continuous with supraorbital and

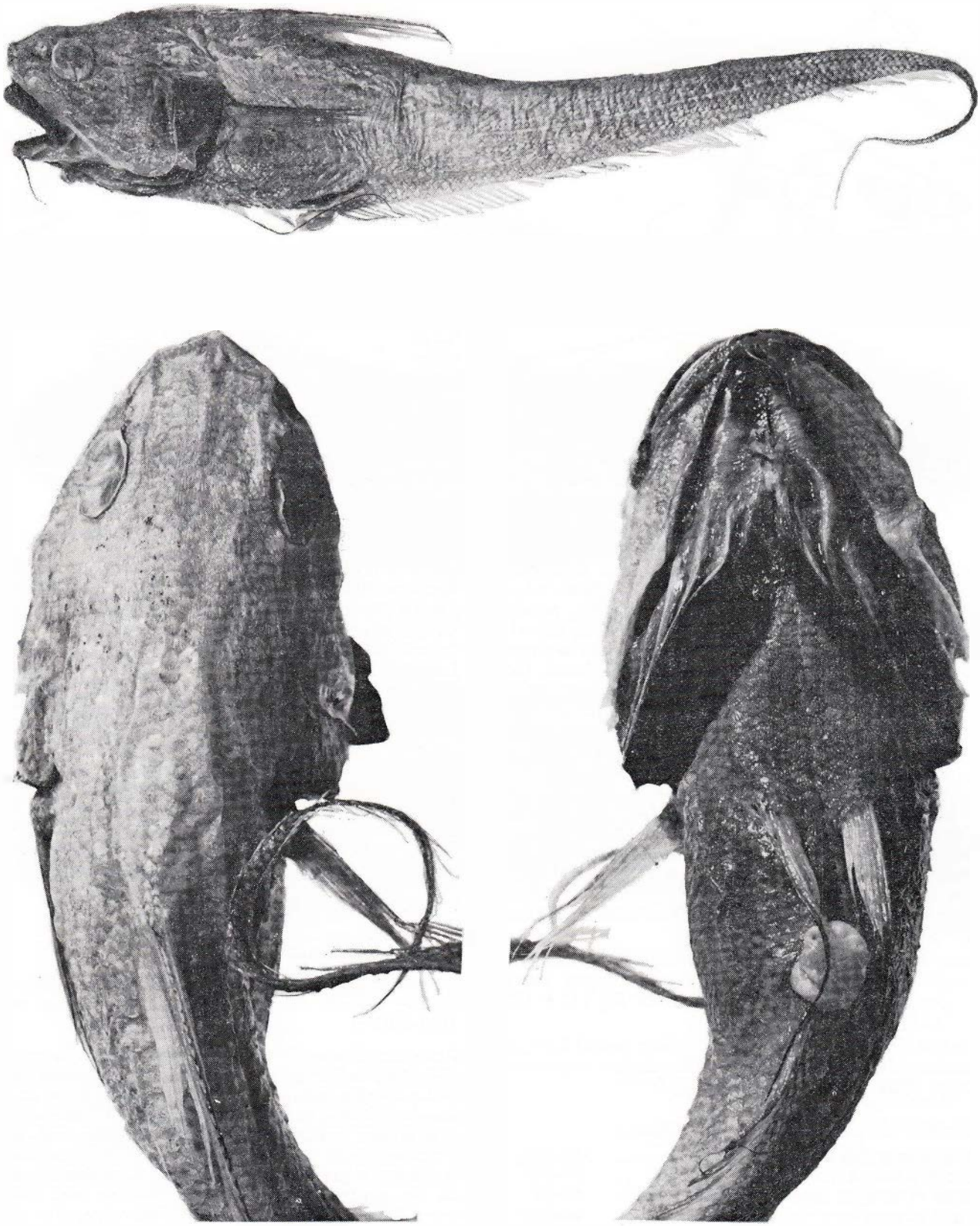

Fig. 14. *Coryphaenoides (Chalinura) murrayi* (♂, Stn F126; SL 97 mm).

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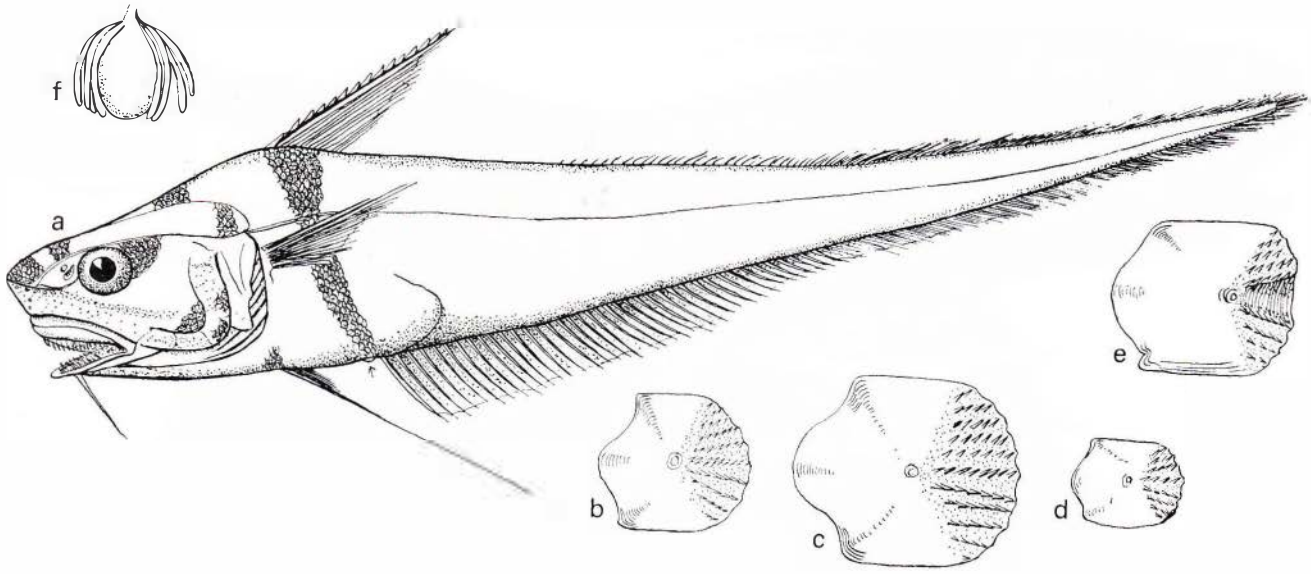


Fig. 15. *Coryphaenoides (Chalinura) murrayi* (♂, Stn F126; SL 97 mm): a, profile (anus arrowed); b–e, scales (b, above LL; c, below LL; d, gular; e, LL); f, pyloric caeca. Scales (approx.)–a, f, x0.5; b–e, x3.

occipital. Occipital ridges convergent then divergent, postorbital ridge almost horizontal. Infraorbital ridge extending to beyond posterior margin of orbit, poorly defined below nasal fossa. Mouth subterminal, lateral, the cleft extending from just behind tip of snout to about midline of orbit. Teeth of upper jaw in a band, the single outer series much larger, canine-like inner series villiform; in lower jaw teeth uniserial, almost as large as in upper jaw. Barbel elongate.

SCALES: Body scales moderate to small, variable in outline depending on position on body, with 7–12 subparallel or divergent series of spines. Six scales between each dorsal fin and lateral line. Head scales with divergent, spinulose series. Scales of frontal, nasal, occipital, and postorbital ridges weakly modified; on proximal part of infraorbital ridge and anterolateral area of snout with spinules directed upwards, in three series. Nasal fossa naked. Underside of head and lower jaw partly to completely scaled.

FINS: Second ray of first dorsal serrate on anterior margin. Ventrals slightly posterior to first dorsal, outer ray produced, filamentous. Ray counts: D_1 11; P 19; V 11; D_2 90±; A 110±.

COLOUR (ex alcohol): Light brownish; branchiostegal membrane, abdominal region, and fins darker, sometimes almost blackish.

SUMMARY OF MEASUREMENTS (2 specimens):

Total length (mm)	340–365±
Standard length (mm)	97–105
Depth of body at anterior end D_1	60–63
Depth at anus	49–54
Length of head	67–70
Depth of head	42
Width of head	36–39
Snout to nostril	14–16
Snout to orbit	16–20
Orbital diameter	13–14
Length of postorbital area	36–38
Interorbital width	17–21
Length of barbel	16–21
Snout to D_1	80–84
Base of D_1	13–18
Length of D_1	59–62
Interdorsal space	57–58
Snout to pectoral	70–72
Length of pectoral	39–67
Snout to ventral	73–75
Length of ventral	58–69
Snout to anal	105–106

MATERIAL EXAMINED:
NZOI Stns F126(1♂), F892(1).

OTHER RECORDS:
(?) Challenger Stn 168 (4).

DISTRIBUTION: Bay of Plenty, off Cape Turnagain, and on the edge of the Campbell Plateau. Depth range 1180–2012 m.

REMARKS: *C. murrayi* Günther differs from *C. liocephalus* (Günther) in having fewer ventral rays, a larger orbit, and a smaller interorbital width. It also differs in the armature of the scales. *C. acrolepis* (Bean) has one less ventral ray, a narrower interorbital width, and more prominent head ridges. *C. pectoralis* (Gilbert) is similar in general appearance, but has biserial, canine-like teeth on the upper jaw. *C. altipinnis* Günther and related forms have the teeth in a band in the upper jaw, more numerous outer gill-rakers, and a narrower interorbital space; *C. asper* Günther and its relatives differ similarly in the dentition and have a smaller, inferior

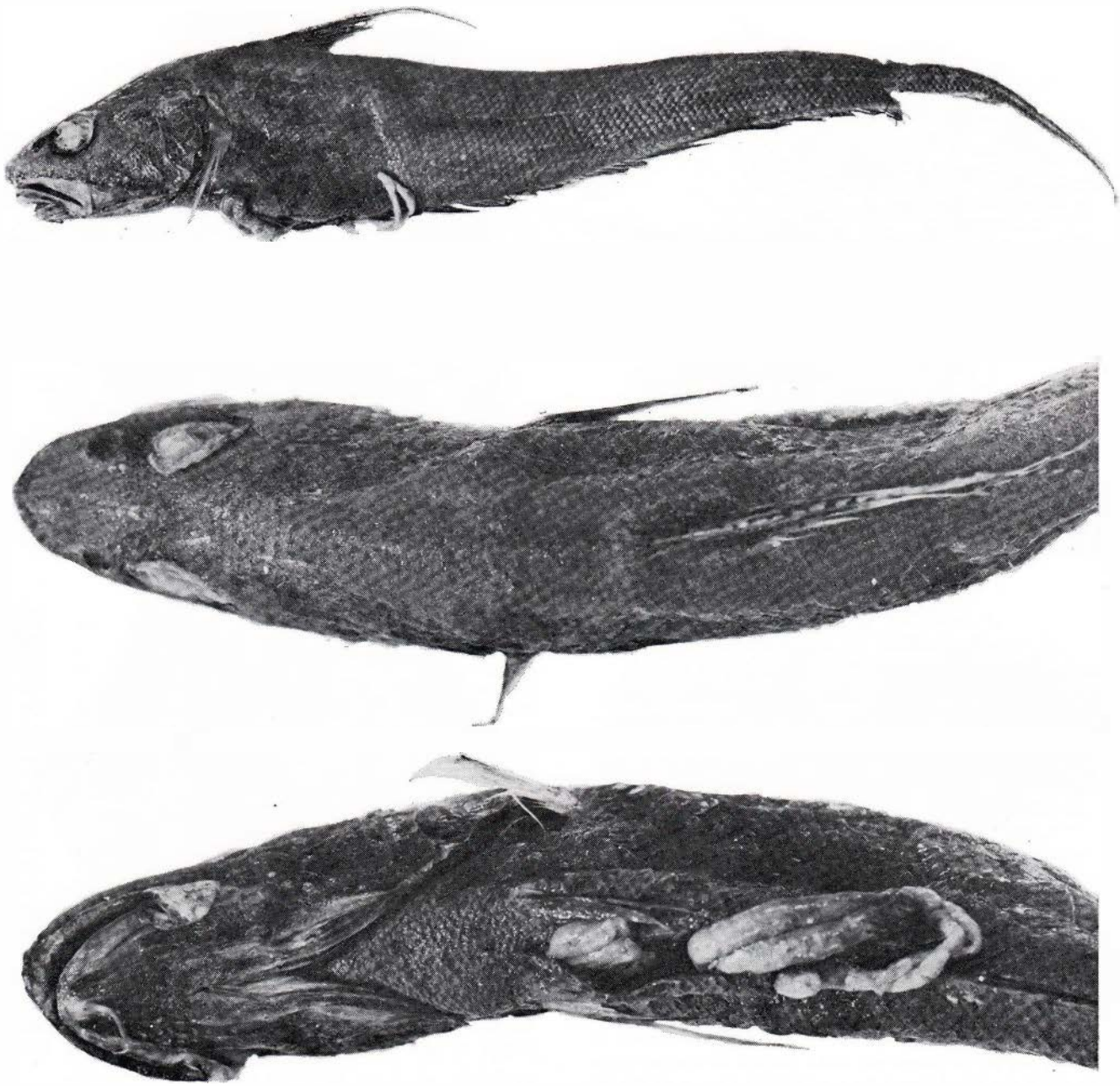


Fig. 16. *Coryphaenoides (Coryphaenoides) rudis* (Stn F767; SL 88 mm).

mouth. Günther (1887:146) remarks that four young specimens from *Challenger* Station 168 differ from the type in having a longer, pointed snout, and may represent another species. Marshall (1965: 319) notes that specimens from the North Atlantic referred to *C. murrayi* have been misidentified.

Subgenus **Coryphaenoides** Gunnerus

Differs from *Nematonurus* and *Chalinura* in having the teeth in bands in both jaws.

Coryphaenoides (Coryphaenoides) rudis Günther

(Figs 16–18)

Coryphaenoides rudis Günther, 1878: 24. Gilbert & Hubbs, 1916: 144. Whitley, 1968: 37.

Macrurus (Macrurus) rudis Günther, 1887: 131, pl. 27. Brauer, 1906: 246.

GENERAL CHARACTERS: Head of moderate length, tapering anteriorly. Dorsal contour gently rising to base of first dorsal fin, then gradually tapering; body compressed. Lateral line descending in broad curve behind head. Gill-rakers tubercular, denticulate, nine inner and

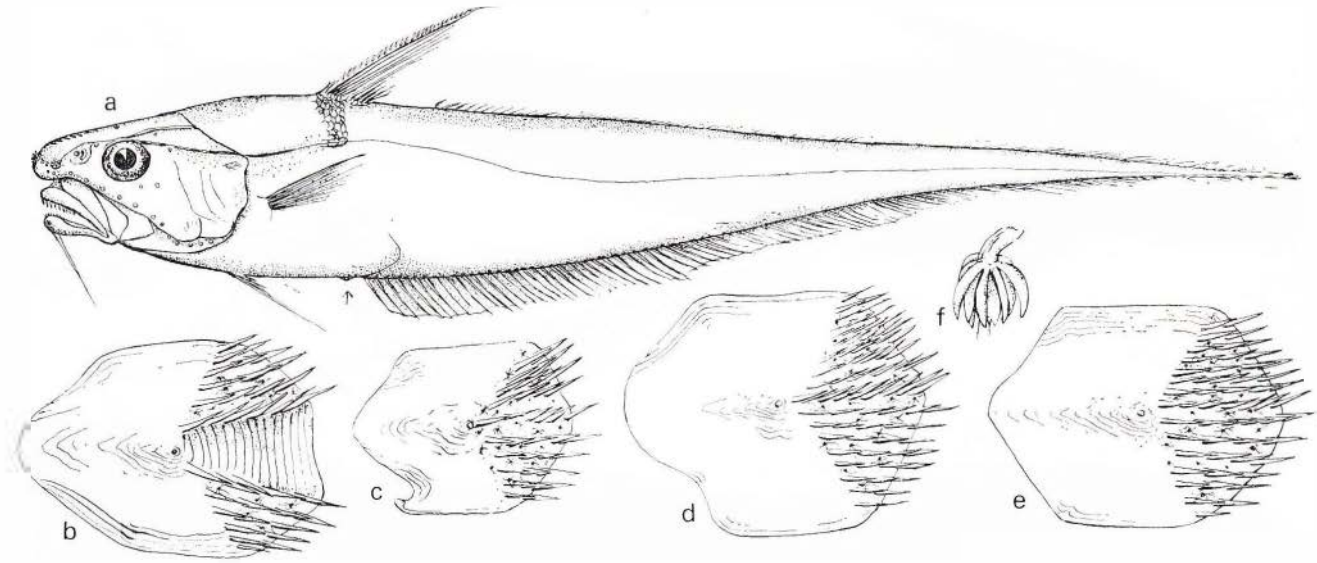


Fig. 17. *Coryphaenoides (Coryphaenoides) rudis* (Stn F767; SL 88 mm): a, profile (anus arrowed); b–e, scales (b, LL; c, gular; d, above LL; e, below LL); f, pyloric caeca. Scales (approx.)–a, f, x0.5; b–e, x3.

seven (smaller) outer on first gill-arch. Phyloric caeca 10, short, stout, directed anteriorly. Luminous organ absent.

HEAD CHARACTERS: Snout obtusely subconical in profile; orbit elliptical. Mucus pores distinct, especially below infraorbital ridge. Ridges of head weakly pronounced. Frontal ridge broad, extending to about posterior orbital margin; nasal ridge broad, sinuous anteriorly. Post-orbital ridges barely indicated; occipital ridges slightly stronger, extending from anterior orbital margin to end of frontal ridge, convergent posteriorly. Infraorbital ridge most pronounced, broad, extending almost to posterior margin of orbit, with diffuse sclerites at tip and anterolateral angles. Nasal fossa relatively inconspicuous. Mouth slightly subterminal, cleft extending to about midline of orbit. Teeth in bands in both jaws, the outer series enlarged, more so in upper jaw. Barbel longer than orbit.

SCALES: Body scales small, beset with subparallel rows of spinules; up to 17 series on flank scales. Seven or eight scales between first dorsal fin and lateral line, nine or ten between second dorsal fin and lateral line. Head scales only slightly modified. Nasal fossa naked; also a small, naked, anterolateral area near tip of snout. Lower side of infraorbital ridge and underside of lower jaw scaled except for tip of snout.

FINS: Second spine of first dorsal serrate. Ventral fins inserted anterior to first dorsal and pectorals. Anal fin arising immediately behind anus. Ray counts: D_1 12; P 19–20; V 9–10; D_2 113±; A 117±.

COLOUR (ex alcohol): Light brown, with dark margins to the orbits and opercula; anal fin entirely dark.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	345±
Standard length (mm)	88
Depth of body at D_1	53
Depth at anus	50
Length of head	65
Depth of head	36
Width of head	28
Snout to nostril	14
Snout to orbit	22
Orbital diameter	15
Postorbital length	28
Interorbital width	13
Length of barbel	22
Snout to D_1	88
Base of D_1	20
Length of D_1	65
Interdorsal space	20
Snout to pectoral	72
Length of pectoral	32
Snout to ventral	67
Length of ventral	36
Snout to anal	104

MATERIAL EXAMINED:
NZOI Stn F767 (1).

OTHER RECORDS:
Challenger Stn 171.

DISTRIBUTION: From off the Kermadec Islands to off Cape Palliser. Depth range 1097–1293 m.

REMARKS: This species is allied to *C. serrulatus* Günther and *C. nasutus* Günther. It is easily distinguished from the former by the lower head with less distinct ridges and sclerites, and by having more ventral rays. *C. nasutus* may appear more closely related, but has the snout and orbit subequal (not snout longer than orbit), a more prominent anterior sclerite on the snout, 5–6.5 scales between the base of the first dorsal fin and the lateral line, and the gill-rakers 10 on the inner side and 4–6 on the outer.

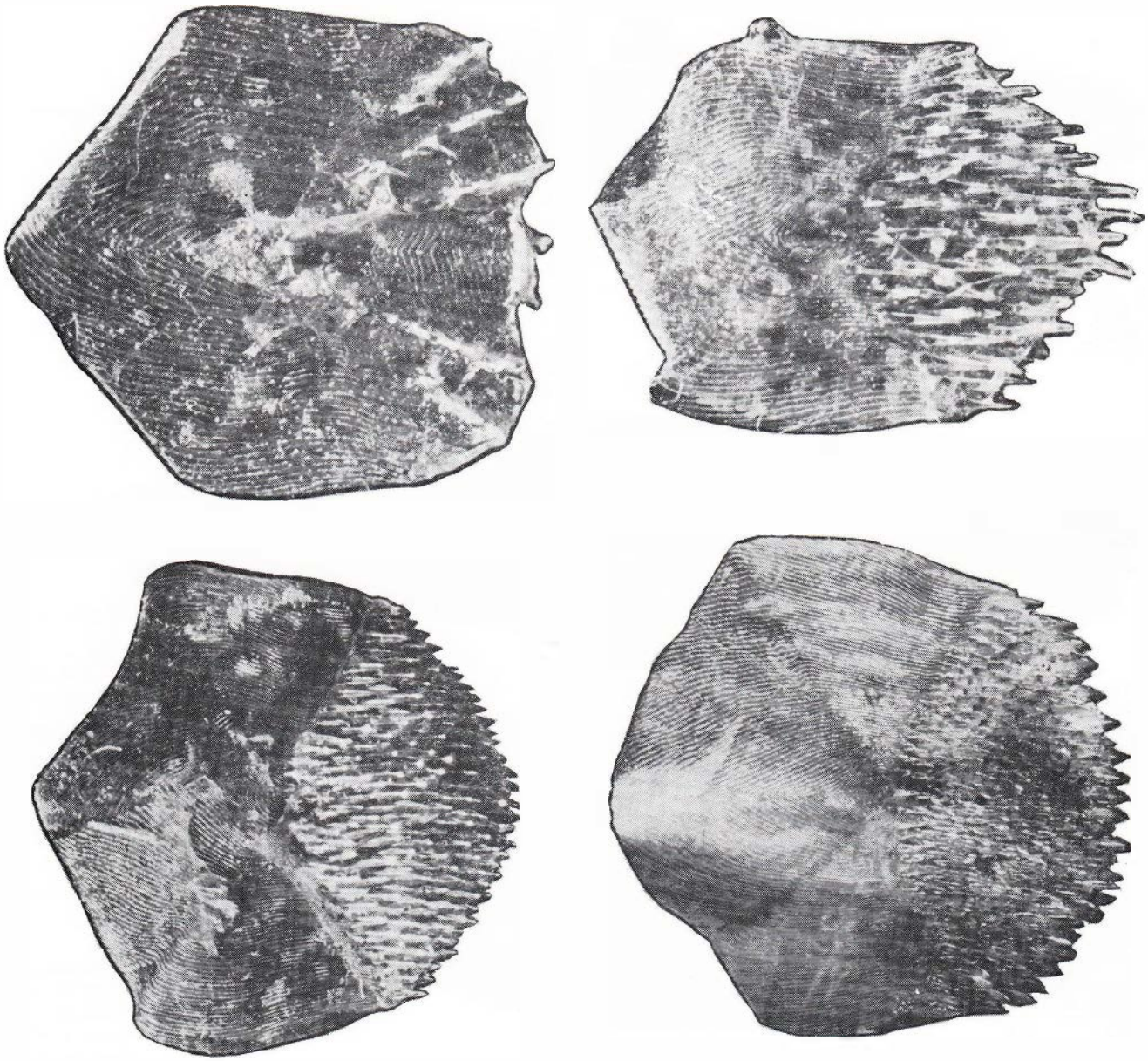


Fig. 18. Body scales of *Coryphaenoides* spp: upper left–*C. (Chalinura) murrayi* (Stn F126; SL 97 mm); lower left–*C. (Coryphaenoides) quadripennatus* (holotype, Stn F149; SL 89 mm); upper right–*C. (Coryphaenoides) rudis* (Stn F767; SL 88 mm); lower right–*C. (Coryphaenoides) serrulatus* (Stn E719; SL 124 mm). Variously enlarged.

Coryphaenoides (Coryphaenoides) serrulatus Günther
(Figs 18–20)

Coryphaenoides serrulatus Günther, 1878: 26. Whitley, 1968: 38.
Macrurus serrulatus Günther, 1887: 133, pl. 30 (A).
Macrourus serrulatus Phillipps, 1927a: 22.

GENERAL CHARACTERS: Head of moderate size. Body compressed, tapering posteriorly, dorsal contour slowly rising to base of first dorsal fin. Anus immediately before anal fin, no luminous organ. Lateral line broadly arched proximally. First gill-slit restricted by a fold of skin, with about nine tubercular, denticulate, anterior rakers and seven much smaller though similar rakers on first gill-arch. Pyloric caeca short, directed anteriorly.

HEAD CHARACTERS: Snout short; orbit circular and large. Ridges of head rather weak, except infraorbital. Frontal ridge subcarinate, nasal ridge broadly sinuous, postorbital barely indicated. Infraorbital ridge more-or-less straight, distinct to just past posterior orbital margin, with three prominent sclerites, one at tip and one at either anterolateral angle. Nasal fossa comparatively large. Mouth slightly inferior and lateral, cleft extending from below anterolateral sclerite to slightly behind midline of orbit. Both jaws with bands of teeth, the outer series enlarged.

SCALES: Body scales subovoid, longer than wide, of moderate size, with a close covering of lanceolate,

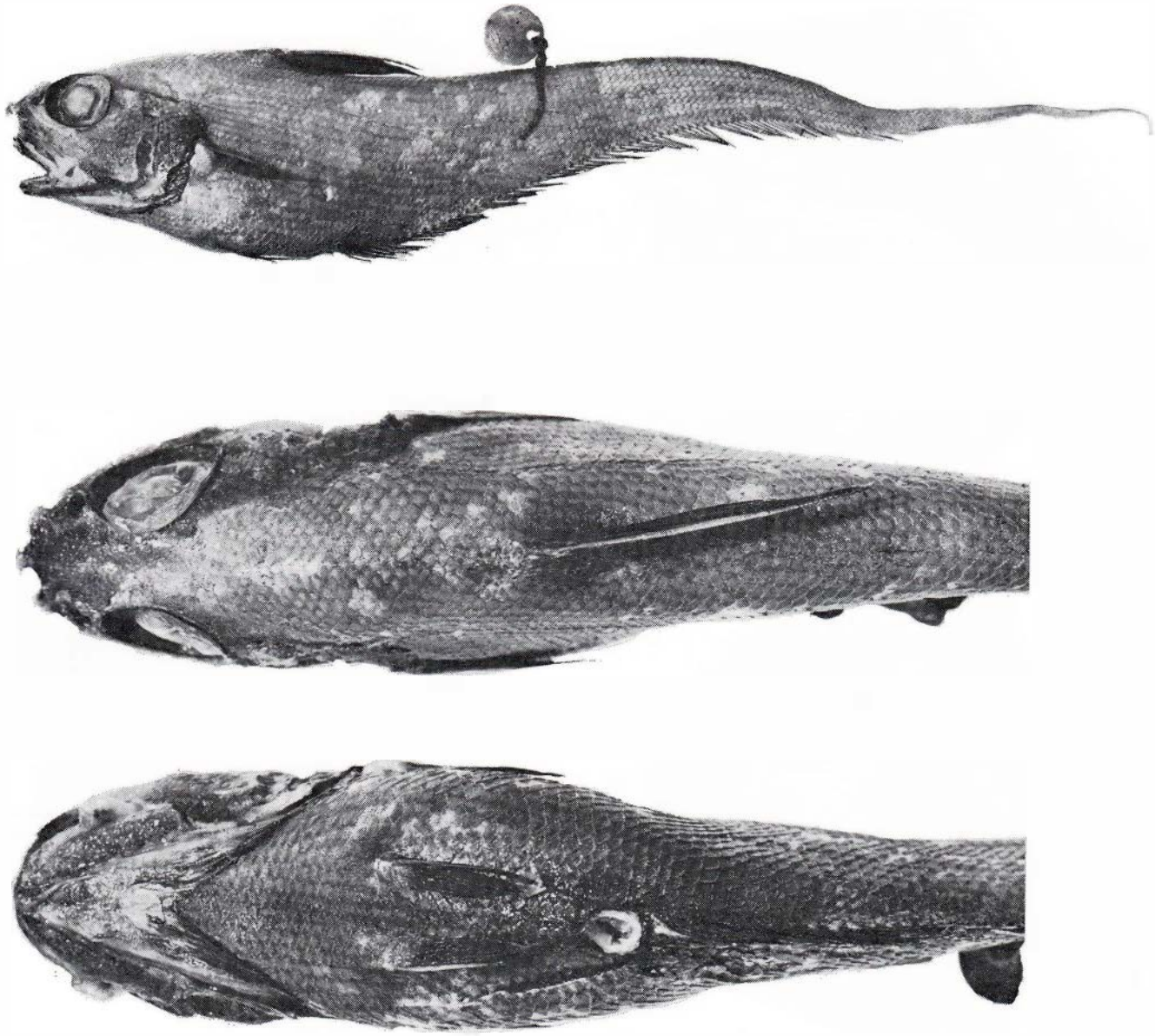


Fig. 19. *Coryphaenoides (Coryphaenoides) serrulatus* (Stn E719; SL 124 mm).

imbricate spinules in subparallel series. Flank scales occasionally with a scalloped margin. Five or six scales between base of first dorsal fin and lateral line, six or seven between second dorsal fin and lateral line. Head scales of opercular flap and posterior portion of preoperculum little modified. Scales from top of head anterior to orbit much smaller than body scales, in a single series on crest of frontal ridge. Each of the three sclerites appears composed of a single enlarged scale. Upper part of nasal fossa scaled, lower part naked. Lower rim of orbit with slightly enlarged scales, and similar though larger scales form a single series on the infraorbital ridge. Underside of head behind anterior orbital margin and lower jaw scaled.

FINS: Second spine of first dorsal serrate on anterior margin. Ventrals inserted almost directly under first dorsal. Ray counts: D_1 11; P 17–19; V 7; D_2 99–132±; A 138±.

COLOUR: Generally dark grey, turning light amber on preservation. Abdominal area bluish-black, fins (except second dorsal) and margins of branchiostegal membrane and orbit black, eye silvery.

SUMMARY OF MEASUREMENTS (11 specimens): *see* p. 39.

MATERIAL EXAMINED:

NZOI Stns C637 (1), E707 (2), E719 (2), E725 (2), E757 (3), E758 (2), E783 (1), E825 (1), F135 (1♀), F767 (4), G700 (1), G821 (2),

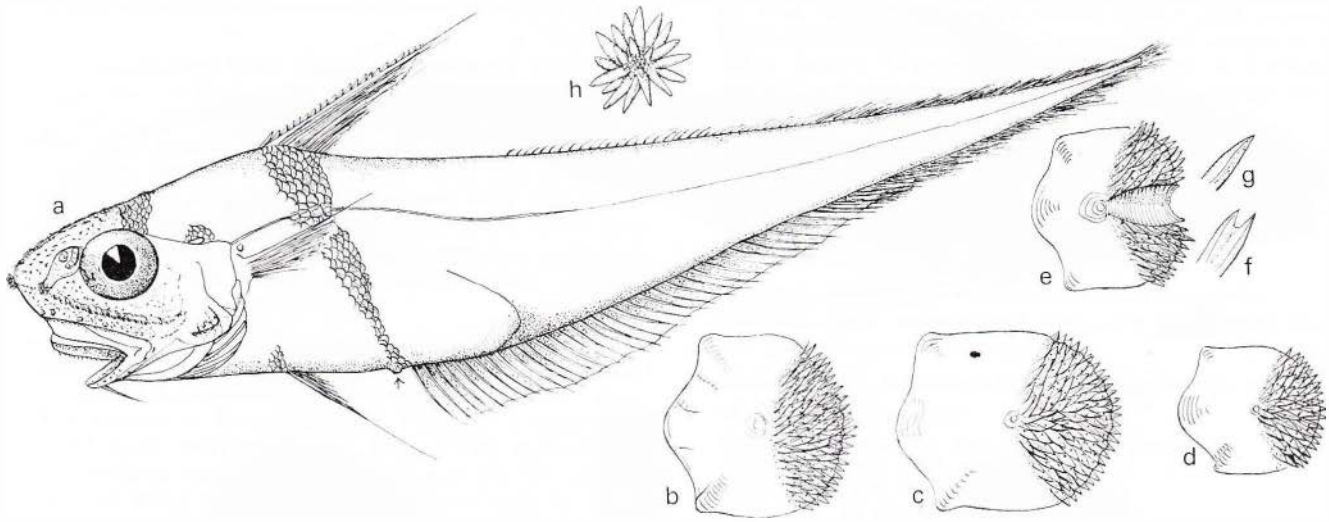


Fig. 20. *Coryphaenoides (Coryphaenoides) serrulatus* (♀, Stn F135; SL 108 mm): a, profile (anus arrowed); b–e, scales (b, above LL; c, below LL; d, gular; e, LL); f, g, tips of scale spinules; h, snout sclerite. Scales (approx.)–a, x0.5; b–e, x2, f–h, variously enlarged.

G830 (1); also Victoria University Zoology Department No. VUZ89 (1).

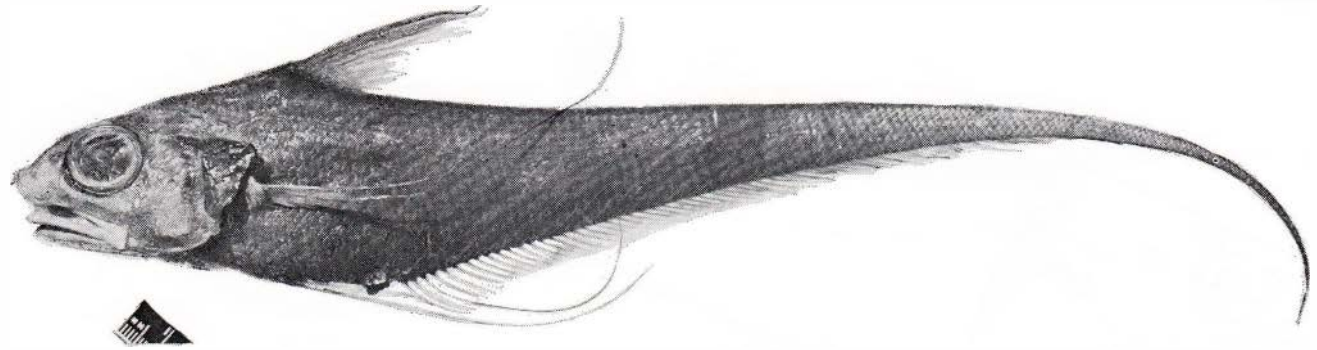
OTHER RECORDS:
Challenger Stn 169 (3).

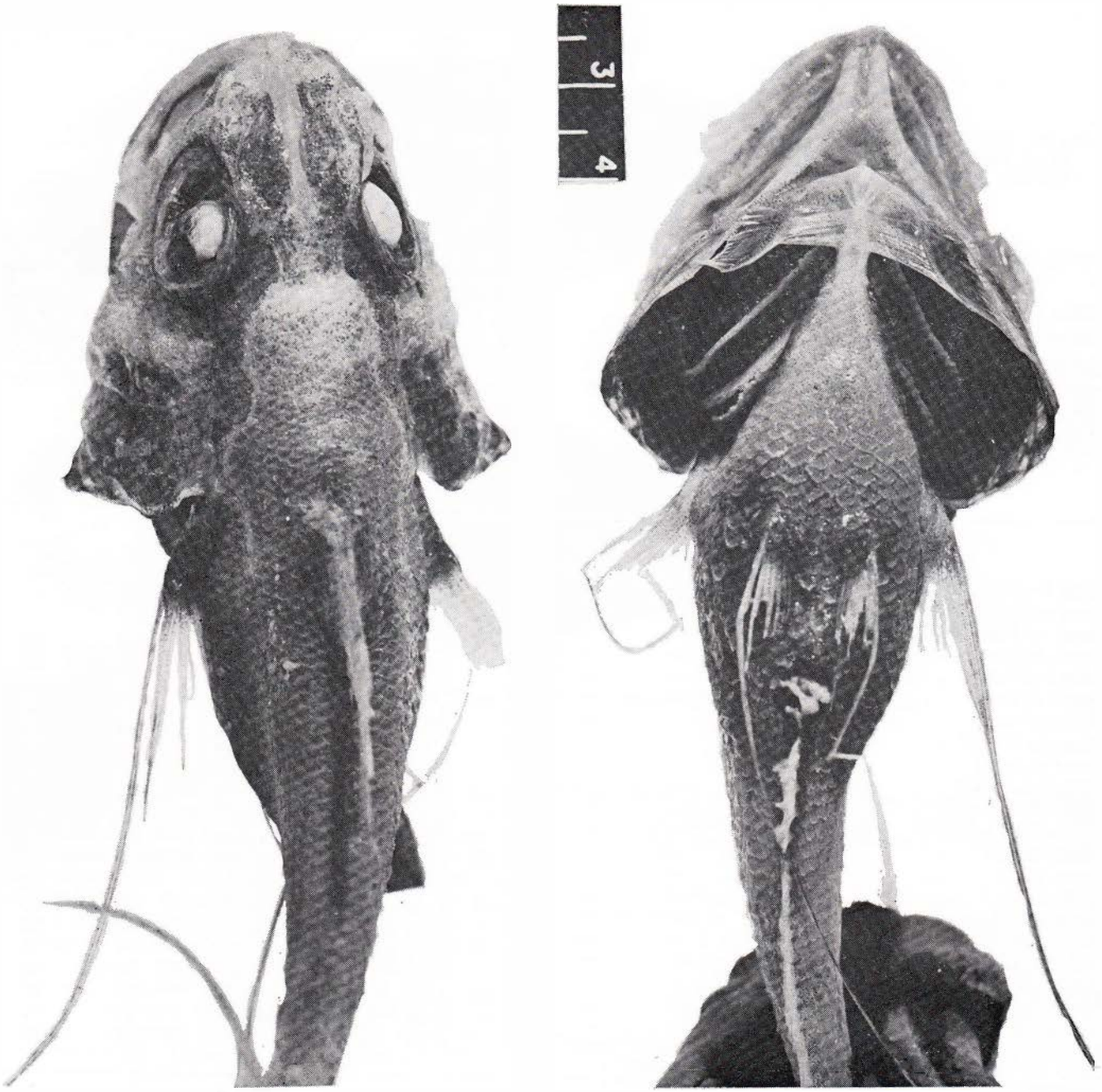
DISTRIBUTION: Lord Howe Rise, Challenger Plateau and west coast of the South Island, and from off East Cape to the Campbell Plateau. Depth range 750–2070 m.

REMARKS: *C. nasutus* Günther, a Japanese species, is related but differs in having a longer snout, more ventral rays, and longer spinules on the body scales. *C. rudis* Günther has a lower head with less distinct sclerites and ridges, and has more ventral rays. *C. asprellus* (Smith & Radcliffe), *C. semiscaber* Gilbert & Hubbs, and *C. tydemani* (Weber) lack the three prominent sclerites on the snout.

Coryphaenoides (*Coryphaenoides*) *serrulatus:* Summary of measurements (11 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					317±	440±
Standard length (mm)					97	143
Depth of body at D_1	57.45	1.12	3.70	6.44	52	62
Depth at anus	51.36	1.33	4.40	5.56	45	60
Length of head	60.64	1.12	3.72	6.14	55	68
Depth of head	40.09	0.71	2.35	5.87	35	44
Width of head	35.09	0.99	3.29	9.37	31	41
Snout to nostril	10.72	0.19	0.62	5.74	10	12
Snout to orbit	16.55	0.37	1.23	7.45	14	19
Orbital diameter	19.55	0.54	1.78	9.09	16	23
Postorbital length	24.55	0.65	2.27	9.25	20	28
Interorbital length	11.91	0.30	1.00	8.36	11	14
Barbel length	15.64	0.49	1.61	10.30	12	18
Snout to D_1	75.18	1.71	5.69	7.56	64	55
Base of D_1	19.09	0.49	1.62	8.49	17	22
Length of D_1	58.36	1.44	4.77	8.18	51	65
Interdorsal length	44.18	1.66	5.51	12.47	33	52
Snout to pectoral	64.45	1.13	3.75	5.82	59	71
Length of pectoral	35.09	0.79	2.61	7.44	31	41
Snout to ventral	73.00	1.51	5.00	6.85	65	83
Length of ventral	44.09	2.09	6.93	15.75	35	57
Snout to anal	102.55	0.45	1.50	1.46	100	106





Coryphaenoides (Coryphaenoides) quadripennatus n.sp.
(Figs 18, 21–23)

GENERAL CHARACTERS: Head of moderate size. Body compressed, dorsal contour rising gently to base of first dorsal fin, then gradually tapering. Lateral line descending gently behind to posterior margin of first dorsal fin, weakly curved below and before it. On first gill-arch, 16 gill-rakers on inner side and 11 on outer; inner series subspatulate and spinous, outer series more slender and elongate, similarly spinous. Luminous organ absent. Ten short, stout pyloric caeca, directed anteriorly.

HEAD CHARACTERS: Snout blunt; orbit subcircular. Ridges of head rather weak. Frontal ridge narrow and keel-like, not extending past midline of orbit; nasal ridges similar, or broad and low. Occipital ridges barely defined, suborbital very weak. Infraorbital extending to just past distal orbital margin, curving upwards in front of eye to meet nasal ridge, then downwards to tip of snout. Three ill-defined to conspicuous sclerites present, one at tip of snout and one at either anterolateral angle. Mouth subterminal and lateral, cleft extending to or just past midline of orbit. Teeth in narrow bands in both jaws, outer series largest. Mucus pores present on head, most conspicuous below infraorbital ridge, and on underside of lower jaw. Barbel short.

SCALES: Body scales of moderate size, densely covered with imbricate spinelets in subparallel series. Seven (occasionally six or eight) scales between first dorsal fin and lateral line, seven or eight between second dorsal fin and lateral line. Head scales weakly differentiated. Infraorbital ridge with a single series of larger scales. Area below infraorbital ridge (except anterolateral region) and underside of lower jaw (except proximal end) scaled.

FINS: First dorsal arising just behind pectorals and ventrals, second spine serrate along entire length. Outer ray of pectorals and ventrals elongate and filamentous. Anal fin arising immediately behind anus. Ray counts: D_1 11; P 13–15; V 7; D_2 134±; A146±.

COLOUR: Generally greyish-brown, darker abdominally; branchiostegal membranes and orbital margin black, fins grey (preserved material).

SUMMARY OF MEASUREMENTS (9 specimens): *see below*

MATERIAL EXAMINED:

Holotype: NZOI No. 190 (Stn F149). Paratypes: NZOI No. P264 (Stn D244), P265 (Stn E120), P266 (Stn E405), P267 (Stn E757), P268 (Stn F760). **Also** NZOI Stns E401 (1), E405 (2), E410 (1), E718 (1), F104 (1), G142 (1).

OTHER RECORDS:

Nil.

DISTRIBUTION: Challenger Plateau, and east coast of New Zealand from off Gisborne to Campbell Plateau. Depth range 739–1212 m.

REMARKS: *C. quadripennatus* n.sp. approaches *C. serrulatus* Günther, *C. rudis* Günther, and *C. nasutus* Günther in the shape of the head and development of sclerites. It is easily distinguished, however, by the sharper frontal ridge and the elongate outer pectoral

Coryphaenoides (Coryphaenoides) quadripennatus n.sp.: Summary of measurements (9 specimens)

	Mean	SEM	CD	CV	Min.	Max.
Total length (mm)					142	345
Standard length (mm)					43	99
Depth of body at D_1	54.78	0.70	2.10	3.83	52	58
Depth at anus	45.44	1.13	3.40	7.49	40	51
Length of head	66.67	1.02	3.05	4.58	64	72
Depth of head	45.13	0.72	2.03	4.49	42	48
Width of head	34.44	1.57	4.72	13.69	30	45
Snout to nostril	12.43	0.53	1.39	11.1	11	16
Snout to orbit	17.78	0.52	1.55	8.70	16	21
Orbital diameter	20.56	0.41	1.26	6.11	19	23
Postorbital length	28.33	0.65	1.94	6.86	25	31
Interorbital width	15.56	0.32	0.96	6.13	15	17
Barbel length	1.75	1.23	0.66	37.79	1	3
Snout to D_1	75.89	0.89	2.68	3.54	71	79
Base of D_1	20.56	1.80	5.39	26.24	17	21
Length of D_1	57.89	0.66	1.97	3.40	56	61
Interdorsal space	37.67	1.21	3.62	9.61	32	43
Snout to pectoral	68.67	0.52	1.56	2.27	66	72
Length of pectoral	111.00	4.92	13.91	12.53	78	124
Snout to ventral	74.22	1.26	3.79	5.11	68	79
Length of ventral	120.00	6.43	19.30	16.08	82	140
Snout to anal	105.33	0.75	2.26	2.15	101	109

◁ **Fig. 21.** *Coryphaenoides (Coryphaenoides) quadripennatus* n. sp.: upper–holotype, Stn F149; SL 89 mm; **lower–paratype, Stn D244; SL** 85 mm.

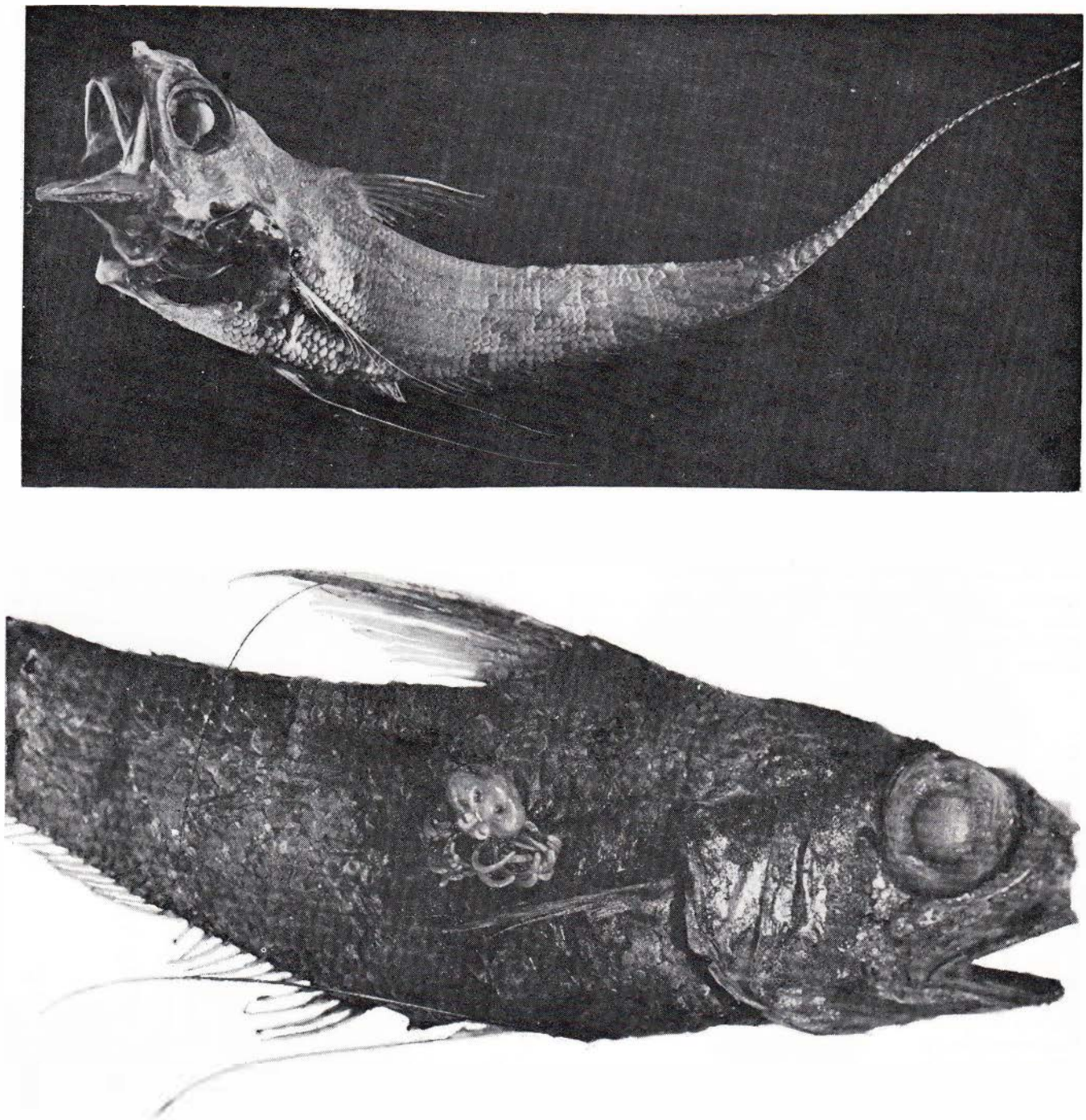


Fig. 22. *Coryphaenoides (Coryphaenoides) quadripennatus* n. sp.: upper–paratype, Stn D244; SL 85 mm; lower–Stn E401; SL 82 mm (note parasitic copepod).

and ventral rays. *C. filamentosus* Okamaru from Japan has a slightly longer snout and orbit, more rays to the pectoral and pelvic fins, seven scales between first dorsal fin and lateral line, 13–14 (inner) and 9–11 (outer) gill-rakers on the first gill-arch, and only 4–7 spinular series on the scales. *C. cinereus* (Gilbert) has similarly few spinular series on the scales. *C. spinulosa* (Gilbert) has eight pelvic rays, an indistinct infraorbital ridge, and the mandibular teeth in a single series laterally.

Nezumia Jordan

Head short, compressed, sides more-or-less angulated at infraorbital ridge. Sensory canals of head not highly developed, ridges of head not conspicuous, but infraorbital always distinct, with modified scales usually in a double series. Margin of orbit usually with a single series of specialised scales. Projection of snout variable, the tip and anterolateral angles usually with spiniferous

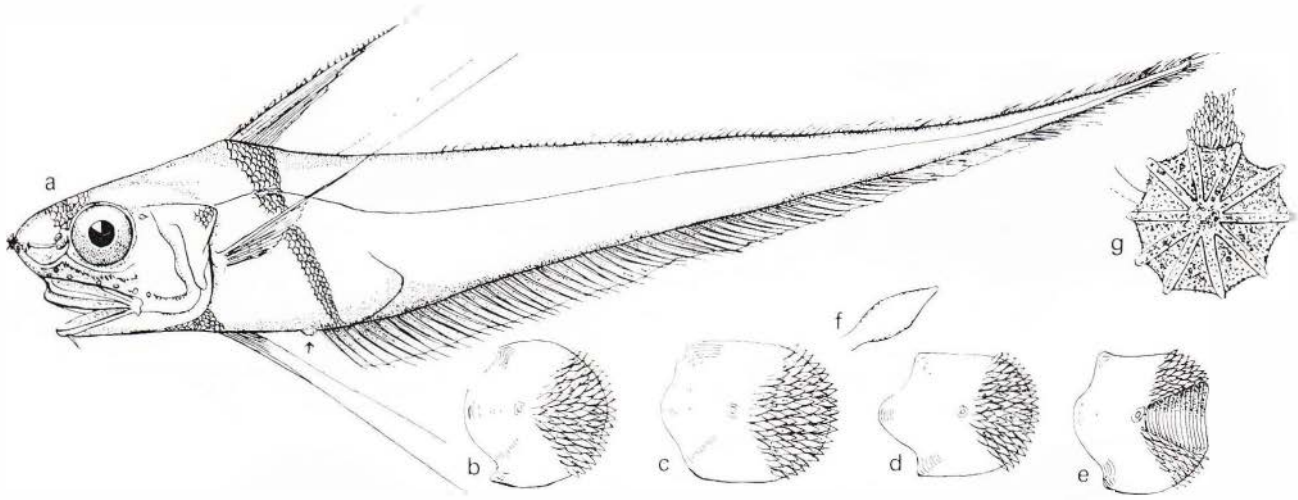


Fig. 23. *Coryphaenoides (Coryphaenoides) quadripennatus* n. sp. (holotype, Stn F149; SL 89 mm): a, profile (anus arrowed); b–f scales (b, above LL; c, below LL; d, gular; e, LL; f, scale spinule (enlarged)); g, snout sclerite (enlarged). Scales (approx.)–a, x0.5; b–e, x3.

tubercles. Teeth in villiform bands in both jaws, outer series of upper jaw enlarged. Gill opening usually narrow, the anteroventral opening extending below preopercular ridge. First gill-slit restricted, gill-rakers rudimentary on outer side of first gill-arch, less than 10 tubercular rakers on lower limb of inner side. Scales usually ctenoid, with reticulate structure of circular and transverse ridges. Anus remote from anal fin. Luminous organ present, with two small, naked photophores, one adjacent to anus, the other more-or-less between bases of pelvic fins. Second spine of first dorsal fin serrate. Intestine with 4 or 6 bends; fewer than 60 pyloric caeca, sometimes branching profusely. Branchiostegal rays seven.

TYPE-SPECIES: *Nezumia condylura* Jordan & Gilbert.

Nezumia nigromaculata (McCulloch)
(Frontis., Figs 24, 25, 28)

Macrourus nigromaculatus McCulloch, 1907: 306, pl. 63 (1).
Lionurus nigromaculatus Barnard, 1925: 348. Moreland, 1957: 34. Smith, 1961: 243.
Nezumia nigromaculata Whitley, 1968: 38.

GENERAL CHARACTERS: Head of moderate size. Head and body compressed, body tapering rapidly behind first dorsal fin. Lateral line rather strongly arched between head and anterior end of second dorsal fin. Anus distant from anal fin. Pyloric caeca short (about 12 mm) and numerous. Ten to 13 tubercular inner gill-rakers on lower limb of first gill-arch, plus 2 shorter rakers above them at angle of arch, and 9 shorter rakers on outer side.

HEAD CHARACTERS: Snout obtuse; orbit circular. Ridges of head inconspicuous except for rather weak infraorbital ridge, which does not extend to preopercular angle. Mouth subterminal and lateral, cleft extending to midline of orbit or before. Teeth in villiform bands in both jaws, outer series enlarged in upper jaw.

SCALES: Boby scales subovoid (wider than long) to subcircular, with fine spinules arranged in diverging series, 3–17 series on scales according to position, most on flank scales, and with usually 8–10 series on scales above lateral line. Fourteen or 15 scales between first dorsal fin and lateral line. Head scales small, irregular in shape and armature, best developed on infraorbital ridge and orbital rim. Scalation of head continuing more-or-less uniformly below infraorbital ridge to underside of lower jaw.

FINS: Second spine of first dorsal with 26–27 serrations over entire length, distal end fine and flexible. First dorsal arising behind pectorals and ventrals. Outer ventral ray produced, extending beyond origin of anal fin. Ray counts: D_1 12; P (17)–19; V 13; D_2 125±; A 168±.

LUMINOUS ORGAN: Between and slightly behind the bases of the ventral fins is an ovate, blackish, notched area, followed more-or-less immediately by a similar area adjacent to the anus. The two areas may be partly coalescent or joined by a narrow, blackish, naked area.

COLOUR: Generally light umber, with dark oral margins and black branchial membrane margins; abdominal region bluish-black, first dorsal fin blackish or with a black spot.

SUMMARY OF MEASUREMENTS (9 specimens): *see* p. 45.

MATERIAL EXAMINED:

NZOI Stns D85 (2), D231 (1♀), E81 (1♀), E413 (1), E423 (1), E719 (2), E826 (1), G268 (1), G283 (1), J28 (1).

OTHER RECORDS:

Chatham Islands and Chatham Rise (Moreland 1957).

DISTRIBUTION: Challenger Plateau, and from off Gisborne to Campbell Plateau. Depth range 421–913 m. Also off eastern Australia and South Africa, 274–1463 m.

REMARKS: *N. pumiliceps* (Alcock) and *N. decimales* (Gilbert & Hubbs), both Indo-Pacific forms, are closely related, and have various proportional measurements overlapping those of *N. nigromaculata*. Both are distinguished, however, in having only eight scales between the second dorsal fin and the lateral line. *N.*

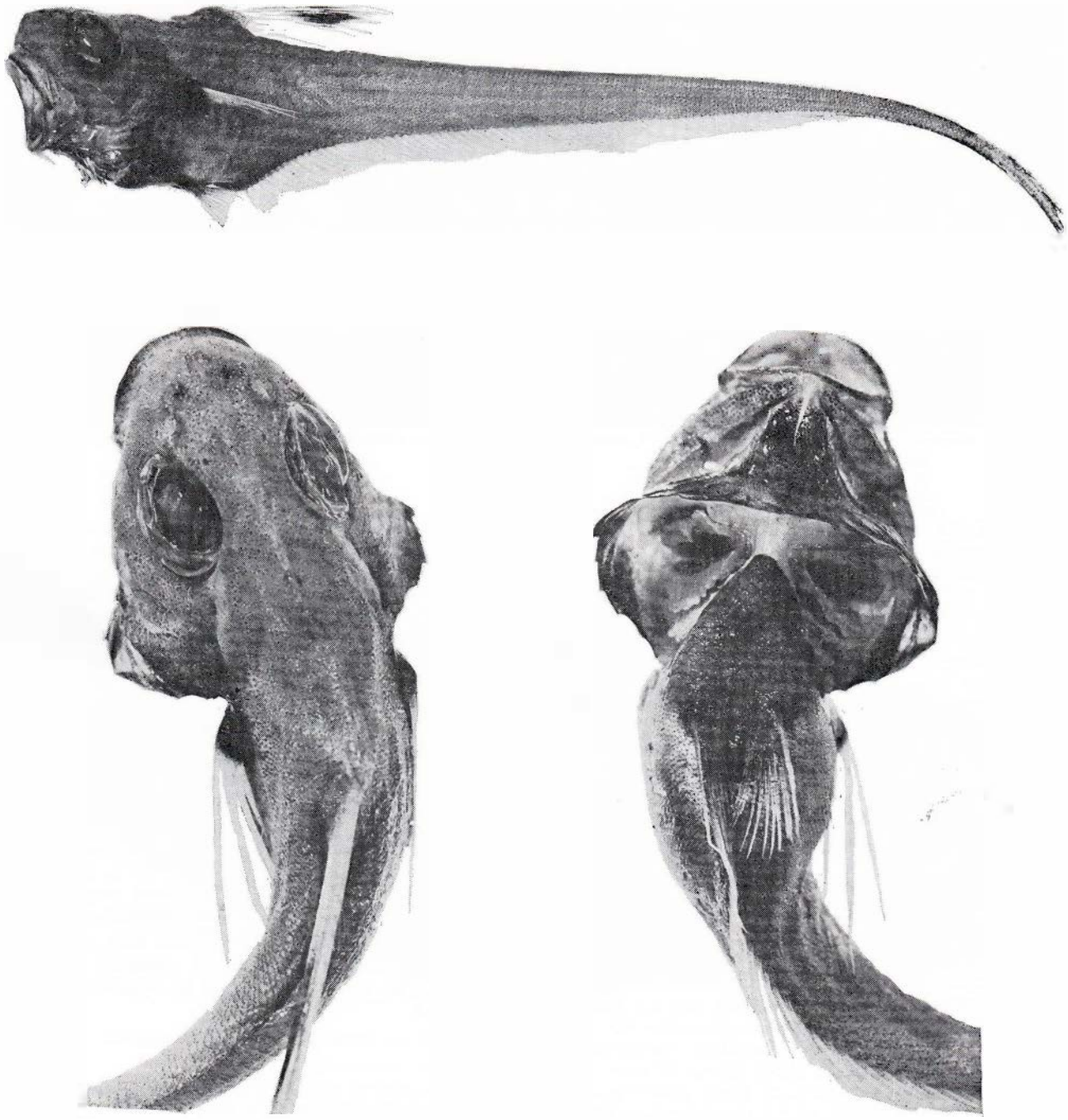


Fig. 24. *Nezumia nigromaculata* (♀, Stn E81; SL 58 mm).

richardi (Weber) is similarly related, but has only eight rays to the ventral fins.
In the specimen from NZOI Stn. D 231 (29.ix.1964) the ova appeared almost ready to be shed.

Nezumia namatahi n. sp. (Figs. 26, 27)

GENERAL CHARACTERS: Head moderately small, relatively uncompressed. Dorsal contour tapering from base of

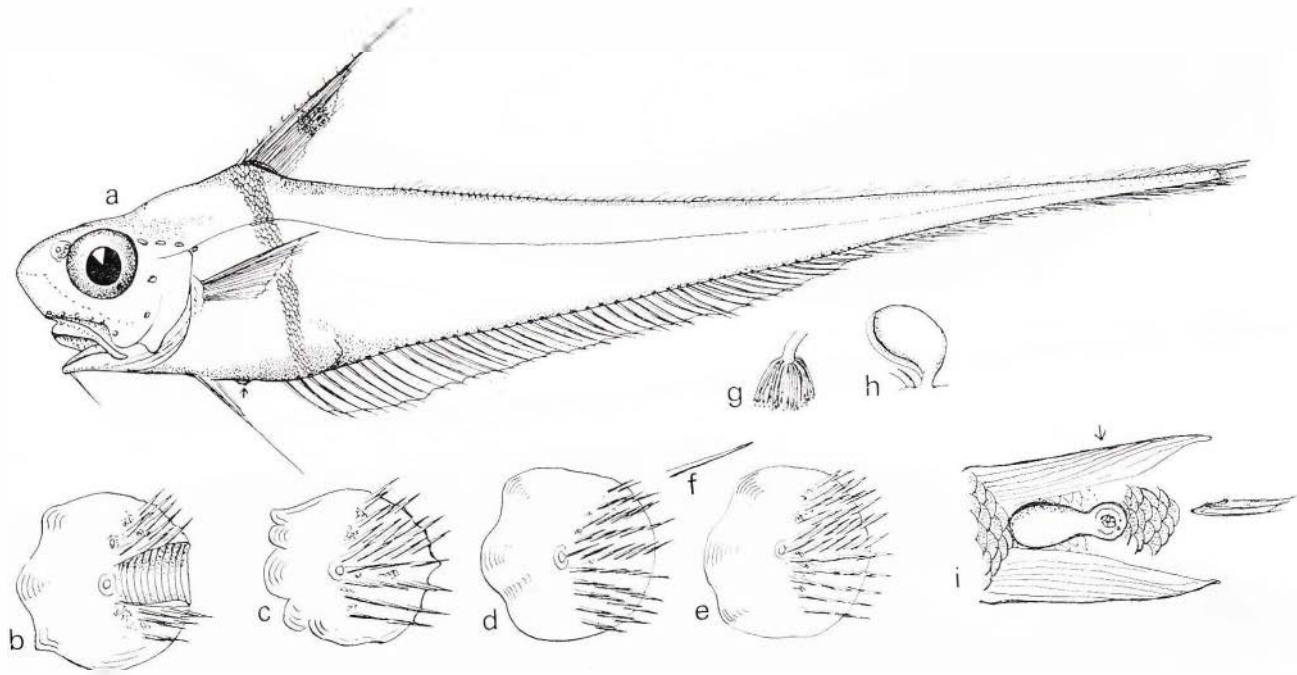


Fig. 25. *Nezumia nigromaculata* (♀, Stn E81; SL 58 mm): a, profile (anus arrowed); b–f, scales (b, LL; c, gular; d, above LL; e, below LL; f, scale spinule (enlarged)); g, pyloric caeca; h, testes (Stn E413); i, luminous organ (anus arrowed). Scales (approx.)– a, x0.6; b–e, x5; g, h, x0.5; i, x1.1.

Nezumia nigromaculata: Summary of measurements (9 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					70±	285±
Standard length (mm)					24	58
Depth of body at D_1	79.33	1.71	5.14	6.49	73	88
Depth at anus	76.80	4.57	10.23	13.31	60	88
Length of head	74.33	1.21	3.62	4.87	65	79
Depth of head	60.22	2.12	6.73	10.55	52	69
Width of head	41.22	1.39	4.18	10.15	36	50
Snout to nostril	14.44	0.42	1.26	8.75	12	17
Snout to orbit	21.22	0.52	1.55	7.29	19	24
Orbital diameter	28.61	0.82	2.45	8.54	26	34
Postorbital length	23.33	1.10	3.30	14.14	19	29
Interorbital width	17.22	0.62	1.87	10.87	15	20
Barbel length	16.56	0.52	1.57	9.49	14	19
Snout to D_1	95.33	2.31	6.93	7.26	81	103
Base of D_1	25.89	0.82	2.47	9.54	21	28
Length of D_1	91.78	2.14	6.42	7.00	84	103
Interdorsal space	33.44	0.96	2.87	8.59	28	37
Snout to pectoral	78.67	1.08	3.73	4.11	72	83
Length of pectoral	50.33	0.74	2.21	4.39	47	53
Snout to ventral	84.44	0.98	2.94	3.49	77	88
Length of ventral	40.50	1.79	5.05	12.47	32	48
Snout to anal	115.89	1.16	3.48	3.00	112	121

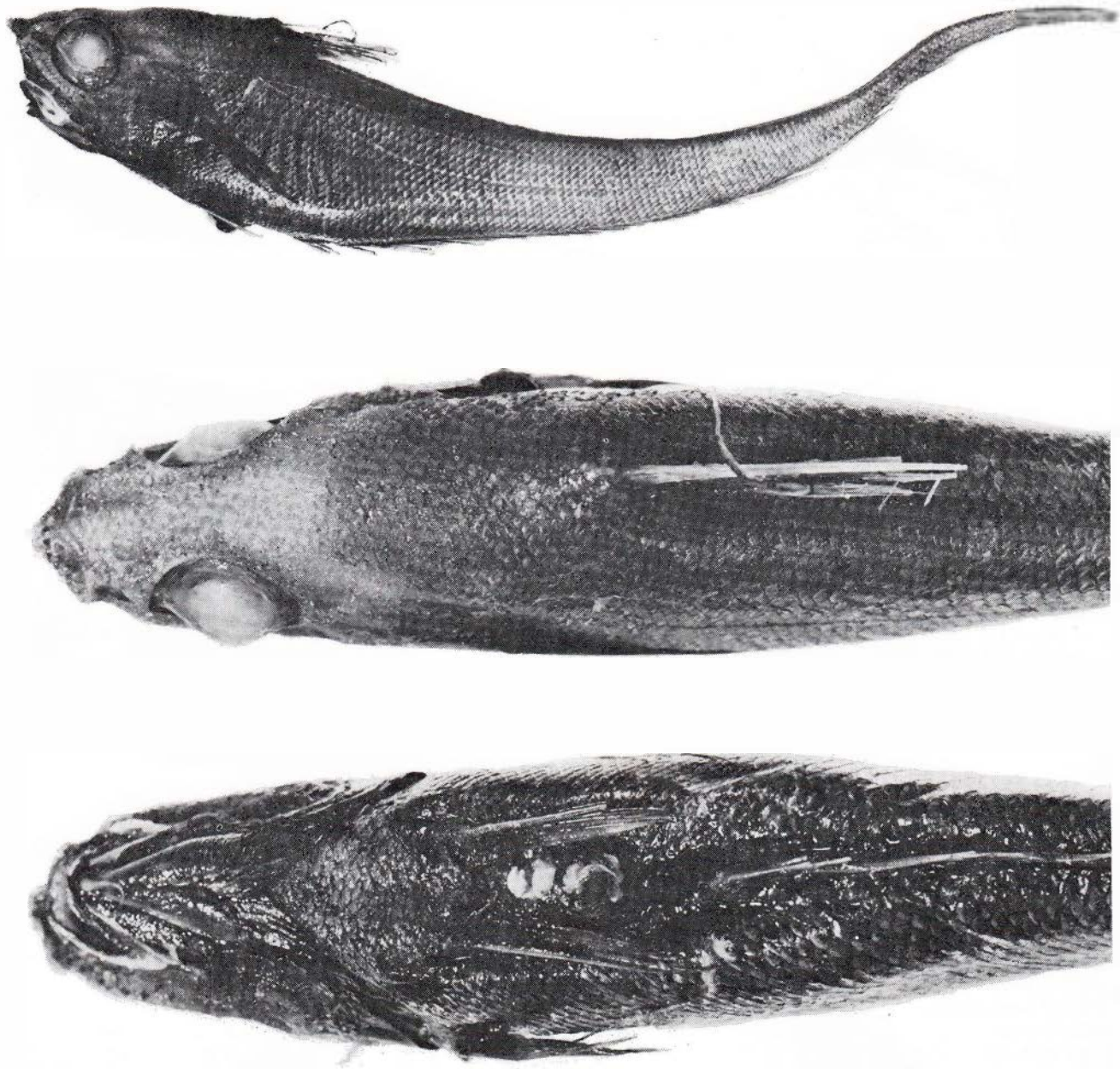


Fig. 26. *Nezumia namatahi* n. sp. (paratype, Stn E714; SL 80 mm).

first dorsal fin. Lateral line not arched strongly at proximal end. Anus remote from anal fin. Pyloric caeca 14. About six short, tubercular inner gill-rakers on first gill-arch, apparently none on outer side.

HEAD CHARACTERS: Snout relatively broad; orbit subcircular, slightly flattened on posterior margin. Ridges of head weakly developed. Frontal ridge broad, nasal ridge similar, occipital scarcely indicated. Infraorbital ridge more pronounced, broadened below posterior orbital margin Single, broad, obtuse sclerites at tip and anterolateral angles. Mouth inferior, cleft extending to about midline of orbit; teeth small, in bands in both jaws, outer series slightly enlarged.

SCALES: Body scales subcircular, small, with fine spinules in several parallel or subconvergent series, up to 18 series on larger scales. Nine scales between each dorsal fin and lateral line. Head scales with spinules directed upward (preorbital) or backward. Median series of frontal ridge flanked by three series on either side; one slightly enlarged series on orbital rim, most conspicuous on ventral margin. Infraorbital ridge below orbit with one series of scales slightly separated from those on

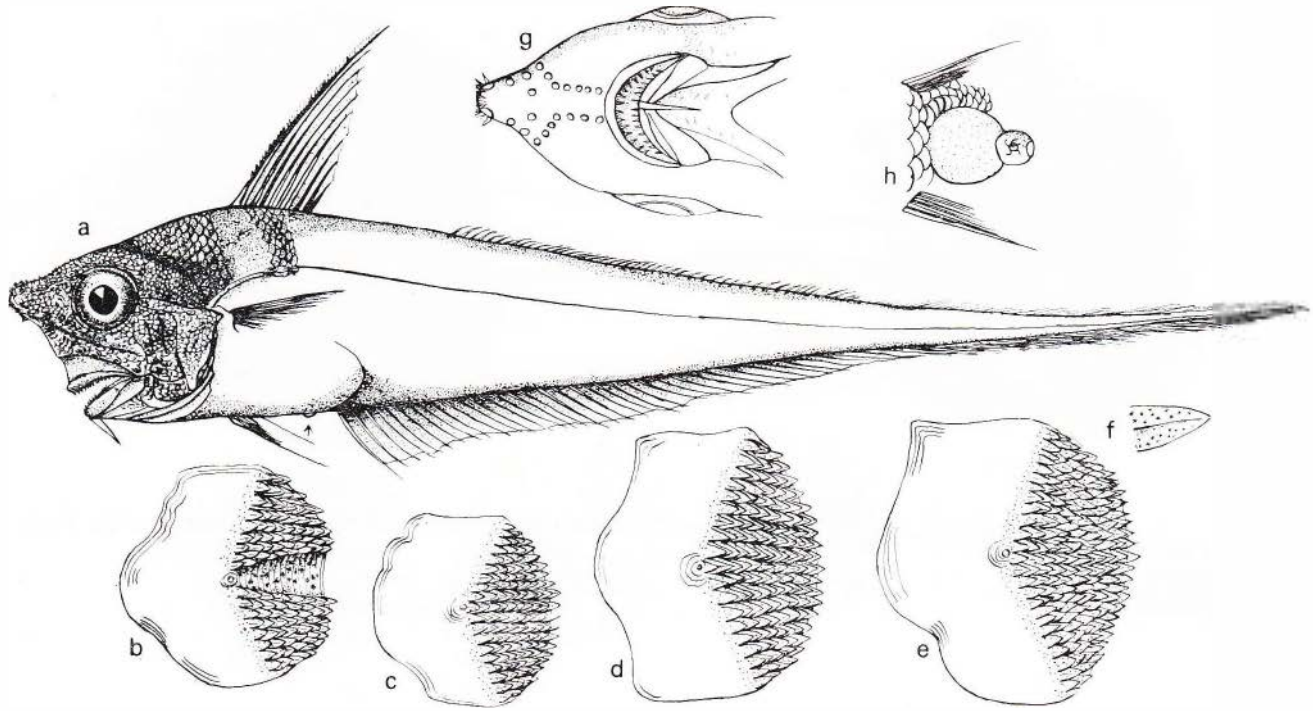


Fig. 27. *Nezumia namatahi* n. sp. (holotype, Stn F758; SL 90 mm): a, profile (anus arrowed); b–f, scales (b, LL; c, gular; d, above LL; e, below LL; f, scale spinule (enlarged)); g, head, ventral aspect; h, luminous organ. Scales (approx.)–a, x0.5; b–e, x5; g, h, x1.

lower orbital rim. Nasal fossa and exposed portion of interoperculum naked, underside of head except for tip of snout scaled.

FINS: Second spine of first dorsal with spaced serrations. Ray counts: D_1 11—12; P17–19; V10; D_2 157±; A 170±.

LUMINOUS ORGAN: Immediately anterior to the anal area is a subcircular, naked area within which are two small, transverse-ovoid, adjacent organs.

COLOUR (ex alcohol): Brownish; tending darker, almost black, on abdominal area, branchial membranes, and bases of second dorsal and anal fins.

SUMMARY OF MEASUREMENTS (2 specimens):

	Stn. F758	Stn. E714
Total length (mm)	364±	340±
Standard length (mm)	85	80
Depth of body at D_1	67	64
Depth at anus	59	63
Length of head	67	73
Depth of head	49	48
Width of head	41	40
Snout to nostril	15	15
Snout to orbit	22	21
Orbital diameter	20	24
Postorbital length	25	28
Interorbital space	14	14
Length of barbel	11	11
Snout to D_1	81	89
Base of D_1	24	24
Length of D_1	74	81
Interdorsal space	34	36
Snout to pectoral	72	75
Length of pectoral	38	46
Snout to ventral	83	84
Length of ventral	35	43
Snout to anal	116	116

MATERIAL EXAMINED:

Holotype: NZOI No. 191 (Stn F758). Paratype: NZOI No. P269 (Stn. E714).

OTHER RECORDS:

Nil.

DISTRIBUTION: Off Mahia Peninsula, and just north of western end of Chatham Rise. Depth range 1245–1284 m.

REMARKS: *N. proximus* (Smith & Radcliffe), from Japanese and Philippine seas, is closely related, but has a longer head and snout, a slightly smaller postorbital area, nine ventral fin rays, fewer scales between the dorsal fins and the lateral line, and a shorter interdorsal space and first dorsal base. *N. brevirostris* (Alcock) is apparently also related, but has the first dorsal spine shorter than the head.

Nezumia toi n.sp. (Figs 28–31)

GENERAL CHARACTERS: Head of moderate size, relatively uncompressed. Dorsal contour slowly tapering from base of first dorsal fin. Lateral line scarcely arched under first dorsal fin. Anus remote from anal fin.

Fig. 28. Body scales of *Nezumia* spp.: left–*N. nigromaculata* (♀, Stn E81; SL 58 mm); right–*N. toi* n. sp. (holotype, Stn E749; SL 32.5 mm). All enlarged.

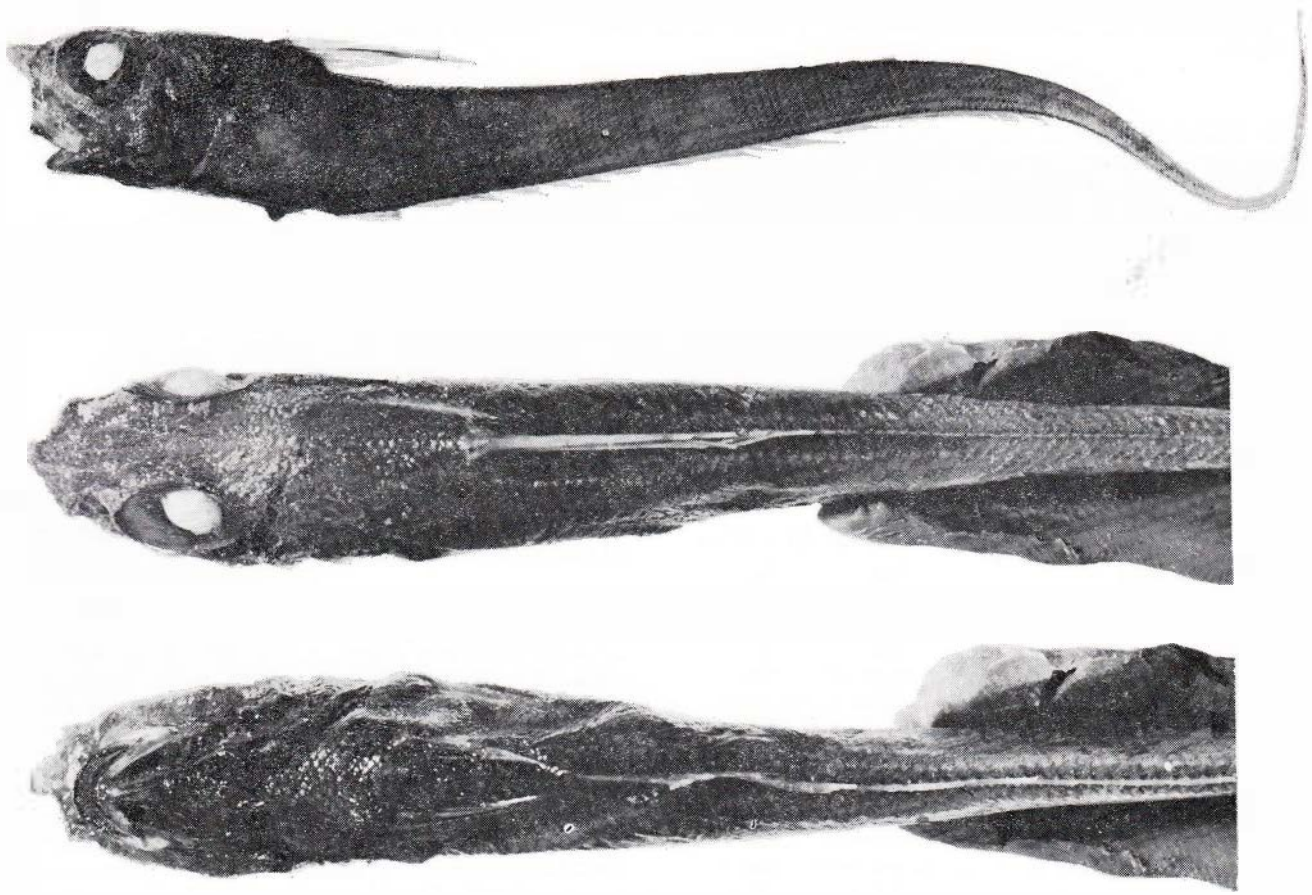


Fig. 29. *Nezumia toi* n. sp. (holotype, Stn E749; SL 32.5 mm).

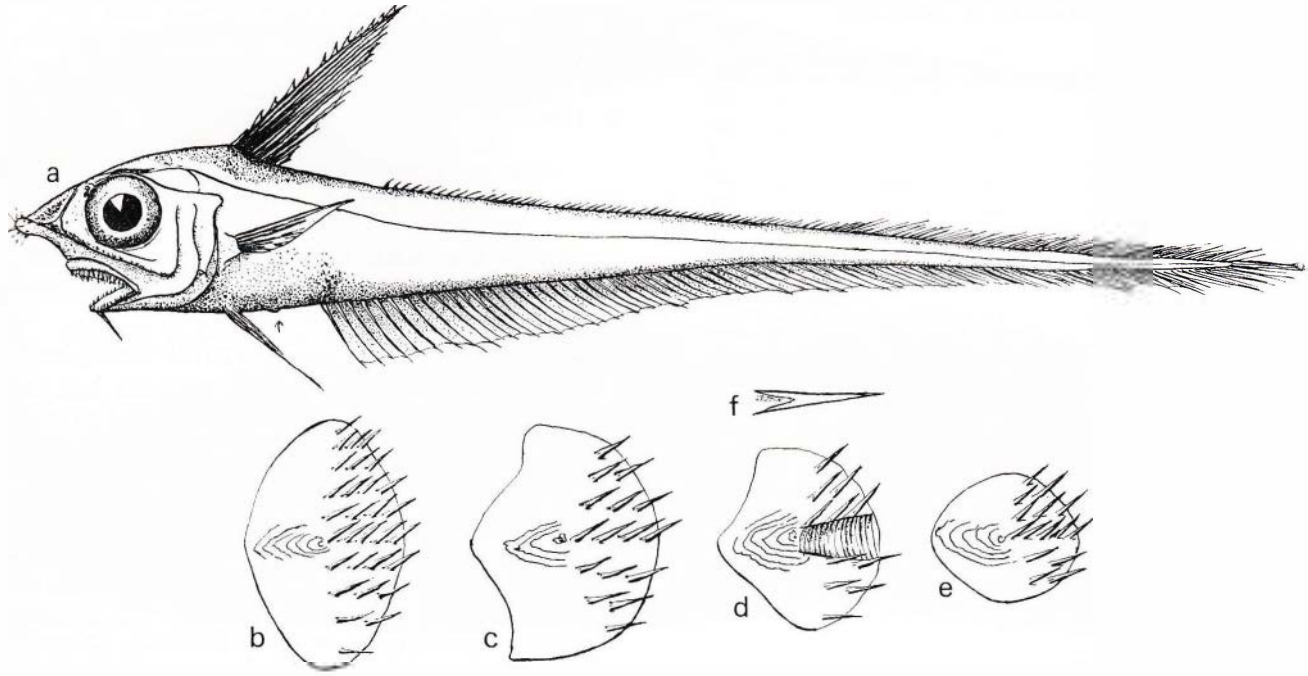


Fig. 30. *Nezumia toi* n. sp. (holotype, Stn E749; SL 32.5 mm): a, profile (anus arrowed); b–f, scales (b, above LL; c, below LL; d, LL; e, gular; f, scale spinule (enlarged)). Scales (approx.)–a, x1.1; b–e, x5.

HEAD CHARACTERS: Snout subacute in profile, depressed, relatively broad; orbit circular. Frontal ridge broad, postorbital and occipital weak. Infraorbital ridge more conspicuous, oblique, extending to posterior orbital margin, straight, strongest proximally. Three small sclerites at tip and anterolateral corners of snout. Mouth inferior, cleft extending to about midline of orbit. Teeth in bands in both jaws, small and curved, outer series largest. Barbel tapering.

SCALES: Body scales small, ovoid to subcircular, with 6–10 series of sharp spinules overlapping distal margin. Median series sometimes enlarged, and occasional spinules with base broadened. Six scales between first dorsal fin and lateral line, 6–6.5 between second dorsal fin and lateral line. Head scales with spinules directed upwards, in three series on frontal ridge, and a single series on orbital rim and infraorbital ridge, slightly enlarged at the three anterolateral sclerites. Nasal fossa with a few spaced spinelets. Underside of head with scales from behind anterior orbital margin, in a single series below orbit, then in several series covering most of area below infraorbital ridge.

FINS: Second spine of first dorsal serrate. Pectorals inserted just behind first dorsal, ventrals inserted below first dorsal. Ray counts: D_1 11; P 17–19; V 9.

LUMINOUS ORGAN: Immediately anterior to the anus is an ovoid, scaleless area preceded by a smaller, transverse, ovoid area.

COLOUR (ex alcohol): Brownish over caudal area, grey to black elsewhere.

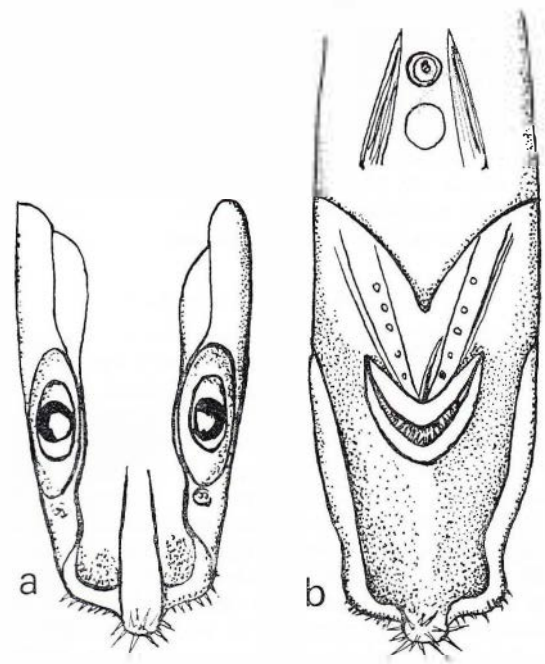


Fig. 31. *Nezumia toi* n. sp. (holotype, Stn E749; SL 32.5 mm): a, head, dorsal aspect; b, head and trunk, ventral aspect. Scale (approx.) x2.2.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	155±
Standard length (mm)	32.5
Depth of body at D_1	52
Depth at anus	49
Length of head	74
Depth of head	40
Width of head	37
Snout to nostril	17
Snout to orbit	25
Orbital diameter	28
Postorbital length	21
Interorbital width	15
Length of barbel	15
Snout to D_1	83
Base of D_1	18
Length of D_1	77
Interdorsal space	40
Snout to pectoral	80
Length of pectoral	46
Snout to ventral	83
Length of ventral	32
Snout to anal	117

MATERIAL EXAMINED:
Holotype: NZOI No. 192 (Stn E749).

OTHER RECORDS:
Nil.

DISTRIBUTION: Known only from off the Wairarapa coast. Depth range 913–997 m.

REMARKS: This species differs from *Nezumia namatahi* in having a larger orbit and interdorsal space, a smaller first dorsal fin base, and only six scales between the first dorsal fin and the lateral line. *N. proximus* (Smith & Radcliffe) is more closely related, having a shorter interdorsal space and a less strongly developed infraorbital ridge, below which the scalation is not reduced. *N. kamakarai* Okamura has a prominent infraorbital ridge, but has convergent rows of spinules on the scales, more rays to the pectoral and ventral fins, and numerous minute serrations on the dorsal spine. *N. gibber* (Gilbert & Cramer), a Hawaiian species, has more ventral rays and more scales above the lateral line.

Lepidorhynchus Richardson

Head relatively large, head and body compressed. Sensory canals and crests of head bones well developed, head soft, often damaged. Ridges of head poorly indicated except for frontal and nasal ridges, infraorbital scarcely apparent. Snout short, mouth terminal, large; teeth in a broad band in upper jaw, villiform except for enlarged outer series, large and uniserial in lower jaw. Orbit large, circular. Scales partly deciduous, ovoid or elliptical, wider than long, densely covered with minute, distally directed spinules. Barbel short. Second ray of first dorsal fin smooth. Lateral line continuous. Luminuous organ present, small and ovoid, adjacent to anus, which immediately precedes anal fin. First gill-slit restricted; gill-rakers tubercular, finely denticulate at the tip.

TYPE-SPECIES: *Macrourus* vel. *Lepidorhynchus australis* Richardson.

REMARKS: This genus has been merged with *Coryphaenoides* by several authors, but is readily distinguishable by the well developed sensory canals and crests on the soft head, the smooth dorsal spine, and the presence of a luminous organ. *Cetonurus* would appear more closely related, but has the body rapidly constricted behind the anal area, a discontinuous lateral line, different scales, and the second spine of the first dorsal fin serrate.

Lepidorhynchus denticulatus Richardson (Figs 32–35)

Macrourus denticulatus Richardson, 1846: 53, pl. 32 (1–3). Günther, 1862: 396; 1887: 147.
Optonurus denticulatus McCulloch, 1926: 33, pl. 11 (116a).
Lepidorhynchus denticulatus Phillipps, 1927a: 22. Whitley, 1968: 39.

GENERAL CHARACTERS: Head of moderate size, compressed. Body gradually tapering. Lateral line slightly arched under first dorsal fin. First gill-arch restricted, with 16 tubercular inner gill-rakers and 9 smaller outer rakers.

HEAD CHARACTERS: Snout short, descending steeply in front; orbit large, circular. Head rather soft, commonly damaged in preorbital area. Sensory canals and bony crests well developed, ridges of head not prominent except for frontal ridge, which is keel-like. Infraorbital ridge scarcely indicated, area below oblique to subvertical. Mouth large, terminal, cleft extending to about midline of orbit. Teeth in a band in upper jaw, the outer series enlarged and canine-like. Lower jaw with a single row of large, canine-like teeth, slightly smaller and more close-set than outer series of upper jaw.

SCALES: Body scales relatively large, deciduous, oval or elliptical, with numerous imbricate spinelets overlapping distal margin. Five or six scales between first dorsal fin and lateral line. Head scales reduced but occurring over most of head, including underside and lower jaw.

FINS: Second spine of first dorsal smooth. Pectorals inserted slightly anterior to first dorsal, ventrals inserted more-or-less under first dorsal. Ray counts D_1 11–(12); P 17–(19); V (8)–9; D_2 129–140±; A 112–130±.

LUMINOUS ORGAN: A small, transverse, ovoid, naked area is present immediately in front of the anus.

COLOUR (ex alcohol): Older specimens generally brownish, abdominal area and lower side of jaws blackish, often brilliant silver beneath scales. Young specimens scaleless, usually burnished silver over a darkened undersurface.

SUMMARY OF MEASUREMENTS (14 specimens): *see* p. 52.

MATERIAL EXAMINED:

NZOI Stns A759 (1), A760 (1), D38 (1), D134 (1), D211 (1), D868 (1), D871 (1), D895 (1), D899 (4), E80 (2), E112 (1), E433 (1), E435 (2), E705 (1), D712 (1), D804 (1), F90 (1), F913 (1), G165 (1), G247 (1), G254a (1), G259a (3), G268 (1), G276a (1), G292 (1), G345 (2), G403 (1), G822 (1), J31 (1).

OTHER RECORDS:

Challenger Stns 166, 170 (5), (Günther 1887); Cook Strait (Hutton 1872, Günther 1887); Chatham Islands and Chatham Rise (Moreland 1957).

DISTRIBUTION: Kermadec Islands; Lord Howe Rise; and New Zealand Plateau, from off Northland to the Campbell Plateau on the east coast, and the Challenger Plateau and off Puysegur Point on the west coast.

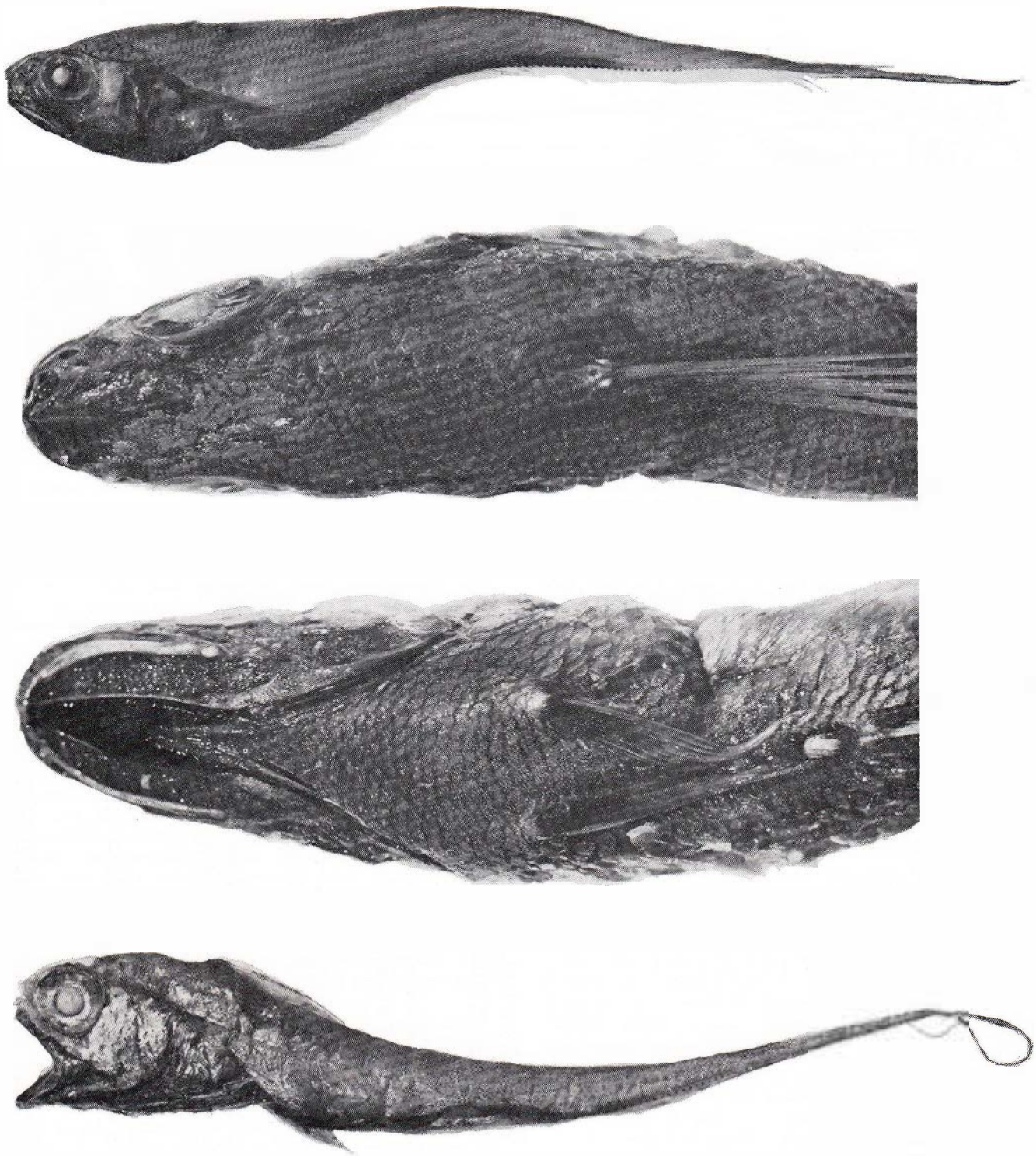


Fig. 32. *Lepidorhynchus denticulatus*; upper & middle–Stn E705; SL 91 mm; lower–juvenile, Stn E804; SL 40 mm.

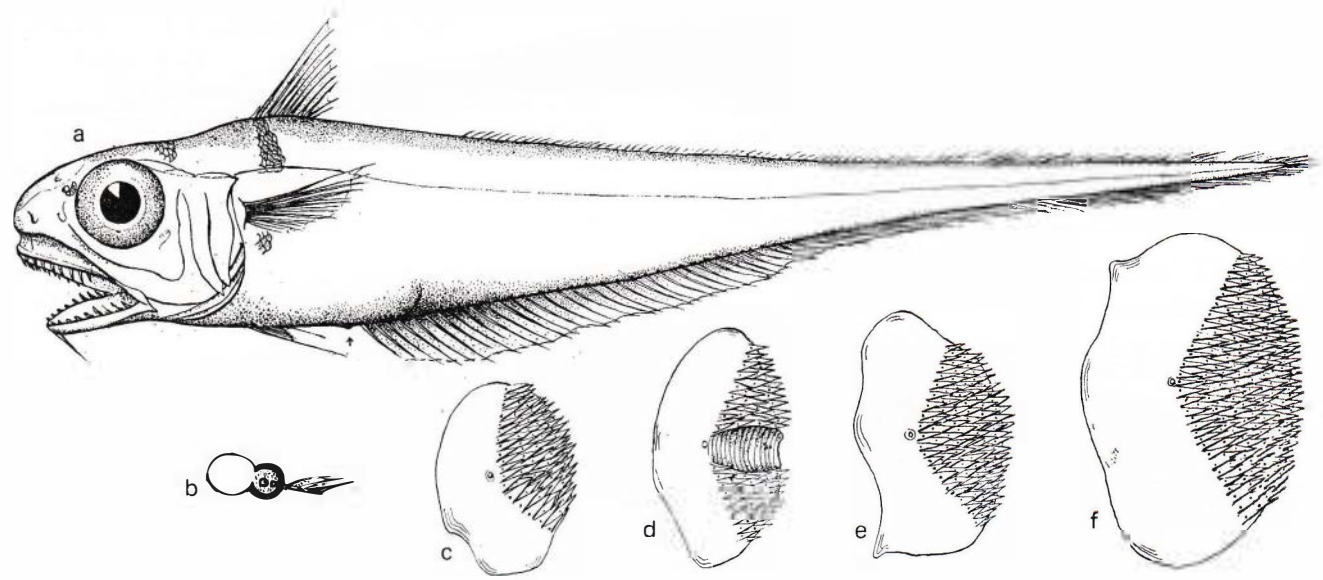


Fig. 33. *Lepidorhynchus denticulatus*; (Stn D134; SL 103 mm): a, profile (anus arrowed); b, luminous organ; c–f, scales (c, gular; d, LL; e, above LL; f, below LL (Stn E435)). Scales (approx.)–a, x0.45; b, x1.3; c–f, x4.

Lepidorhynchus denticulatus: Summary of measurements (14 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					135	506
Standard length (mm)					34	125
Depth of body at D_1	56.27	1.16	5.03	5.55	48	64
Depth at anus	49.50	0.34	5.98	1.10	42	57
Length of head	65.71	0.72	2.71	4.12	71	62
Depth of head	47.36	0.59	2.22	4.70	44	50
Width of head	35.64	0.88	3.31	9.25	31	42
Snout to nostril	14.42	0.77	2.66	18.45	11	18
Snout to orbit	15.64	0.52	1.95	10.46	16	23
Orbital diameter	24.50	0.84	3.13	12.79	17	29
Postorbital length	22.57	0.73	2.74	12.16	18	26
Interorbital width	16.29	0.29	1.10	6.74	14	18
Length of barbel	7.71	1.64	4.33	56.17	4	18
Snout to D_1	76.21	1.16	4.35	5.70	69	84
Base of D_1	24.67	0.83	2.49	10.11	21	28
Length of D_1	53.83	2.58	8.94	16.61	34	66
Interdorsal space	55.25	1.49	5.17	9.35	47	67
Snout to pectoral	66.43	1.04	3.90	5.88	58	73
Length of pectoral	54.85	1.49	5.39	9.83	44	63
Snout to ventral	73.77	1.16	4.19	5.55	66	82
Length of ventral	40.83	2.55	8.83	21.62	30	62
Snout to anal	104.55	0.35	1.15	1.10	103	106

Depth range 188–951 m. Also recorded from off southern and eastern Australia.

REMARKS: *L. denticulatus* is clearly distinct from any other local macrourid, and is readily distinguishable in the field. "*Macrurus*" *longibarbis* Günther (1887: 139, pl. xviii C), known only from one specimen taken at *Challenger* Stn 173 near Fiji in 576 m, may be a related form. It differs in having only 2.5 scales above the lateral line and the ray counts D_1 10; P 11; V 8. The body is not as deep, the head and snout are shorter, and the barbel is much longer.

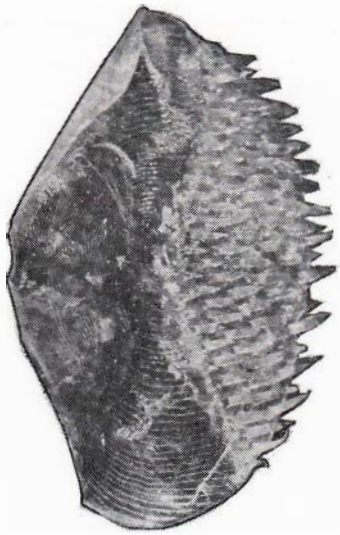


Fig. 34. *Lepidorhynchus denticulatus* (Stn E705; SL 91 mm): body scale (enlarged).

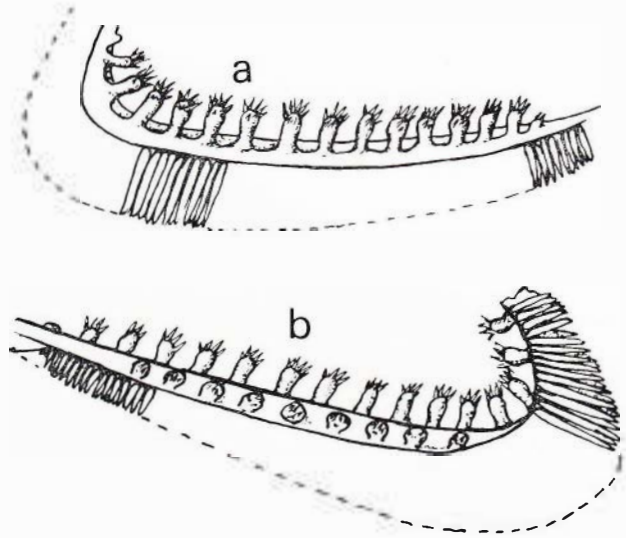


Fig. 35. *Lepidorhynchus denticulatus* (Stn D134; SL 103 mm): first gill-arch–a, inner face; b, outer face. Scale (approx.)–x1.4.

Mahia n.gen.

Head relatively large, head and body compressed. Sensory canals and ridges of head moderately pronounced, ridges rather low and broad except for the subcarinate postorbital. Infraorbital ridge the most conspicuous, extending to preopercular angle, curving upward anterior to orbit, only slightly raised, ventrolateral angle distinct, area below oblique to subvertical. Snout of moderate length, just longer than orbit, shorter than postorbital length. Interorbital width less than orbital diameter. Barbel less than half orbital diameter. Upper jaw longer than one-third length of head, with two enlarged outer series of curved teeth. Teeth in bands in both jaws, fine and tapering, small though not villiform. Suboperculum ending in a distinct flap behind and above rounded preopercular angle. First gill-slit restricted, more than half orbital diameter, with 10 tubercular inner gill-rakers, none on outer margin. Six branchiostegal rays.

Second spine of first dorsal fin smooth on anterior margin, base of fin shorter than interdorsal space. Fins without elongate filamentous rays, anal rays longer than those of second dorsal.

Body scales large, thin, wider than long, with divergent spinular ridges, the median slightly enlarged. Seven to nine ridges on body scales, the spinules sometimes obsolescent. Head scalation relatively dense, extending below infraorbital ridge and over lower jaw. Luminous organ small, more-or-less rounded, partly to completely covered by scales, situated midway between bases of ventral fins and anus. Anus distinctly anterior to anal fin.

Lateral line entire, arched proximally, descending to beyond anterior end of second dorsal fin. Sixteen to 18 tubercular pyloric caeca, about 15 mm in length.

TYPE-SPECIES: *Mahia matamua* n.sp.

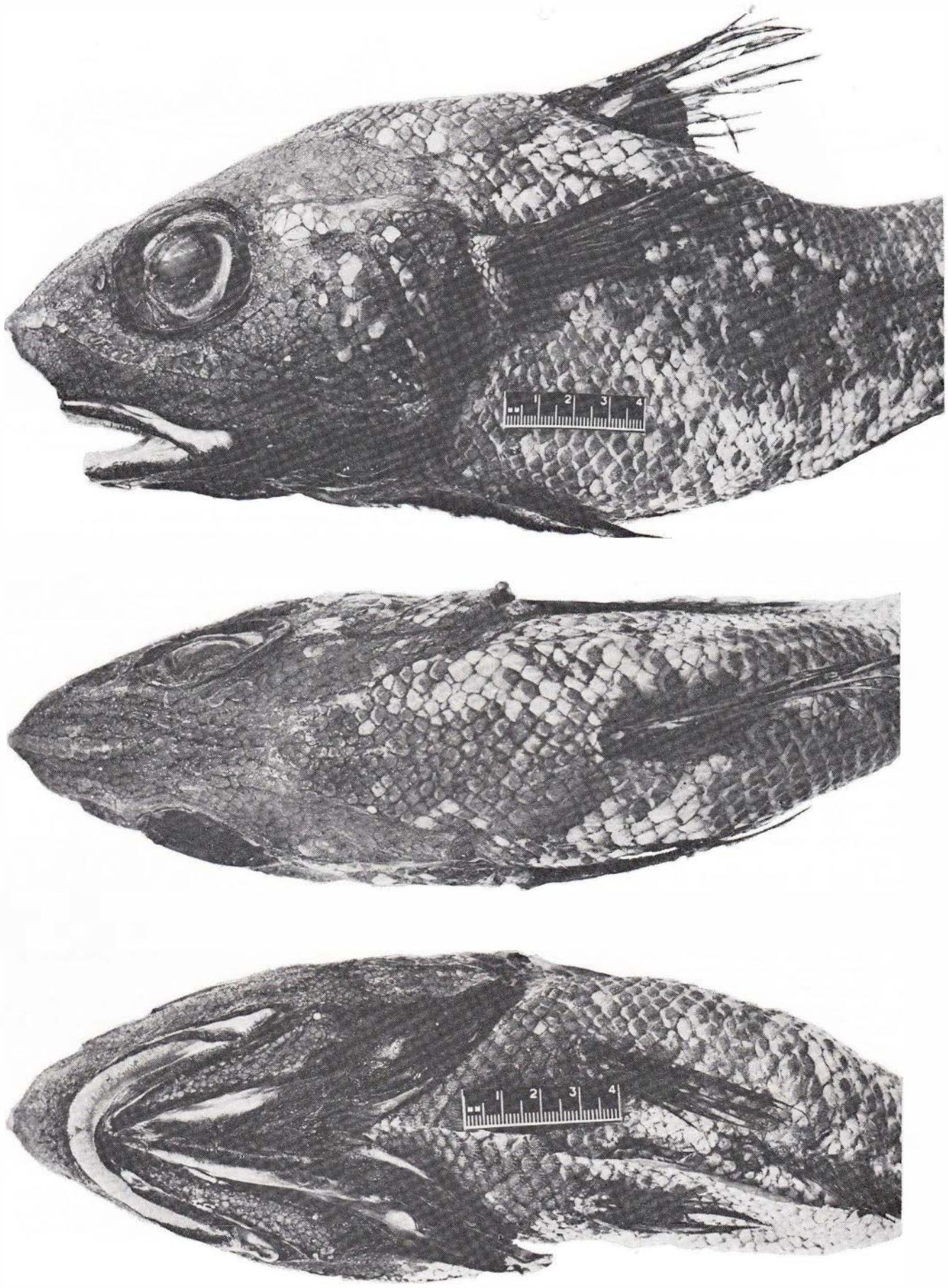
REMARKS: *Abyssicola* and *Coelorhynchus* are both closely related genera. The former differs in having the teeth triserial in the upper jaw and biserial in the lower, the inner series enlarged; in lacking the distinct subopercular flap; and in having fewer gill-rakers on the first gill-slit and a naked luminous organ. *Coelorhynchus* differs in having a more depressed head with the infraorbital ridge more prominent and the region below subhorizontal, and a smaller upper jaw and mouth. The species are generally smaller in total length. *Mahia* n.gen. is as distinct from *Coelorhynchus* as is *Abyssicola*. To include it in *Coelorhynchus* would suggest that *Abyssicola* should also be included. Conversely, to include it in *Abyssicola* would weaken that genus in comparison with *Coelorhynchus*.

Mahia matamua n.sp. (Figs 36–38)

Coelorhynchus sp. C Singleton & Skerman (1973).

GENERAL CHARACTERS: Head relatively large. Dorsal contour gradually rising from snout, almost horizontal at base of first dorsal fin, steepest in front of orbit, somewhat excavate above orbit; body gradually tapering posteriorly. Lateral line slightly arched proximally, and descending to beyond anterior end of second dorsal fin. First gill-arch with 10 tubercular gill-rakers on inner margin, none on outer margin. Fifteen tubercular pyloric caeca, up to 35 mm in length.

HEAD CHARACTERS: Snout moderately produced, tip pointed, with obtuse anterolateral angles; orbit more-or-less circular. Ridges of head moderately well defined. Frontal ridge flat-topped, prominent, extending to just past anterior orbital margin. Nasal ridge sharper, extending to anterolateral angle, continuous with supraorbital. Occipital ridges arising at about midline of orbit, slightly convergent for about first half of length, then divergent; postorbital ridge subcarinate, more-or-less horizontal, continuous anteriorly with supraorbital. Infraorbital ridge entire, low but strong, arching upward in front of anterior orbital margin to anterolateral angle of snout, slightly curved downward behind anterior orbital margin.



◁ Fig. 36. *Mahia matamua* n. gen. & sp. (holotype ♀, Stn E717; SL 202 mm).

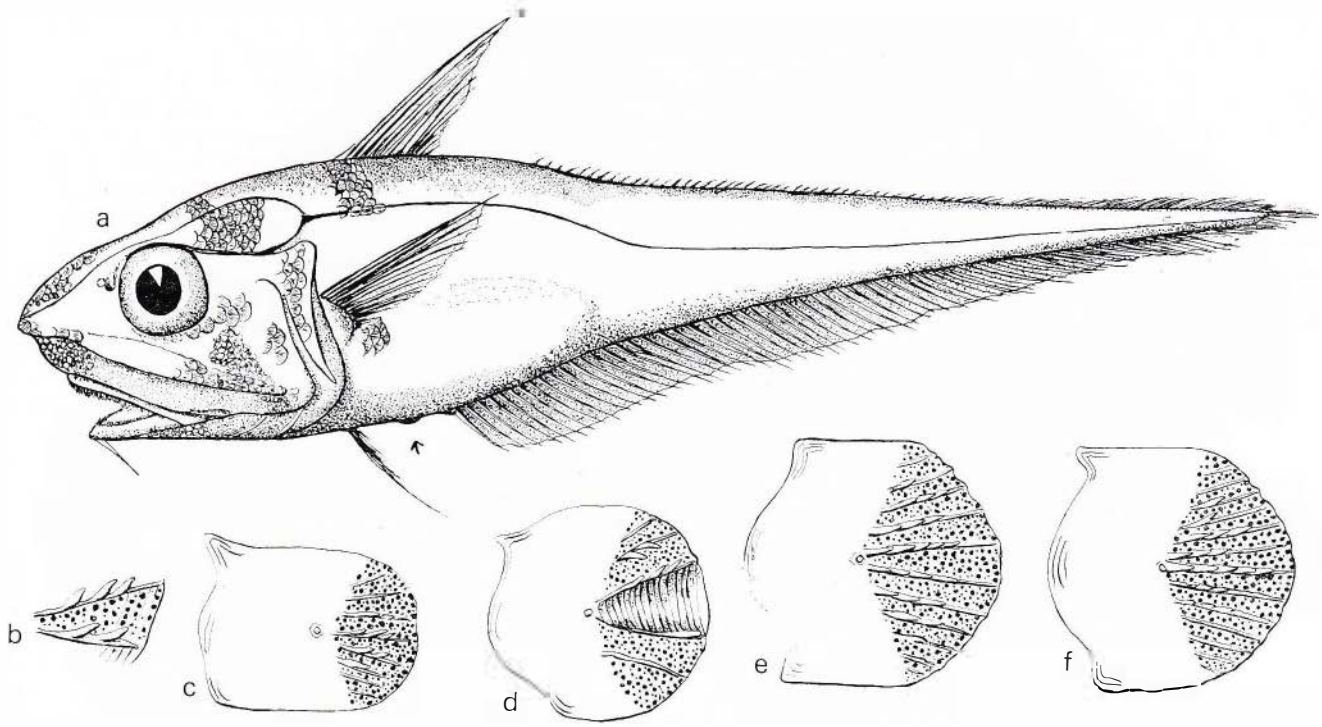


Fig. 37. *Mahia matamua* n. gen. & sp. (holotype ♀, Stn E717; SL 202 mm): a, profile (anus arrowed); b–f, scales (b, spinuous ridge of scale (enlarged); c, gular; d, LL; e, above LL; f, below LL). Scales (approx.)–a, x0.27; c–f, x3.

Region below ridge oblique. Mouth ventral, U-shaped, cleft extending from just behind anterolateral angle to midline of orbit, or just beyond. Teeth in bands in both jaws, outermost series largest.

SCALES: Body scales large and thin, wider than long, with divergent, spinular ridges, the median one slightly enlarged; ridges relatively high, seven to nine in number, spinules sometimes obsolescent. Five scales between first dorsal fin and lateral line. Head scales tending to a more elongate form, but variable. Median series of frontal ridge ovoid to subrectangular with ridges radiating from a point about one-third from anterior edge of scale, flanked on either side by a single series of subrectangular scales, wider than or as wide as long. Nasal ridge with one series of elongate, subcarinate scales flanked on inner side by one series of subrectangular scales, separated by a narrow, naked, slightly depressed line from lateral series of frontal ridge. Supraorbital ridge scales becoming carinate on posterior orbital margin, postorbital ridge series similar, occipital ridge series broader and lower. Median series between occipital and postorbital ridges subcarinate. Infraorbital ridge scales in two series from anterior orbital margin. No naked area between ridge and orbit. Anterolateral region of snout, lower half of nasal fossa, and underside of head and lower jaw scaled.

FINS: First dorsal fin arising just behind pectorals, second spine smooth. Ventrals inserted slightly behind pectorals and first dorsal, outer ray produced. Ray counts: D_1 11; P 17–18; V 7; D_2 124±; A 108±.

LUMINOUS ORGAN: The underside of the abdominal region is completely covered by scales, but when these are removed a thin, blackish line is visible, extending from the vent almost midway to the ventral fins (less than 50% orbital diameter) and with a small internal organ near its anterior end.

COLOUR: Generally umber dorsally, blue-black over abdominal region; fins and branchiostegal membranes black.

SUMMARY OF MEASUREMENTS (3 specimens):

	Mean	Min.	Max.
Total length (mm)		462±	645±
Standard length (mm)		137	202
Depth of body at D_1	57.0	53	63
Depth at anus	49.3	46	55
Length of head	73.0	72	74
Depth of head	47.7	45	51
Width of head	40.0	38	42
Snout to nostril	17.7	17	18
Snout to orbit	24.3	24	25

Fig. 38. *Mahia matamua* n. gen. & sp. (holotype, Stn E717; SL 202 mm): body scale (enlarged).

SUMMARY OF MEASUREMENTS, CONT'D:

Orbital diameter	22.7	22	24
Postorbital length	26.0	24	28
Interorbital length ..	16.7	16	18
Length of barbel	9.7	8	11
Snout to D_1	86.0	84	88
Base of D_1	19.0	15	22
Length of D_1	46.0	44	49
Interdorsal space	28.0	26	30
Snout to pectoral	76.7	76	77
Length of pectoral	41.0	37	47
Snout to ventral	81.3	79	83
Length of ventral	33.7	32	37
Snout to anal	108.7	106	112

MATERIAL EXAMINED:

Holotype: NZOI No. 193 (Stn E717; ♀). Paratypes: NZOI No. P270 (Stn E719). (2).

OTHER RECORDS:

Nil.

REMARKS: *Mahia matamua* n.sp. is a relatively large macrourid (TL 462–645 mm) known only from off Gisborne at depths of 750–913 m. It bears a superficial resemblance to *Abyssicola machrochir* (Günther) from Japan, but is easily distinguished by the character of the teeth and luminous organ. The holotype contained some partially digested remains of myctophid fishes (?*Diaphus* sp.), and remains of small crabs were present in the paratypes.

Coelorhynchus Giorna

Head moderate in size, more-or-less depressed anteriorly; ridges well developed, especially infraorbital, which extends to preopercular angle. Snout more-or-less elongate, terminating in a spine or tubercle. Mouth inferior, upper jaw shorter than one-third length of head, teeth villiform, usually in bands in both jaws, sometimes irregularly uniserial or biserial. Interoperculum hidden by preoperculum. Sensory canals of head well developed, usually covered by membrane or scales. Branchiostegal rays six. Gill-opening restricted, usually not extending below posterior orbital rim. First gill-slit narrow, restricted by fold of skin, gill-rakers tubercular, less than 12 on inner side of first gill-arch, usually none on outer side. Scales ctenoid with spinules usually borne on keel or secondary ridges. Head scales modified and strengthened, especially on ridges. Anus close to or distant from anal fin. Luminous organ present, of varying shape and form. Second spine of first dorsal fin smooth.

TYPE-SPECIES: *Lepidolepis coelorhynchus* Risso.

Subgenus **Quincuncia** Gilbert & Hubbs

Snout long, terminating in a sharp spine or point, anterolateral dorsal surface often largely naked, underside of snout scaled in anterolateral region only. Suboperculum with an acute flap at lower angle. Spinules on scales in irregular order or in divergent rows. Luminous organ long, the blackish streak extending from anus to near isthmus, longer than half length of head. Anus adjacent to anal fin. Base of ventral fin nearer to isthmus than anus.

Coelorhynchus (Quincuncia) campbellicus n.sp.
(Figs 39, 40, 60)

GENERAL CHARACTERS: Head relatively large. Dorsal contour gently rising to first dorsal fin, body then gradually tapering. Lateral line gently arched proximally. Ten tubercular pyloric caeca, about 22 mm in length. Seven gill-rakers on inner side of first gill-arch.

HEAD CHARACTERS: Snout depressed, lanceolate in dorsal aspect, tip acute; orbit dorsoventrally flattened. Head ridges well developed. Frontal ridge extending to about anterior margin of orbit, low and broad. Nasal ridge elongate, slightly convergent anteriorly. Postorbital ridges more acute, elongate, extending to preoperculum. Occipital ridges similar, slightly divergent posteriorly, extending almost as far as postorbital. Infraorbital continuous from tip of snout to preopercular angle, broader from anterior orbital margin. Suboperculum extending as small, acute flap below. Mouth entirely ventral, strongly curved, cleft short, extending from about midline of nasal fossa almost to midline of orbit. Teeth small, in bands in both jaws. Barbel short.

SCALES: Body scales moderately large, subcircular to subovoid, with up to 11 weakly divergent series of spinules, median series the strongest. Five scales between each dorsal fin and lateral line. Head scales elongate with three to five series of spinules. Frontal ridge with five longiseries of scales, i.e., one median flanked on either side by two rows. Nasal ridge with two longiseries of scales, one median and one inner, i.e., towards frontal ridge. Occipital and postorbital ridges with a single median series of scales; median series of scales between occipital and postorbital ridges slightly enlarged and carinate. Infraorbital ridge with two series of scales over most of length. Nasal fossa naked, distal margin outlined by enlarged scales of anterior orbital rim in a single series. A very narrow, scaleless, depressed area between frontal and infraorbital ridges and on either side of nasal ridge. Underside of head naked except for tip of snout and a single scale just below infraorbital ridge opposite posterior end of mouth.

FINS: Second spine of first dorsal smooth. First dorsal arising just behind pectorals. Ventral fins inserted almost directly below first dorsal, nearer to anus than to isthmus; outer ray pronounced, filamentous. Rays of second dorsal shorter than those of anal. Ray counts: D_1 10; P 15–17; V 7; D_2 90±; A 90±.

LUMINOUS ORGAN: A narrow, blackish streak extends from the anus almost to the isthmus (length 32 mm, i.e., 30% SL). Anterior photophore covered by scales, posterior ovoid, naked.

COLOUR (ex alcohol): Generally light brown, bluish-black over abdominal region, flanks, and dorsal fins; posterior portion of opercular plates and also orbital margins blackish.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	320±
Standard length (mm)	116
Depth of body at D_1	40
Depth at anus	24
Length of head	75
Depth of head	28
Width of head	30
Snout to nostril	27
Snout to orbit	35
Orbital diameter	20
Postorbital length	20
Interorbital width	15
Length of barbel	6
Snout to D_1	80
Base of D_1	14
Length of D_1	34
Interdorsal space	18
Snout to pectoral	77
Length of pectoral	29
Snout to ventral	84
Length of ventral	25
Snout to anal	105

MATERIAL EXAMINED:
Holotype: NZOI No. 194 (Stn F149; ♂).

OTHER RECORDS:
Nil.

DISTRIBUTION: Known only from the Campbell Plateau at 1026 m.

REMARKS: *C. campbellicus* n. sp. is very similar in many respects to *C. hubbsi* Matsubara, a Japanese species. The upper jaw is small, the anterolateral region of the upper side of the head is largely scaled, and the infraorbital ridge scales are in a double series throughout. It differs, however, in having shorter rays to the second dorsal fin, a shorter luminuous organ, a slightly more anterior

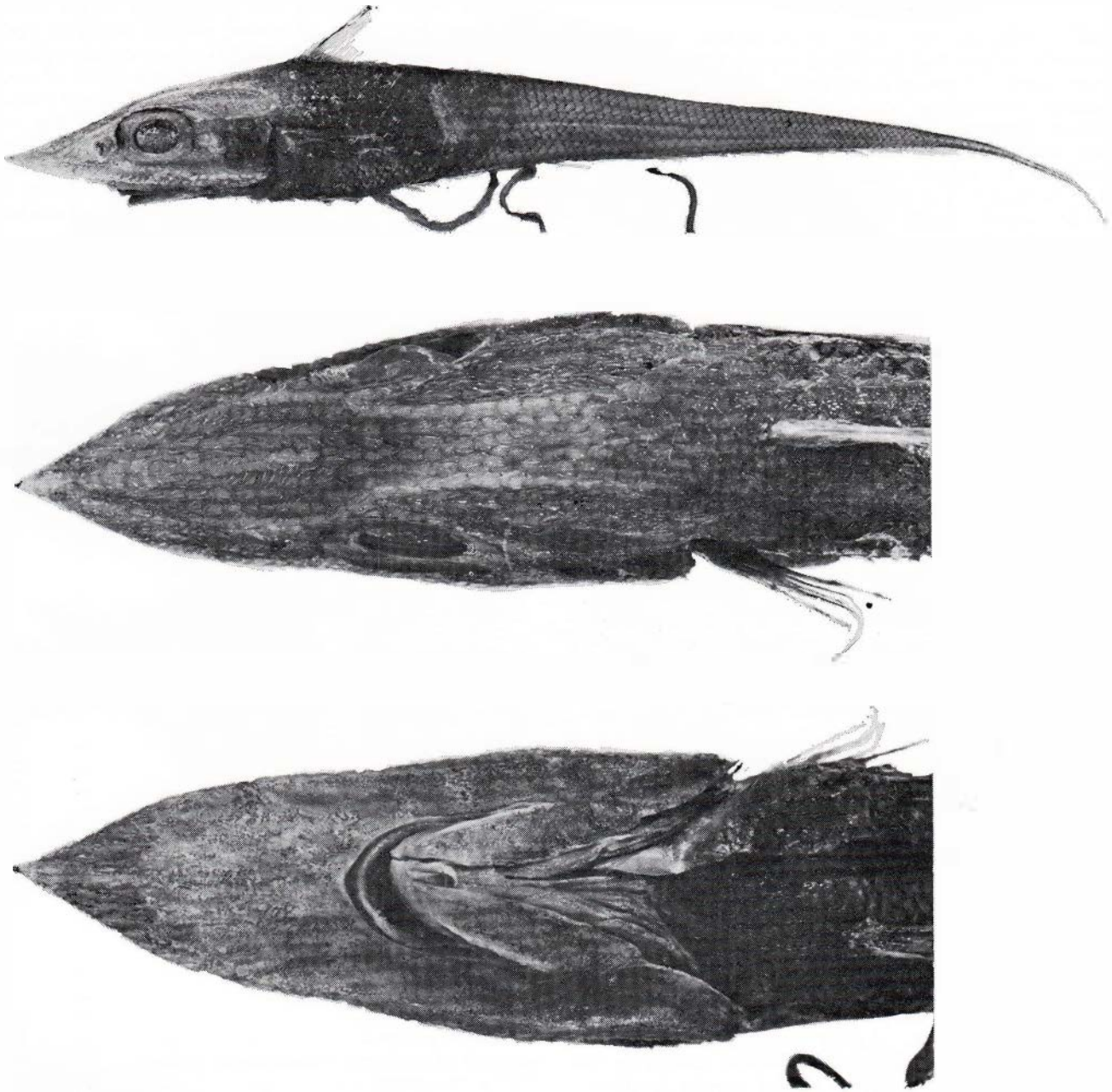


Fig. 39. *Coelorhynchus (Quincuncia) campbellicus* n. sp. (holotype ♂, Stn F149; SL 116 mm).

position of the ventral fins, and five scales between the first dorsal fin and lateral line. *C. acutirostris* Smith & Radcliffe, a Philippine species, is also closely related, differing in having a smaller orbit, a large interdorsal space, and slightly fewer pectoral rays. *C. gladius* Gilbert & Cramer is also similar, but has the spinulous scale ridges parallel, not divergent, and differs in some relative body measurements.

The stomach of the holotype contained parts of small, partially digested crustaceans, and the testes were apparently enlarging.

Subgenus **Paramacrurus** Bleeker

Snout short, concave on dorsal contour, terminating in a blunt, tricuspid tubercle. A large, subtriangular, naked area dorsally on each side of snout. Postorbital ridge continuous with supraorbital. Suboperculum with an acute flap at lower angle. Spinules on scales weak, in subparallel series. Luminous organ moderately long, visible as a blackish streak extending from anus to or beyond bases of pelvic fins, usually dilated at anterior end, length less than half that of head, more

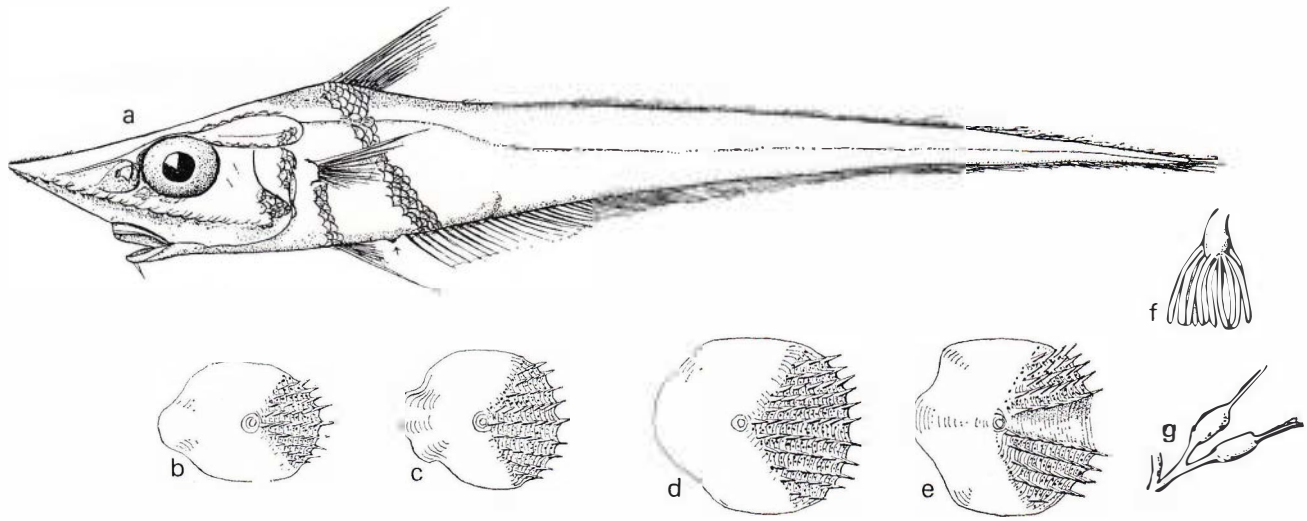


Fig. 40. *Coelorhynchus (Quincuncia) campbellicus* n. sp. (holotype ♂, Stn F149; SL 116 mm): a profile (anus arrowed); b–e, scales (b, above LL; c, gular; d, below LL; e, LL); f, pyloric caeca; g, testes. Scales (approx.)–a, f, g, x0.5; b–e, x5.

than half orbital diameter. Anus distinctly separated from anal fin by several rows of scales. Ventral fins midway between isthmus and anus, or closer to anus.

Coelorhynchus (Paramacrurus) innotabilis McCulloch
(Figs 41–43, 60)

Coelorhynchus innotabilis McCulloch, 1907: 348, pl. 63 (2, 2a). Gilbert & Hubbs, 1916: 144; 1920: 426, 429, 484.

GENERAL CHARACTERS: Head relatively large. Dorsal contour rising slowly to before or about base of first dorsal fin, body then slowly tapering. Lateral line almost straight anteriorly, descending below interdorsal space. Five short gill-rakers on inner side of first gill-arch, none on outer side. Twelve short pyloric caeca.

HEAD CHARACTERS: Snout produced, depressed, lanceolate in dorsal aspect, terminating in sharp spine; orbit ovoid. Frontal ridge extending to past anterior orbital margin, broad nasal ridge weakly sinuous. Occipital ridges arising anterior to centre of orbit, convergent for about first one-third of length, then slightly divergent; postorbital ridge more-or-less horizontal. Infraorbital ridge conspicuous, slightly sinuous, extending to preopercular angle. Mouth entirely ventral, small, cleft extending from below nasal fossa almost to midline of orbit. Teeth small, in three or four irregular series in both jaws, outermost the larger.

SCALES: Body scales of moderate size, subovoid, longer than wide, with spinules arranged in subparallel series varying in number from 4 to 14 with the position of scale and size of specimen. Free margin of scale scalloped, overhung by distal spinules of each series. Five (sometimes six) scales between each dorsal fin and lateral line. Scales on ridges of head elongate, carinate or subcarinate. Median series of frontal ridge subcarinate, flanked on either side by lower and broader scales in one continuous series, with a smaller second series on distal half of ridge. Scales on nasal, occipital, and postorbital ridges carinate and narrow. A series of small, subcarinate scales between nasal and frontal ridges, not extending to infraorbital ridge. Infraorbital ridge scales in a single series anteriorly, in two series behind about midline of orbit. Nasal fossa, anterolateral dorsal area, between orbit and infraorbital ridge, and underside of head and lower jaw scaleless; underside of head and jaw with several mucus pores.

FINS: Second spine of first dorsal smooth. First dorsal arising behind pectorals and ventrals. Outer ventral ray somewhat produced. Ray counts: D_1 11; P 15–(17); V 7; D_2 84±; A 144±.

LUMINOUS ORGAN: A narrow, scaleless, blackish streak extends from the anus to the base of the ventral fins. Two small, blackish areas flank it adjacent to the anus.

COLOUR: Anterior portion of head translucent, flushed with iridescent green and pink; pupil black, iris silver-grey; orbit and mouth with black margins. Dorsum light ochre with a metallic sheen. Dorsal fins greenish, pectorals and ventrals blackish. Branchial membrane and abdominal region black, fading posteriorly into light grey-brown.

SUMMARY OF MEASUREMENTS (13 specimens): *see* p. 61.

MATERIAL EXAMINED:

NZOI Stns E148 (1), E436 (1), E707 (1), E713 (1), E717 (1), E747 (1), E757 (2), E772 (1), E776 (1), E777 (1), E783 (1), E826 (2), F750 (1), F755 (2), F757 (2), F763 (1), F877 (1).

OTHER RECORDS:

Nil.

DISTRIBUTION: Bay of Plenty to Chatham Rise; also west coast of South Island, from off Cape Foulwind to off Solander Island. Depth range 554–1125 m. Previous records are from off eastern Australia.

REMARKS: *C. innotabilis* is related to *C. cingulatus* Gilbert & Hubbs, a Philippine species which has a longer snout, shorter orbital diameter, wider interorbital space, and dark vertical bars posteriorly. No other

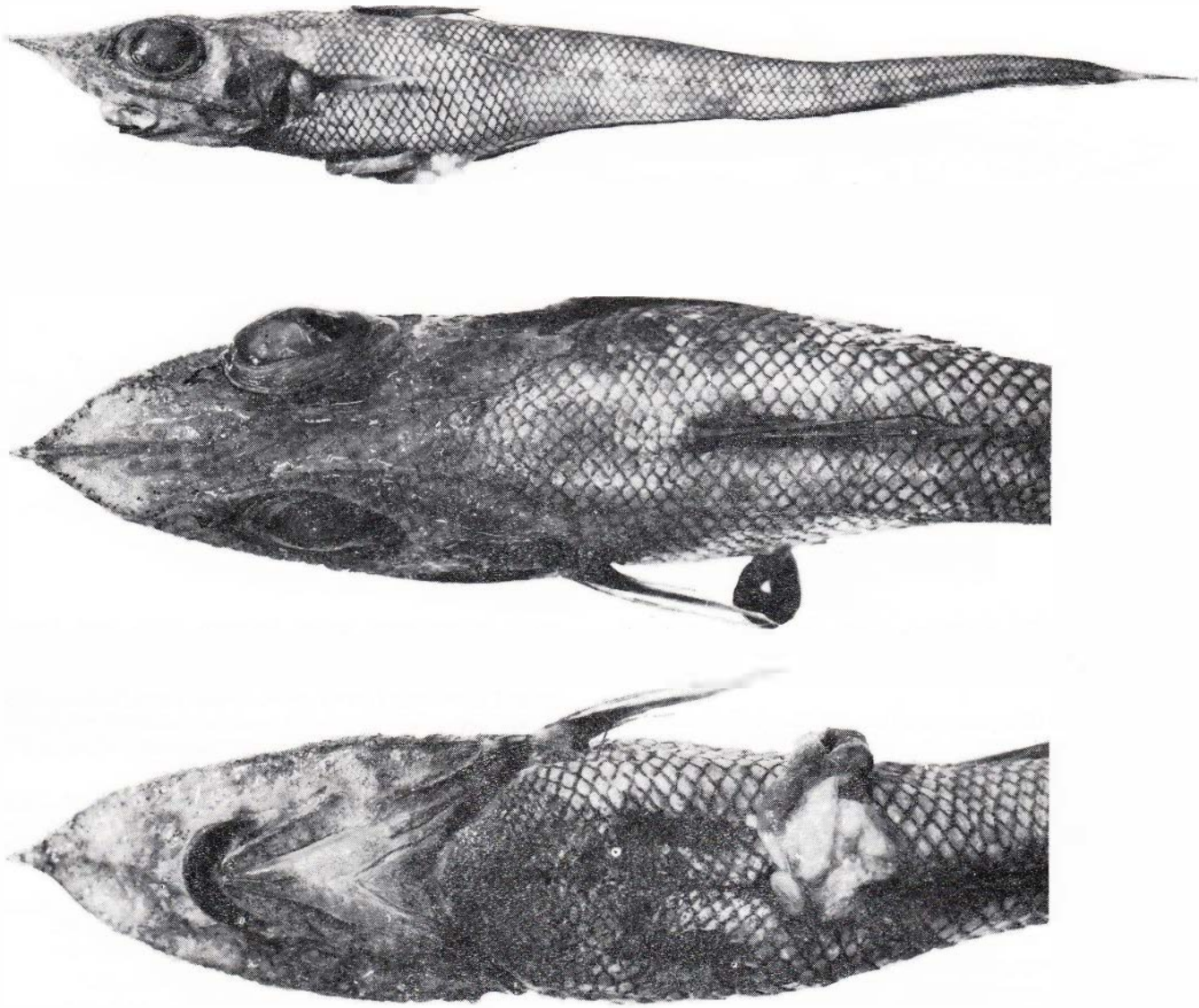


Fig. 41. *Coelorhynchus (Paramacrurus) innotabilis* (Stn E757; SL 111 mm).

species appears closely related. The material examined differs from the type in consistently having a narrower and shallower head, a shallower body, fins inserted closer to the snout, and a larger interdorsal space. The significance of these differences cannot be judged, however, until a suitable range of Australian material can be examined. One female specimen (Stn E757, 30. iii. 1967) extruded relatively large ova, suggesting that it was entering the breeding season.

Coelorhynchus (Paramacrurus) oliverianus Phillipps (Figs 44–47)

Coelorhynchus oliverianus Phillipps, 1927b: 125, pl. 3. Graham, 1953: 151.
Coelorinchus oliverianus Whitley, 1968: 38.

GENERAL CHARACTERS: Head relatively large. Dorsal contour rising slowing to first dorsal fin, body then gradually tapering. Lateral line with a broad downward curve below base of first dorsal fin. Ten denticulate, tubercular inner rakers on first gill-arch, none on outer side. Ten pyloric caeca.

HEAD CHARACTERS: Snout bluntly produced, subangular; orbit slightly ellipsoidal. Ridges of head well developed. Frontal ridge carinate, extending almost to midline of orbit, nasal ridge broadened above nasal fossa, narrowed in front. Occipital ridges convergent posteriorly, post-orbital curving upwards posteriorly. Infraorbital ridge continuous to preopercular angle, sharp at lower margin, curving upward below anteroventral margin of orbit, with a small sclerite at the tip. Mouth inferior, cleft extending from about anterior margin of orbit to just past midline of orbit. Teeth small, villiform, in bands in both jaws.

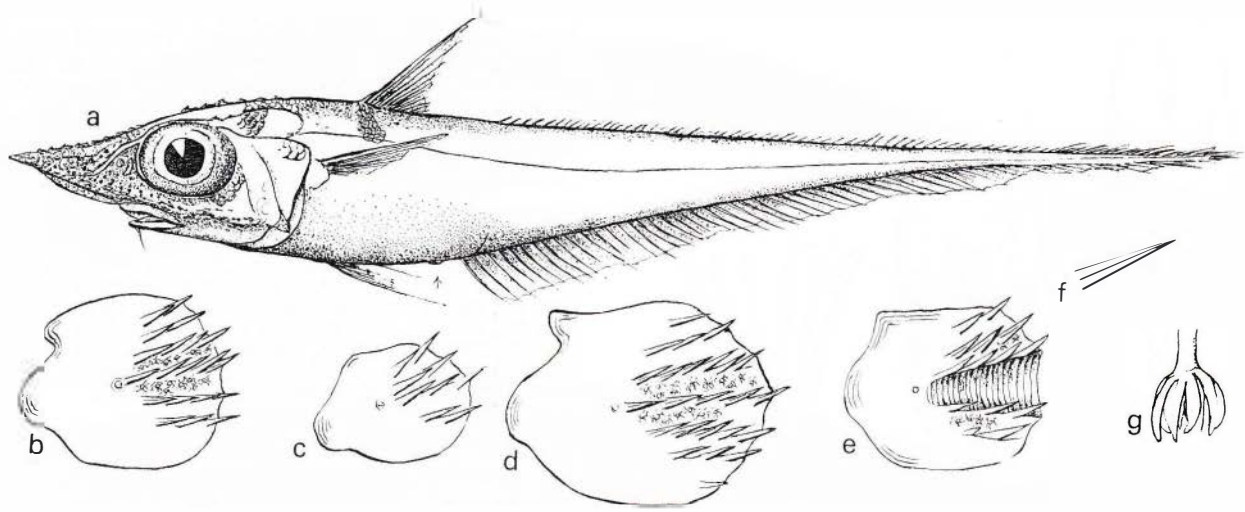


Fig. 42. *Coelorhynchus (Paramacrurus) innotabilis* (Stn E757; SL 111 mm): a, profile (anus arrowed); b–f, scales (b, above LL; c, gular; d, below LL; e, LL; f, scale spinule (enlarged)); g, pyloric caeca. Scales (approx.)–a, g, x0.5; b–e, x4.

Coelorhynchus (Paramacrurus) innotabilis: Summary of measurements (13 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					137	317
Standard length (mm)					47	111
Depth of body at D_1	32.38	0.54	1.94	6.00	27	35
Depth at anus	29.31	0.57	2.05	7.00	25	32
Length of head	71.46	0.89	3.23	4.51	67	77
Depth of head	30.58	0.89	1.80	5.89	28	33
Width of head	33.84	0.50	2.03	6.00	30	38
Snout to nostril	23.31	0.37	1.32	5.68	21	26
Snout to orbit	30.38	0.46	1.64	5.41	25	34
Orbital diameter	23.77	0.56	2.01	8.44	20	26
Postorbital length	17.31	0.89	3.20	18.46	13	22
Interorbital width	12.35	0.25	0.92	7.46	11	14
Length of barbel	6.27	0.23	0.75	11.95	5	8
Snout to D_1	80.08	0.65	2.34	2.92	77	85
Base of D_1	17.15	0.48	1.75	10.19	15	20
Length of D_1	38.77	0.86	2.99	7.72	32	42
Interdorsal space	11.08	0.55	1.98	17.69	8	15
Snout to pectoral	72.54	0.72	2.59	3.57	70	78
Length of pectoral	32.33	0.63	2.17	6.72	28	35
Snout to ventral	79.31	0.89	3.22	4.06	77	85
Length of ventral	30.23	1.43	5.16	17.07	26	43
Snout to anal	106.38	0.65	2.34	2.20	102	110

SCALES: Body scales rather easily dislodged, subovoid, generally wider than long, with five to seven divergent series of spinules. Three or four scales between dorsal fins and lateral line. Head scales elongate, with spinules directed upwards or backward. Frontal ridge with one median series of scales flanked on either side by two series of subovoid scales. Postorbital ridge with a single median series of elongate scales; occipital ridges with median series not differentiated. Infraorbital ridge scales in a double series over most of length. Nasal fossa, dorsal anterolateral area of snout, underside of head, and lower jaw scaleless.

FINS: Second spine of first dorsal smooth. First dorsal arising just anterior to pectorals. Outer ventral ray slightly produced. Ray counts: D_1 (10)–11–(12); P 15–(17–18); V 7; D_2 81–146±; A 60–144±.

LUMINOUS ORGAN: The luminous organ extends from the anus to between the ventral fins an as obovate, naked area connected to the anus by a narrow blackish

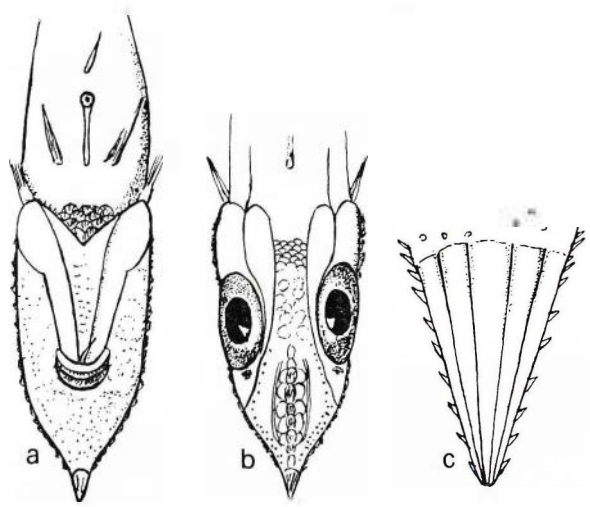


Fig. 43. *Coelorhynchus (Paramacrurus) innotabilis* (Stn E757; SL 111 mm): a, head and trunk, ventral aspect; b, head, dorsal aspect; c, extremity of snout, dorsal aspect. Scales (approx.)– a, b, x0.5; c, x4.

streak. Sometimes it may be partly or almost completely covered by scales.

COLOUR: Generally grey or grey-brown, turning yellow-brown or yellowish after preservation. Dorsal surface of head, including snout, translucent bluish or greenish. Undersurface blackish, particularly round the mouth; abdominal region and flanks blackish, though not as intense. First dorsal fin grey, blackish towards the tip, base of second dorsal fin blackish. Pectorals grey, bases black, surrounding the silvery areas of their insertion. Ventral fins black, the elongate outer ray whitish; anal fin blackish, base of rays darker. In preserved material the head is usually greyish and translucent.

SUMMARY OF MEASUREMENTS: (55 specimens) *see below.*

MATERIAL EXAMINED:

NZOI Stns B684 (2), C683 (1), D85 (1), D134 (3), D136 (5), D211 (1), D232 (8), D233 (1), D234 (3), D243 (1), D871 (1), D902 (1), D903 (3), D904 (1), E83 (1), E118 (1), E119 (1), D149 (1), E152 (2), E400 (6), incl. 2 juveniles, E421 (1), E422 (2), E423 (1), E428 (2), E433 (2), E434 (3), E435 (2), E711 (1), E717 (3), E748 (1), E771 (1), E780 (2), E781 (1), F100 (4), F105 (1), F150 (1), F758 (1), F760 (1), G224 (3), G249a (1), G259a (1), G293 (1), G305 (1), G335a (2), G651 (1), G652 (1), J29 (3), J31 (1), J35 (1), J36 (1).

OTHER RECORDS:

Cook Strait area (?) (Phillipps 1927b); Chatham Islands area (Moreland 1957).

DISTRIBUTION: Challenger Plateau, and from off Hawke Bay to Campbell Plateau, including Chatham Rise. Depth range 85–1245 m.

REMARKS: *C. oliverianus* is one of a trio of southern species of subgenus *Paramacrurus.* It differs from *C. fasciatus* Günther in having the interorbital space subequal to the postorbital and shorter than the snout (preorbital). Many of the relative dimensions differ in the range, mean, or standard deviation, the most significant (apart from those mentioned above) being the head length and depth, body depth at the first dorsal fin, point of origin of the fins, length of the pectoral fin, and interdorsal space. *C. mirus* McCulloch, reported from the Chatham Rise by Moreland (1957), is not present in any samples examined in this study. It can

Coelorhynchus (Paramacrurus) oliverianus: Summary of measurements (55 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					37	345
Standard length (mm)					115	101
Depth of body at D_1	48.67	0.39	2.85	5.86	43	54
Depth at anus	39.84	0.92	6.75	16.95	31	54
Length of head	74.49	0.56	4.18	5.61	67	85
Depth of head	46.80	0.34	2.50	5.34	41	52
Width of head	40.60	0.46	3.37	8.30	34	49
Snout to nostril	18.19	0.17	1.26	6.92	16	21
Snout to orbit	24.63	0.22	1.59	6.46	21	28
Orbital diameter	31.84	0.30	2.23	7.00	26	36
Postorbital length	18.09	0.39	2.84	15.68	10	25
Interorbital width	23.15	0.28	2.05	8.85	20	30
Length of barbel	7.46	0.21	1.36	18.27	5	10
Snout to D_1	78.55	0.69	5.11	6.51	67	89
Base of D_1	21.06	0.34	2.40	11.38	17	26
Length of D_1	53.76	0.66	4.29	7.98	40	62
Interdorsal space	25.63	0.67	4.85	18.91	16	35
Snout to pectoral	78.56	0.62	4.53	3.77	70	93
Length of pectoral	52.18	0.69	4.83	9.26	37	63
Snout to ventral	88.94	0.59	4.28	4.98	77	97
Length of ventral	43.28	0.96	6.52	15.06	28	55
Snout to anal	107.17	0.44	3.21	2.99	101	121

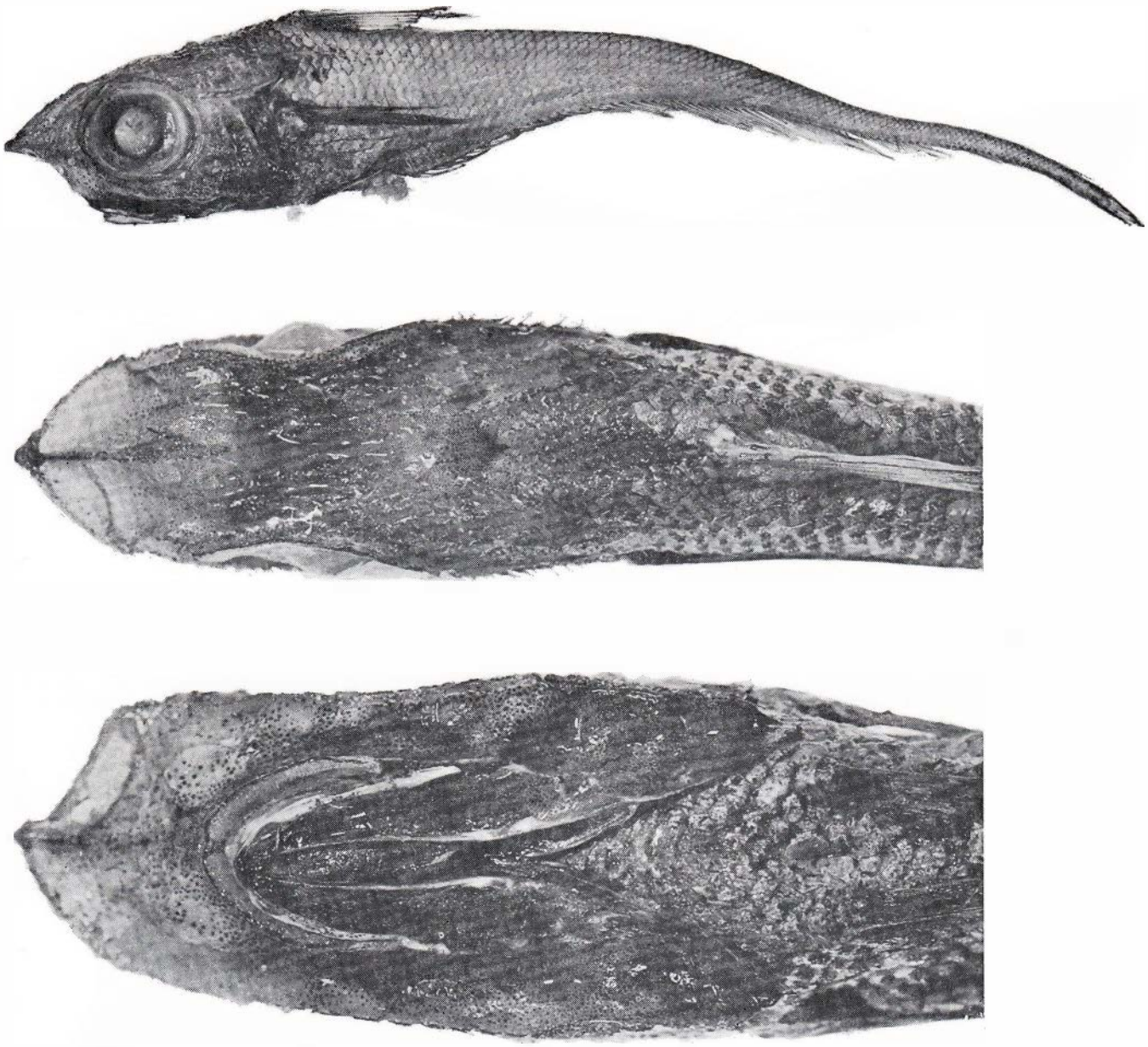


Fig. 44. *Coelorhynchus (Paramacrurus) oliverianus* (Stn E717; SL 95 mm).

be distinguished by the orbital diameter being larger than the postorbital length, and by the patch of scales posterior to the mouth angle on the underside of the head.

Sufficient specimens of *C. oliverianus* were examined to permit study of its distribution and characters. The total bathymetric range of specimens collected was 85–1245 m; however, only single juvenile specimens (approximately 50 mm long) were collected at the extremes of the range. The postlarval stages of several macrourids are known to be bathypelagic (Marshall 1964), and these specimens may well have been collected from waters some distance above the bottom. If so, the bathymetric range is more probably 202–839 mm. *C. oliverianus* was commonest at depths between 400 and 600 m; few specimens were collected from depths less than 400 m or over 800 m. Differences in sampling techniques and types of gear preclude catch rate analyses of the material, but the general bathymetric distribution is indicated below.

Fig. 45. *Coelorhynchus (Paramacrurus) oliverianus* (juvenile, Stn E400; SL 58 mm).

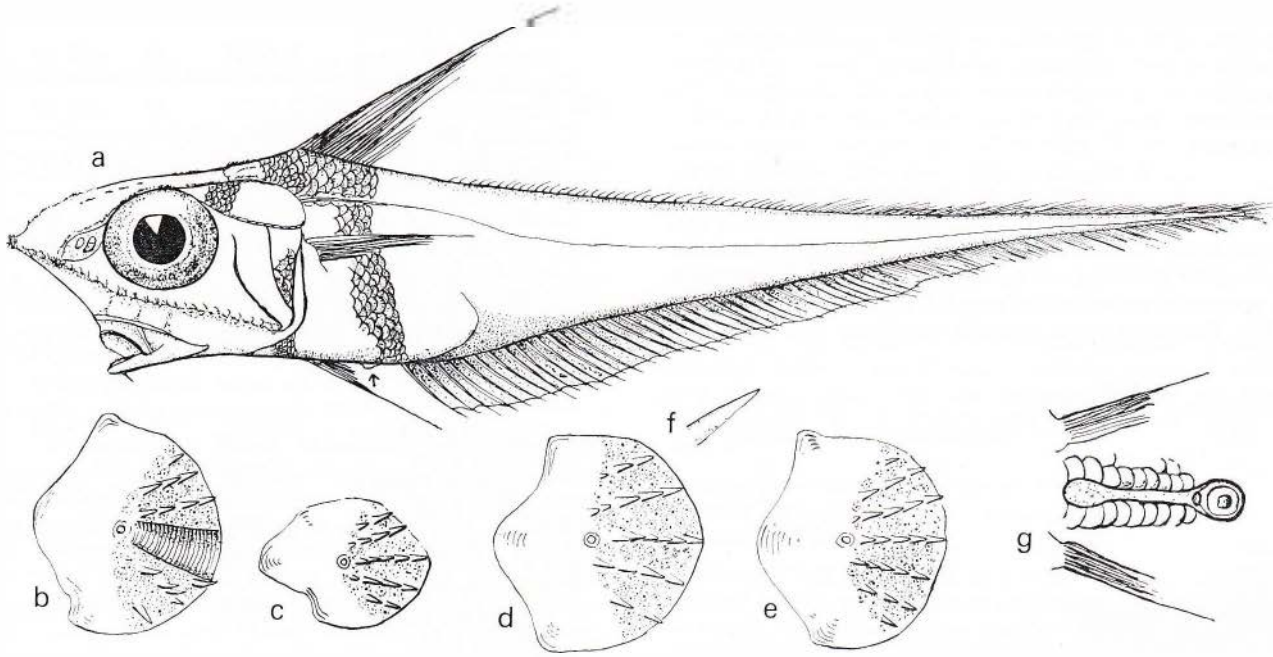


Fig. 46. *Coelorhynchus (Paramacrurus) oliverianus* (Stn E435; SL 88 mm): a, profile (anus arrowed); b–f, scales (b, LL; c, gular; d, above LL; e, below LL; f, scale spinule (enlarged)); g, luminous organ. Scales (approx.)–a, x0.6; b–e, x5; g, x2.

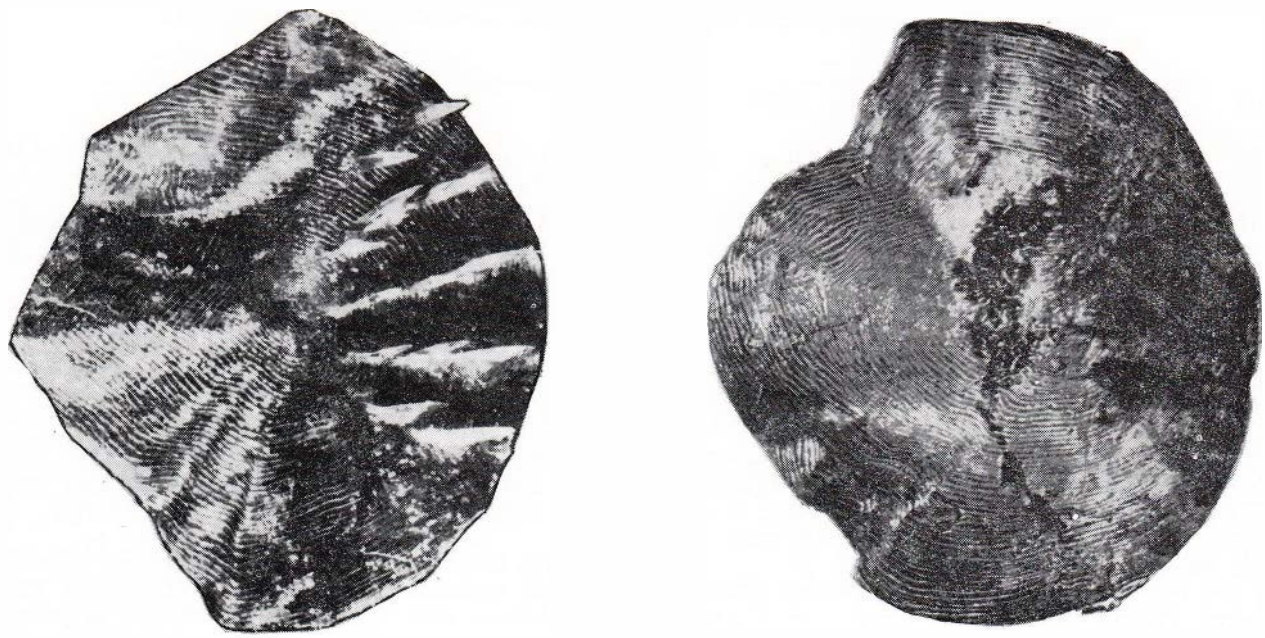


Fig. 47. *Coelorhynchus (Paramacrurus) oliverianus*: body scales, left–Stn E748, SL 75 mm; right–Stn E717, SL 95 mm (enlarged).

Depth (m)	% records	% specimens	No. of NZOI stations
0–199	2	1	15
200–399	6	8	14
400–599	62	60	43
600–799	26	26	25
800–999	2	4	22
1000–1199	0	0	13
1200–1399	2	1	10

The species is commonest in the central New Zealand area, i.e., between latitudes 40°S and 45°S, and it is not known from northern latitudes— 24°S–35°S —or from south of 50°S latitude. The range of latitude from which the species is recorded is from 33°S almost to 56°S, and within this area most records are from the Chatham Rise.

Latitude (S)	% records	% specimens	No. of NZOI stations
24–30°	0	0	0
30–35°	0	0	4
35–40°	22	28	31
40–45°	60	45	76
45–50°	18	27	35
50–57° 30	0	0	8

Sex determinations were made on several specimens, and the measurements of males (12 specimens) and females (14 specimens) were compared. Small differences in the means of some measurements were apparent, but none was significant at the 5% level ('t' test).

Specimens from three geographic areas were compared, the areas selected being the Challenger Plateau, Chatham Rise, and Campbell Plateau. Initially, differences between the groups were tested ('F' test), and the following were significant.

Summary of 't' tests

	't'	d.f.	P
Interorbital space			
Challenger Plateau/ Campbell Plateau	3.0163	30	<0.01
Chatham Rise/ Campbell Plateau	2.9020	30	<0.01
Chatham Rise/ Challenger Plateau	0.6834	30	0.5
Length of barbel			
Challenger Plateau/ Campbell Plateau	4.8396	19	<0.01
Chatham Rise/ Campbell Plateau	1.2208	30	0.3–0.2
Chatham Rise/ Challenger Plateau	2.2814	23	0.05–0.02
Interdorsal space			
Challenger Plateau/ Campbell Plateau	3.9851	25	<0.01
Chatham Rise/ Campbell Plateau	1.8352	30	0.1–0.05
Chatham Rise/ Challenger Plateau	2.3474	29	0.05–0.02
Length of ventral fin			
Challenger Plateau/ Campbell Plateau	2.3687	21	0.05–0.02
Chatham Rise/ Campbell Plateau	0.9629	26	0.4–0.3
Chatham Rise/ Challenger Plateau	4.1874	28	<0.01

Features apparent from this analysis are:

(i) The differences between the Campbell Plateau and Chatham Rise groups are, in general terms, less than between either group and the Challenger Plateau group, In general geographic terms this is to be expected.

Measurement	MEAN Challenger Plateau	MEAN Chatham Rise	MEAN Campbell Plateau	F	d.f.	P
Snout to nostril	17.7143	18.7778	17.9286	3.54	43,2	0.05–0.01
Interorbital space	22.5714	22.9444	24.8571	7.34	43,2	<0.01
Length of barbel	8.6667	7.8462	6.2222	6.76	31,2	<0.01
Interdorsal space	29.3077	25.1667	22.4826	7.93	42,2	<0.01
Length of ventral fin	49.0000	41.2500	43.2500	7.11	36,2	<0.01

Differences between the three pairs of the groups were tested for significance of 't'; highly significant differences ($P<0.01$) were apparent in 5 of the 15 tests, 4 were moderately significant ($P=0.05$–0.02), and 6 were only weakly significant ($P>0.05$).

Of the five tests made on the Challenger Plateau/ Campbell Plateau pair, 3 were highly significant, 1 moderately, and 1 weakly; and of the five tests on the Challenger Plateau/Chatham Rise pair, 1 was highly significant, 3 moderately, and 1 weakly. Of the five tests made on the Chatham Rise/Campbell Plateau pair, four were weakly significant and one highly.

because the linking bathyal zone between the Chatham Rise and the Campbell Plateau is shorter and broader than between either and the Challenger Plateau.

(ii) The Chatham Rise populations are less different in general statistical terms from the Campbell Plateau populations than the Challenger Plateau populations, suggesting that differences between the groups correlate to some degree with latitude, due perhaps either to the influence of local environment on the populations or to the segregation of eggs and young stages from different spawning areas by differing currents.

(iii) Distinct 'regional' characteristics are apparent in this species, and may well be found in other groups of benthopelagic fishes or bathyal animals in the New Zearand region.

Coelorhynchus (Paramacrurus) fasciatus (Günther)
(Figs. 48–53)

Macrurus fasciatus Günther, 1878: 24. Brauer, 1906: 259.
Macrurus (Coelorhynchus) fasciatus Günther 1887: 129, pl. 28 (A).
Coelorhynchus fasciatus McCulloch, 1907: 348. Gilbert & Hubbs, 1916: 144; 1920: 426. Smith, 1961:133, text-fig. 236.
Garichthys fasciatus Whitley, 1968: 38.

GENERAL CHARACTERS: Head large. Dorsal contour rising to base of first dorsal fin, often steeper in pre-orbital region, body then gradually tapering. Lateral line scarcely arched, descending slowly behind origin of second dorsal fin. Seven tubercular gill-rakers on inner side of first gill-arch, none on outer side. Fifteen to 16 tubercular pyloric caeca, up to 20 mm in length.

HEAD CHARACTERS: Snout subacute; orbit elliptical. Ridges of head moderately developed. Frontal ridge broad, extending to about anterior orbital margin; nasal ridge broad, not extending to infraorbital. Occipital ridges divergent at posterior end only, elsewhere parallel; postorbital ridge short, almost horizontal. Infraorbital ridge continuous, slightly curved throughout entire length, sometimes with obtuse sclerites developed at tip of snout and anterolateral angles. Mouth entirely ventral, cleft extending from nasal fossa or anterior orbital margin to about midline of orbit. Teeth small, in bands in both jaws.

SCALES: Body scales relatively large, subrectangular, longer than wide or as long as wide, with 7–15 slightly divergent series of spinules which overlap distal border. Median series often slightly enlarged. Three or four scales between base of first dorsal fin and lateral line, four between second dorsal fin and lateral line. Head scales elongate, median series of spinules usually enlarged. Median series of frontal ridge flanked by two outer series on either side. A single series on occipital and post-orbital ridges, the latter continuous with a series of scales around upper orbital border. Median series of scales between these two ridges enlarged. Scales of infra-orbital ridge in a double series from anterior orbital margin. Nasal fossa and area below naked, area on either side of and in front of nasal ridge naked. A small scaled area just above anterolateral margin of infraorbital ridge. Underside of head and lower jaw scaleless.

FINS: Second spine of first dorsal smooth. Pectorals inserted below first dorsal; ventrals inserted behind first dorsal, outer ray of ventral slightly produced. Ray counts: D_1 11; P (13)–15–(17); V (6)–7; D_2 88±; A89±.

LUMINOUS ORGAN: A narrow, blackish, scaleless area extends forward from the anus to about the bases of the pectoral fins.

COLOUR: Dull grey with a varying number of darker vertical bands, up to eight in smaller specimens, tapering ventrally, the widest below the first dorsal fin. Preserved specimens often brownish.

SUMMARY OF MEASUREMENTS (50 specimens): *see below*

MATERIAL EXAMINED:
NZOI Stns C605 (1), D85 (1), D134 (2), D136 (2), D137 (4, incl. 1 juvenile), D138 (1), D145 (1), D179 (2), D203 (1), D205 (2), D211 (7), E118 (2), E400 (2), E410 (1), E422 (1), E423 (2), E756 (2),

Coelorhynchus (Paramacrurus) fasciatus: Summary of measurements (50 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					50	444
Standard length (mm)					17	152
Depth of body at D_1	43.50	0.34	2.43	5.71	36	48
Depth at anus	38.04	0.76	3.36	8.84	29	44
Length of head	69.84	0.60	4.23	8.48	61	82
Depth of head	40.14	0.36	2.51	6.26	36	47
Width of head	41.20	0.38	2.70	6.55	33	47
Snout to nostril	15.74	0.22	1.56	9.91	13	21
Snout to orbit	23.04	0.35	2.44	10.59	20	32
Orbital diameter	29.72	0.31	2.18	7.34	24	35
Postorbital length	17.04	0.28	2.00	11.73	13	24
Interorbital width	13.94	0.22	1.58	11.33	11	21
Length of barbel	7.48	0.16	1.10	14.70	6	10
Snout to D_1	77.62	0.59	4.16	5.35	69	85
Base of D_1	18.62	0.26	1.86	10.01	13	24
Length of D_1	50.68	0.54	3.84	7.57	44	57
Interdorsal space	16.32	0.37	2.65	16.23	11	22
Snout to pectoral	71.24	0.40	2.85	11.01	65	80
Length of pectoral	39.70	0.97	6.86	17.25	29	51
Snout to ventral	78.94	0.39	2.75	3.49	72	85
Length of ventral	40.60	0.65	4.61	11.35	28	53
Snout to anal	103.88	0.22	1.54	1.47	102	107

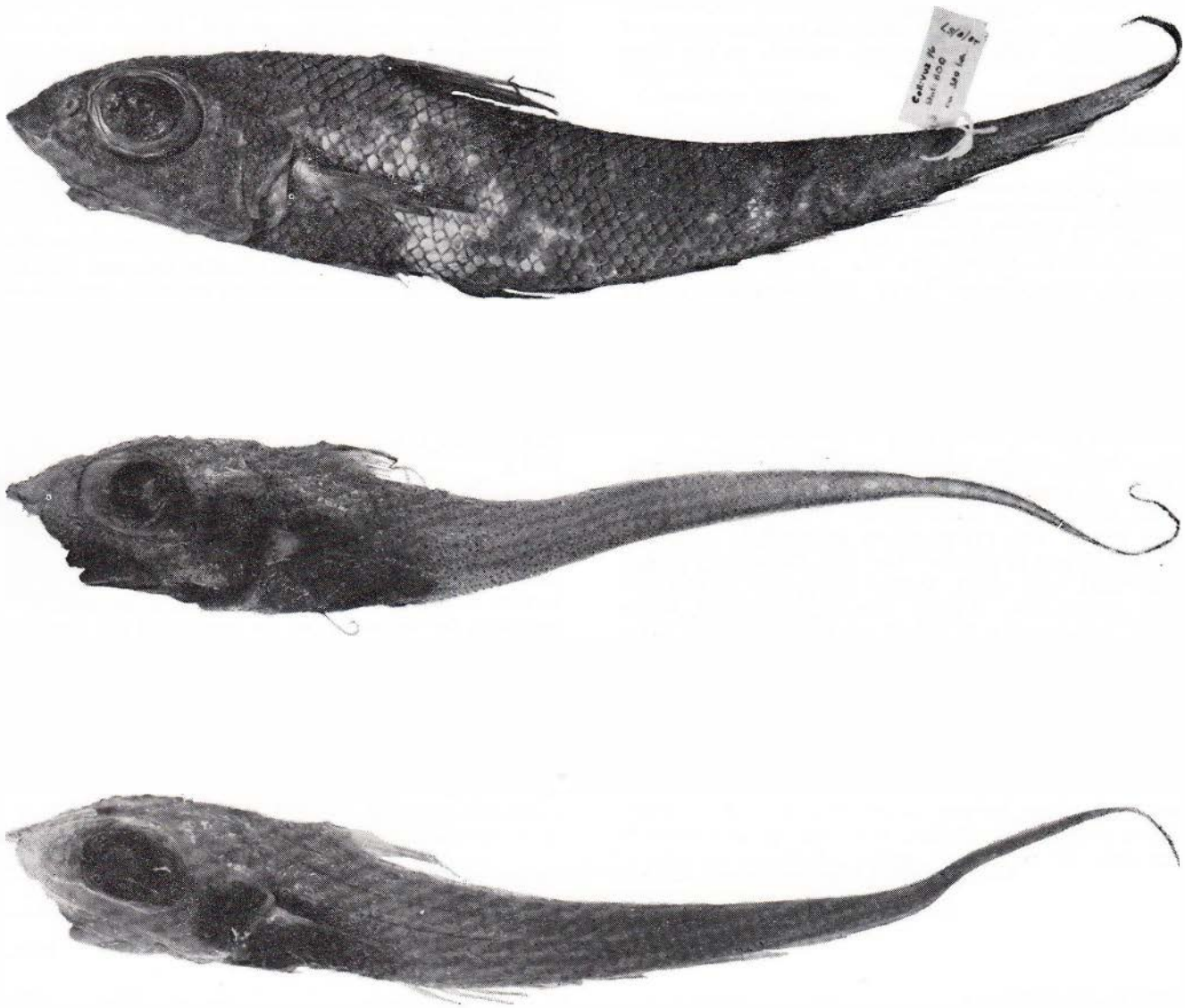


Fig. 48. *Coelorhynchus (Paramacrurus) fasciatus*: upper–adult, Stn VUZ96, SL 149 mm; middle–juvenile, Stn D137, SL 35 mm; lower–juvenile, Stn F108, SL 28.5 mm.

E878 (1), F80 (1), F100 (1), F102 (1), F104 (3), F105 (1), F107 (1), F108 (1 juvenile), F109 (2), F124 (1), F135 (2), F144 (3), F150 (1), F151 (2), F868 (1), J36 (2); **also** Victoria University Zoology Department No. VUZ96 (3).

OTHER RECORDS:

Chatham Islands and Rise (Moreland 1957).

DISTRIBUTION: From off Kaikoura to the Campbell Plateau, including the Chatham Rise. Also South Africa, southern Australia, and South America. Depth range 366–1086 m.

REMARKS: This species has been discussed under *C. oliverianus*. Sufficient specimens have been collected for analysis of its distribution. The depth range is 366–1086 m, most specimens occurring between 400–598 m and 600–799 m; records are few for the zones 200–399 m and 800–1199 m. In contrast to *C. oliverianus*, the percentages of records in the zones 400–599 m and 600–799 m are almost equal.

Depth (m)	% records	% specimens	No. of NZOI stations
0–199	0	0	15
200–399	3	2	14
400–599	40	39	43
600–799	37	42	25
800–999	13	13	22
1000–1199	7	4	13
1200–1399	0	0	10

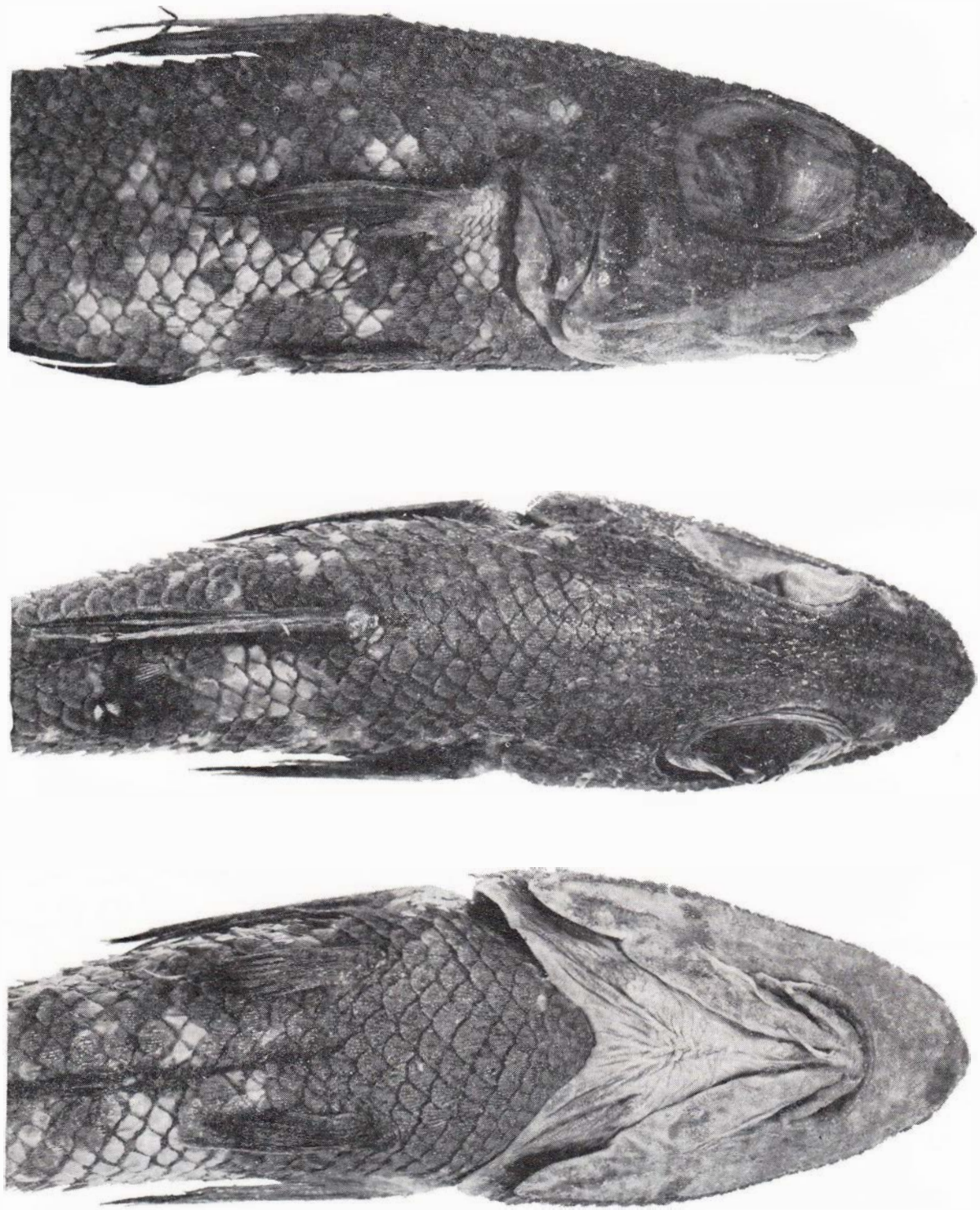


Fig. 49. *Coelorhynchus (Paramacrurus) fasciatus* (Stn VUZ96; SL 149 mm).

◁ Fig. 50. *Coelorhynchus (Paramacrurus) fasciatus:* juveniles, upper–Stn D137, SL 35 mm; lower–Stn F108, SL 28.5 mm.

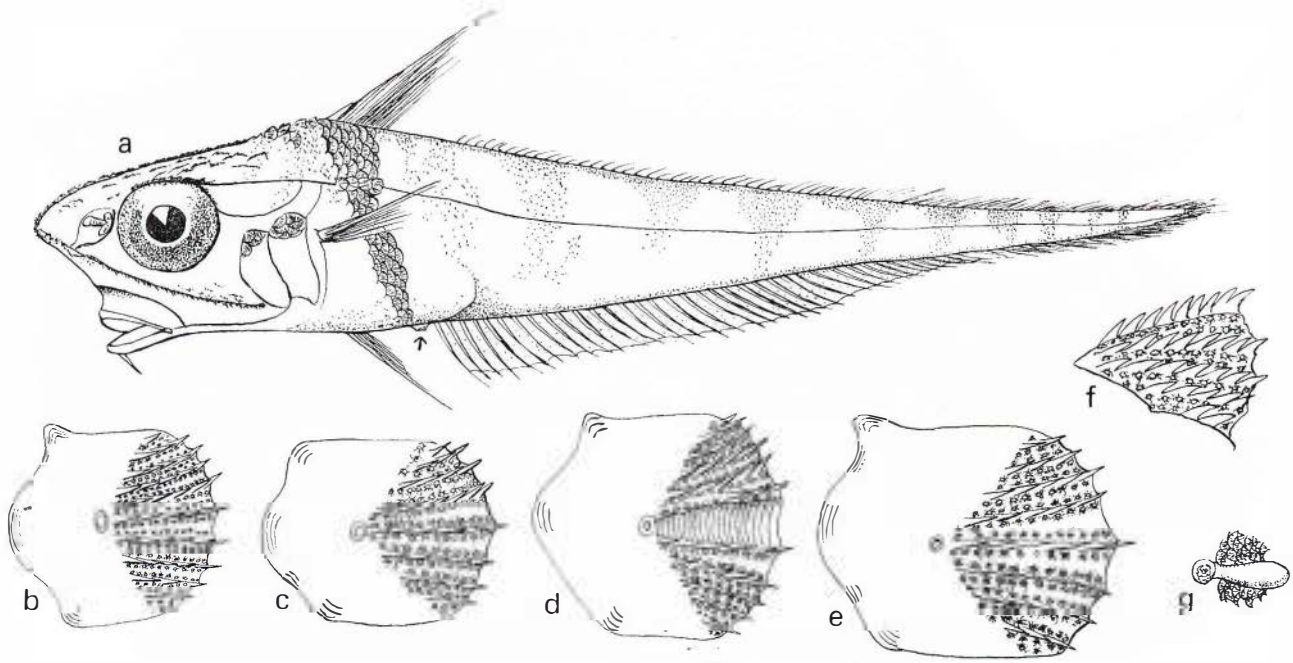


Fig. 51. *Coelorhynchus (Paramacrurus) fasciatus* (Stn E400; SL 94 mm): a, profile (anus arrowed); b–f, scales (b, above LL; c, gular; d, LL; e, below LL; f, scale spinule (enlarged)); g, luminous organ. Scales (approx.)–a, x0.6; b–e, x5; g, x2.

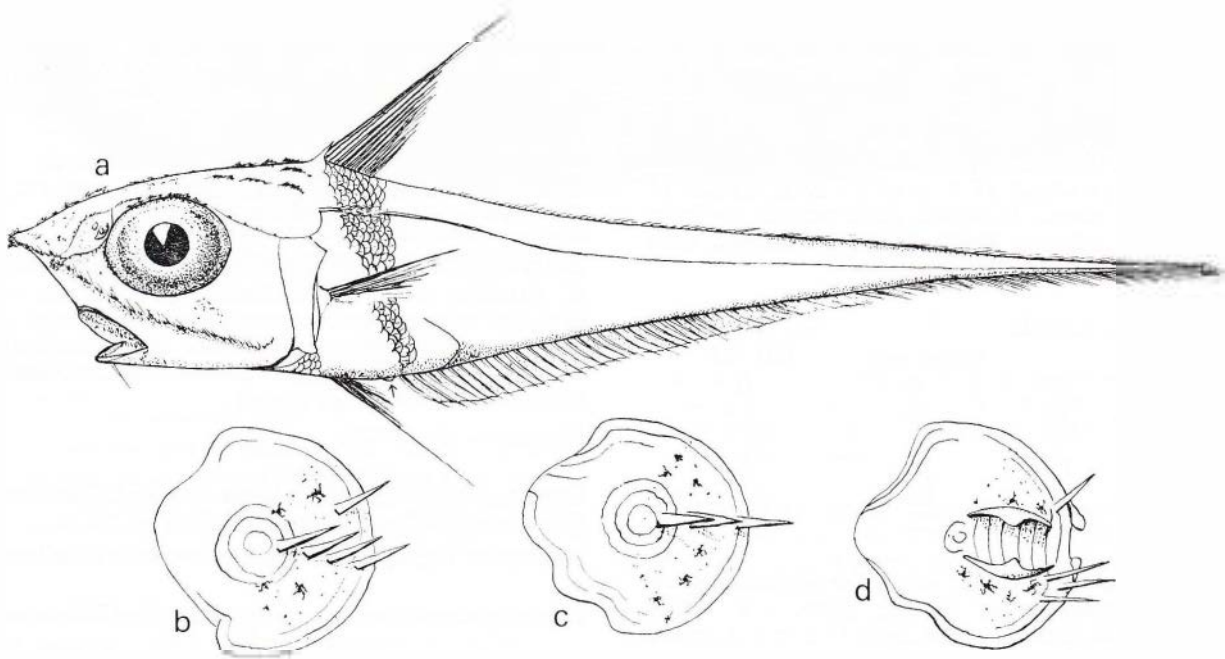


Fig. 52. *Coelorhynchus (Paramacrurus) fasciatus* (juvenile, Stn D137; SL 35 mm): a, profile (anus arrowed); b, c, body scales; d, LL scale. Scales (approx.)–a, x2; b–d, x5.

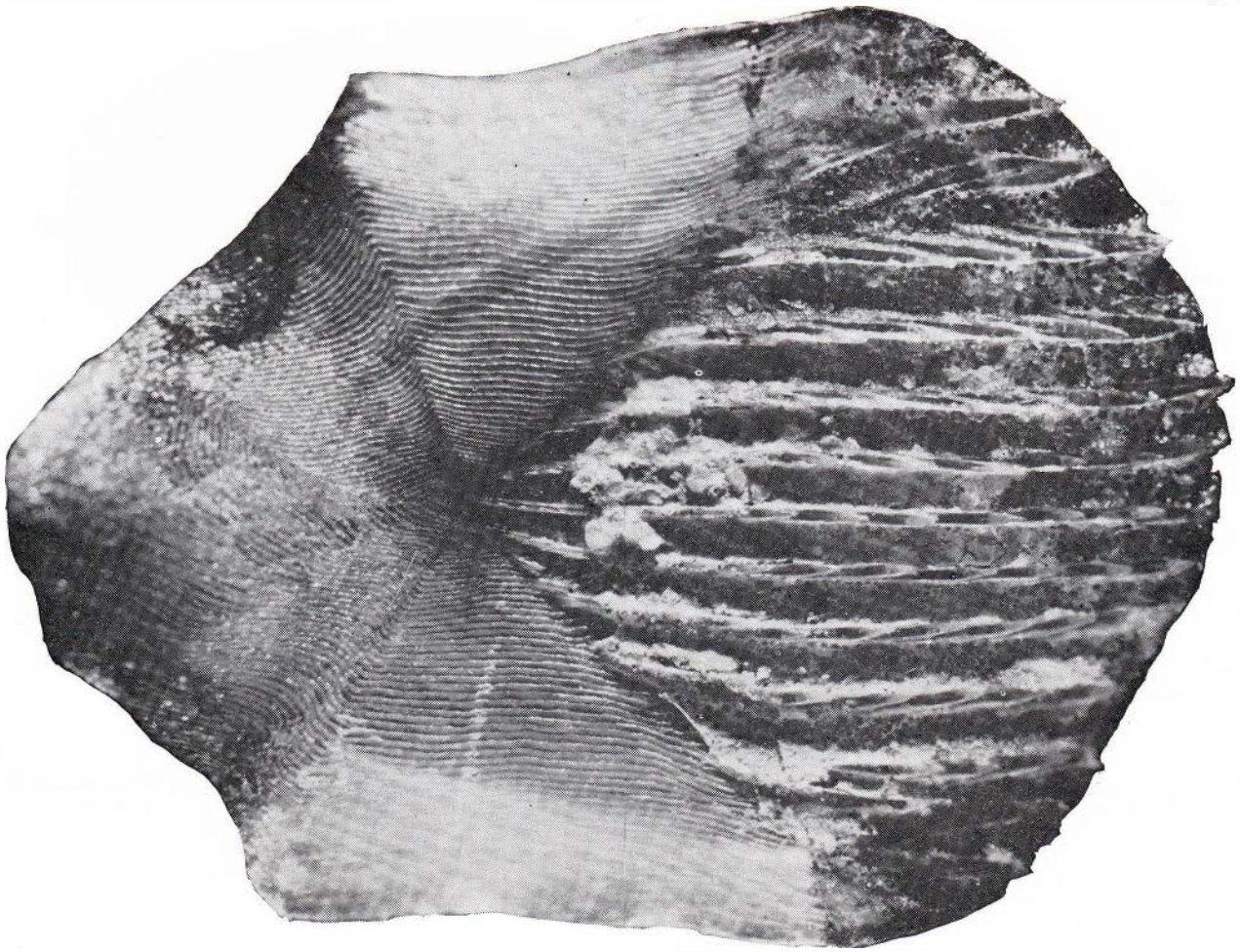


Fig. 53. *Coelorhynchus (Paramacrurus) fasciatus:* (Stn VUZ96, SL 149 mm): body scale (enlarged).

The range of latitude from which the species has been collected is from about 37°30′S to 53°30′S, similar to that for *C. oliverianus*. However, most records are from 45°S to 50°S, whereas those of *C. oliverianus* were densest between 40°S and 45°S.

Latitude (S)	% records	% specimens	No. of NZOI stations
24°–30°	0	0	0
30°–35°	0	0	4
35°–40°	10	7	31
40°–45°	17	16	76
45°–50°	63	65	35
50°–57° 30′	10	12	8

Insufficient specimens were sexed for statistical comparison of measurements of the sexes, but visual inspection of the data suggests little if any difference, as was found for *C. oliverianus*. Geographic differences in measurements have not been analysed, since there is only one record from the Challenger Plateau and four from the Chatham Rise.

Coelorhynchus (Paramacrurus) mirus McCulloch

Coelorhynchus (Paramacrurus) mirus McCulloch, 1926: 178, pl. 46.
Coelorhynchus mirus Moreland, 1957: 34.
Garichthys mirus Whitley, 1968: 38.

DIAGNOSTIC FEATURES: Similar in general appearance to *C. fasciatus* and *C. oliverianus*, but with the orbital diameter subequal to the post-orbital length, not longer; the interorbital space smaller than the postorbital, not subequal or larger; and the underside of the head behind the mouth angle scaled.

MATERIAL EXAMINED:
Nil.

DISTRIBUTION: Chatham Islands area and Chatham Rise (Moreland 1957); also east of Sydney at 274 m.

REMARKS: This species is discussed under *C. oliverianus*.

Coelorhynchus (Paramacrurus) australis (Richardson) (Figs 54–57)

Lepidoleprus australis Richardson, 1839: 100.
Macrurus australis Günther, 1862: 391. Hutton, 1872: 49, pl. 8 (78).
Macrurus (Coelorhynchus) australis Günther, 1887: 127.

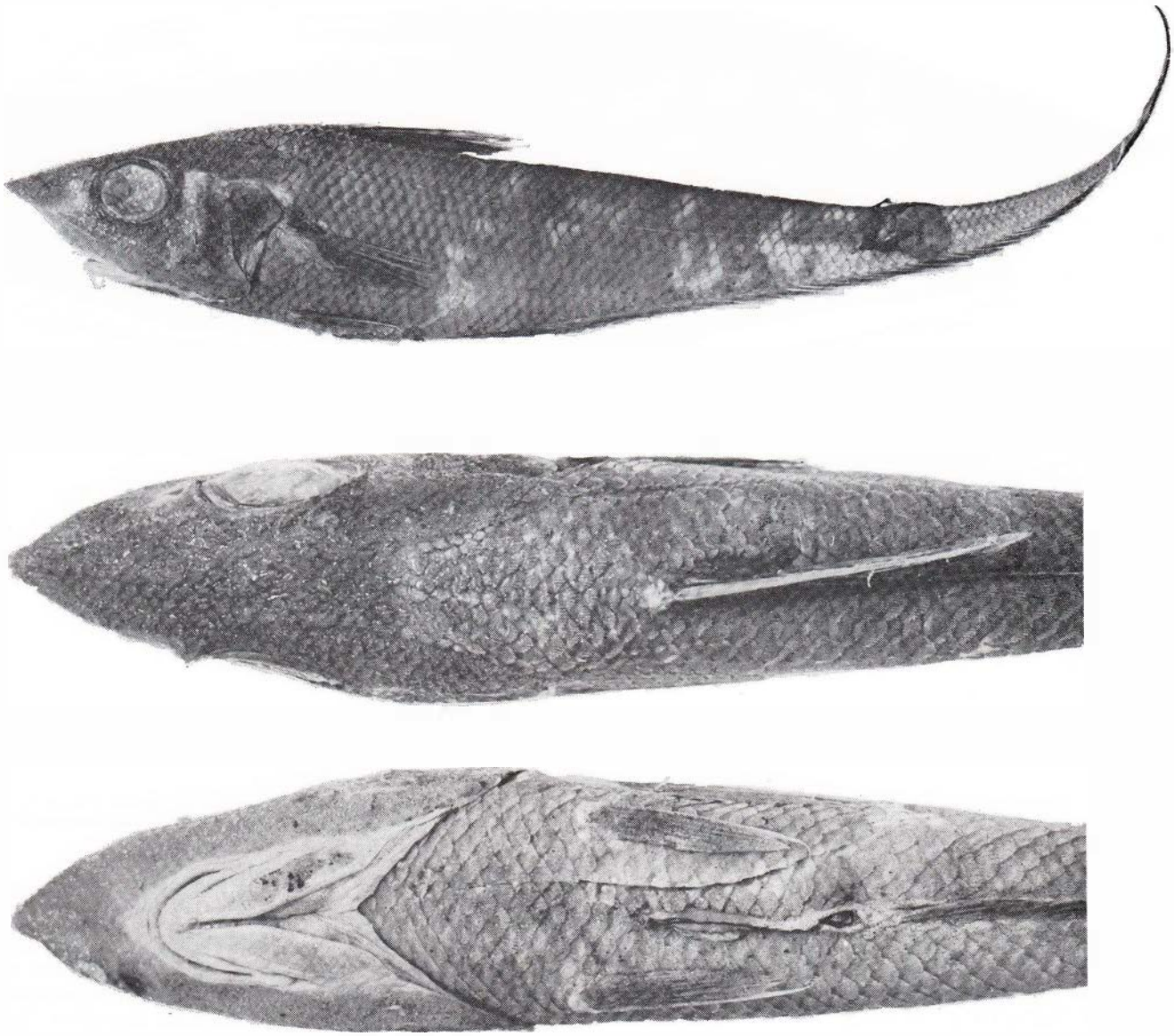


Fig. 54. *Coelorhynchus (Paramacrurus) australis* (Stn Z2077; SL 147 mm).

Coelorhynchus australis Waite, 1911: 177, pl. 29 (1). Phillipps, 1927a: 22.
Paramacrurus australis Whitley, 1968: 37.

GENERAL CHARACTERS: Head large. Dorsal contour rising to base of first dorsal fin, slightly convex. Lateral line gently descending behind base of first dorsal fin. First gill-arch with eight tubercular inner rakers, none on outer face. Thirty-six or more relatively short pyloric caeca.

HEAD CHARACTERS: Snout produced, acute in dorsal and lateral aspects; orbit elliptic. Ridges of head only moderately developed. Frontal ridge broad, extending to just beyond anterior margins of orbit; nasal ridges broad, ill defined. Occipital ridges divergent posteriorly, postorbital slightly descending posteriorly. Infraorbital ridge continuous to preopercular angle, slightly and very broadly sinuous. Mouth inferior, cleft extending from nasal fossa to about midline of orbit. Teeth small, in bands in both jaws.

SCALES: Body scales large, subrectangular, wider than long, with spinules arranged in 9–18 subparallel or weakly divergent series, the greatest number of series on flank scales. Three (rarely four) scales between base of first dorsal fin and lateral line. Head scales elongate, numerous. Frontal ridge with two or three series on either side of median row, median series of occipital and postorbital ridges carinate. Two series of scales on infraorbital ridge anteriorly, three behind midline of orbit. Underside of head and lower jaw densely scaled.

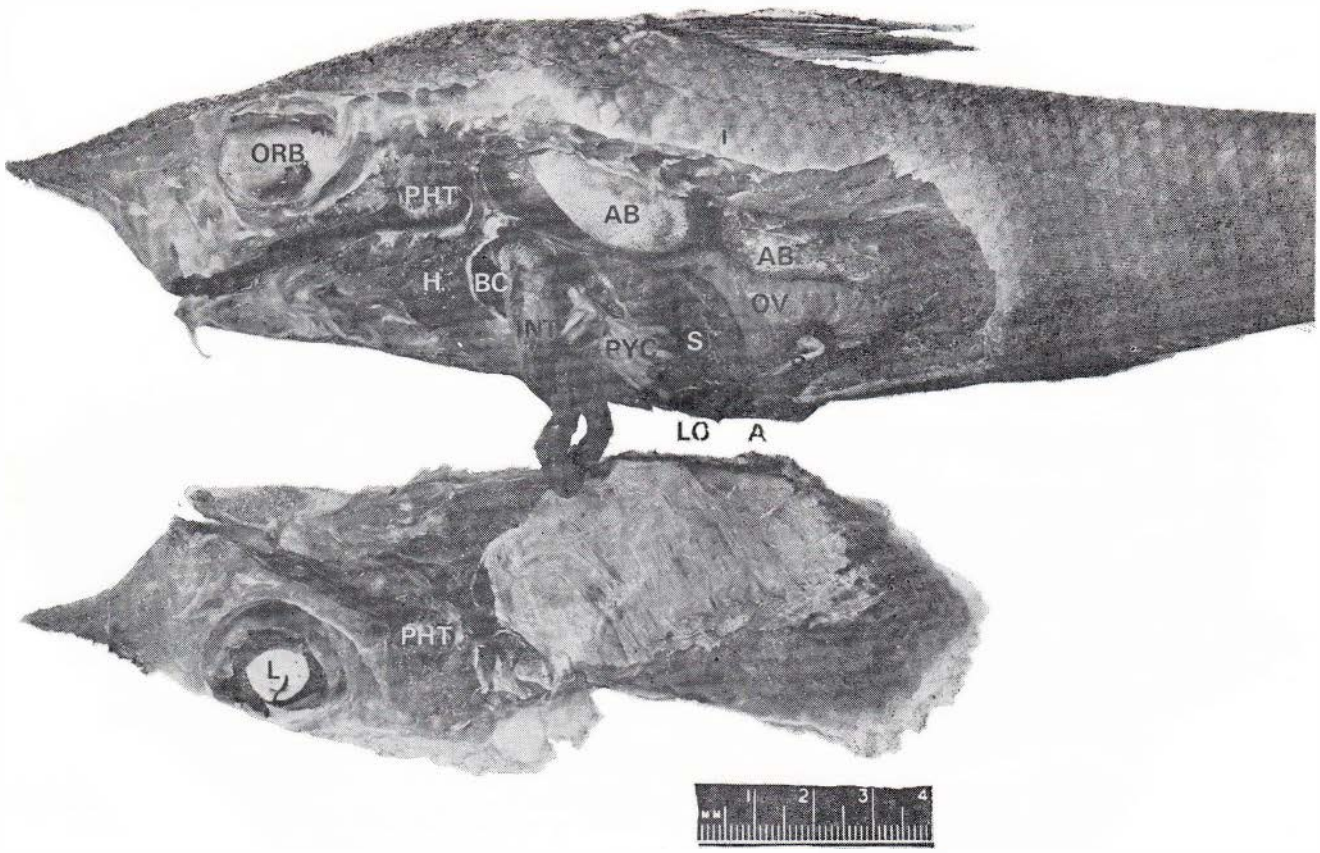


Fig. 55. *Coelorhynchus (Paramacrurus) australis* (♀, Stn G155; SL 153 mm): dissection showing arrangement of viscera (A, anus; AB, air bladder; BC, body cavity; H, heart; INT, intestine; L, lens; LO, luminous organ; ORB, orbit; OV, ovary; PHT, pharyngeal teeth; PYC, pyloric caeca; R, rectum; S, stomach).

FINS: Second spine of first dorsal smooth. Pectorals inserted below first dorsal; ventrals inserted behind first dorsal and pectorals. Ray counts: D_1 II, 12; P 15–(16); V 7; D_2 116±; A 110±.

LUMINOUS ORGAN: An elongate-ovoid naked area extends anteriorly from the anus to about midway between anus and insertion of ventral fins.

COLOUR: Greenish-grey, tending brown on preservation; darker 'saddle-like' vertical bars may be present. Fins dark grey, outer ventral ray sometimes whitish.

SUMMARY OF MEASUREMENTS (15 specimens): *see* p. 75.

MATERIAL EXAMINED:

NZOI Stns G153 (2), G155 (2, incl. 1 ♀), G157 (1), Z2076 (3), Z2077 (5), Z2078 (2), Z2141 (3), Z2363 (1).

OTHER RECORDS:

Wellington, Cape Campbell, Challenger Station 166 (Günther 1887); N.Z. Government Trawling Expedition Stations 54, 59, 61, 71 (Waite 1911).

DISTRIBUTION: Bay of Plenty to off Dunedin; also Challenger Plateau and off Greymouth. Depth range 37–503 m.

REMARKS: The record from *Challenger* Station 166 is ather dubious. Günther (1887: 128) remarks that the specimens are very young (TL75–88 mm), have a shorter snout than adults, and have a 'fontanelle' between the ventral fins. Similarly, a specimen from Cape Campbell (TL148 mm; Günther 1887: 128) has a ventral 'fontanelle' and five radiating series of spinules on the scales. Waite (1911) records this species from depths of 18–70 m, but all subsequent records are from 106–348 m. *C. australis* is also known from Tasmanian seas, and *C. aspercephalus* Waite appears to be the only closely related species, differing in having a more tapering body, a larger head, orbit, postorbital area, and interorbital space, and a shorter interdorsal space.

Coelorhynchus (Paramacrurus) aspercephalus Waite
(Figs 58–60).

Coelorhynchus aspercephalus Waite, 1911: 178, pl. xxix (2). Gilbert & Hubbs, 1920: 426. Phillipps, 1927a: 22.
Coelorhynchus aspercephalus Whitley, 1968: 38.

GENERAL CHARACTERS: Head large. Dorsal contour rising evenly anterior to base of first dorsal fin, body then tapering gradually to posterior tip. Lateral line more-or-less straight proximally, descending in a broad curve behind first dorsal fin. Ten tubercular gill-rakers on inner side of first gill-arch, none on outer side. Twelve pyloric caeca, 10–12 mm in length.

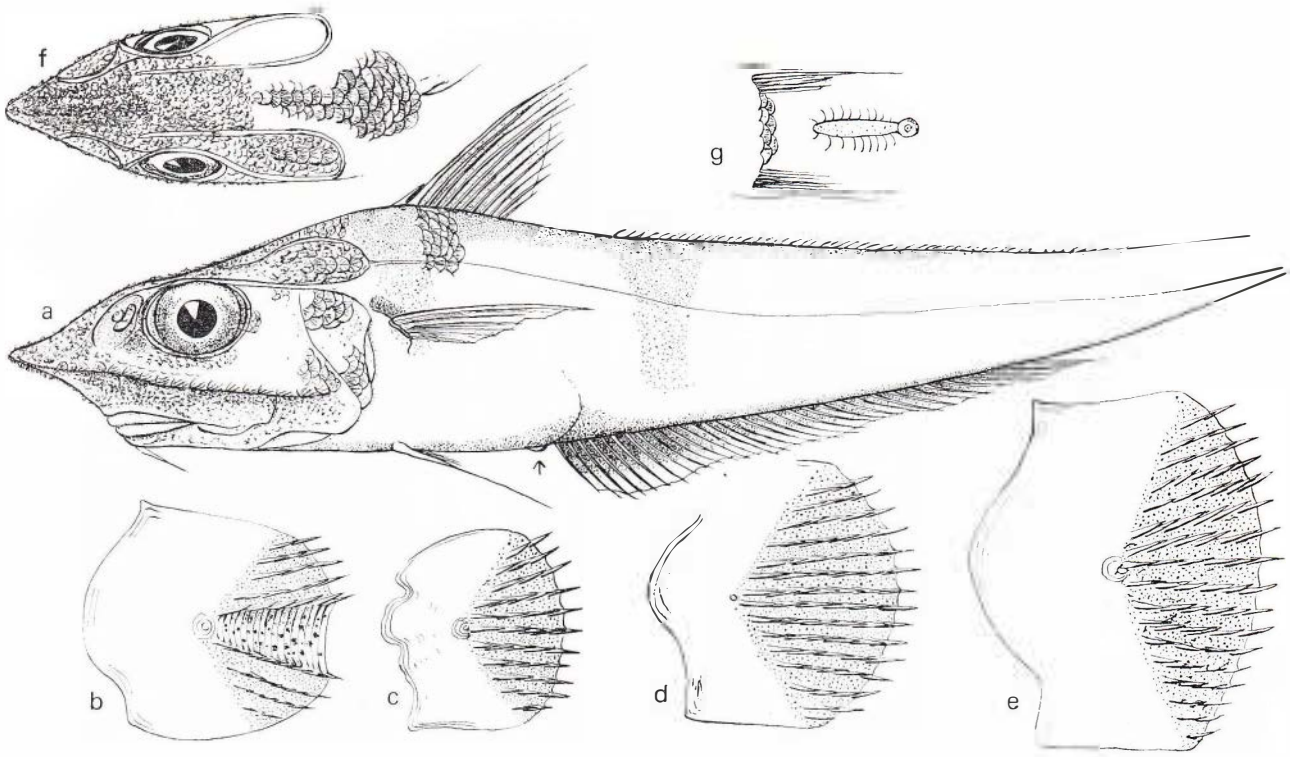


Fig. 56. *Coelorhynchus (Paramacrurus) australis* (Stn Z2076; SL 146 mm): a, profile (anus arrowed); b–e, scales (b, LL; c, gular; d, above LL; e, below LL); f, head, dorsal aspect; g, luminous organ. Scales (approx)–a, f, g, x0.5; b–e, x3.

Coelorhynchus (Paramacrurus) australis: Summary of measurements (15 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					255	474
Standard length (mm)					82	153
Depth of body at D_1	47.67	0.43	1.66	3.48	46	51
Depth at anus	43.53	0.59	2.28	5.23	40	49
Length of head	69.13	0.61	2.36	3.48	66	73
Depth of head	37.13	0.59	2.28	6.13	34	41
Width of head	31.50	0.74	2.72	8.63	27	34
Snout to nostril	20.13	0.46	1.78	8.86	18	25
Snout to orbit	25.53	0.44	1.71	6.69	22	28
Orbital diameter	21.27	0.61	2.38	10.49	18	26
Postorbital length	22.47	0.39	1.50	6.67	20	27
Interorbital width	17.71	0.26	0.96	5.41	16	20
Length of barbel	8.13	0.25	0.96	11.77	10	7
Snout to D_1	79.00	0.86	3.33	4.21	73	86
Base of D_1	19.60	0.36	1.40	7.17	18	22
Length of D_1	48.47	0.85	3.28	6.77	44	56
Interdorsal space	17.93	0.51	1.98	11.05	15	22
Snout to pectoral	70.80	0.80	3.08	4.35	65	75
Length of pectoral	39.87	0.87	3.36	8.44	33	47
Snout to ventral	72.20	0.61	2.37	3.07	74	82
Length of ventral	32.93	0.79	3.04	9.24	28	38
Snout to anal	105.27	0.48	1.88	1.78	102	109

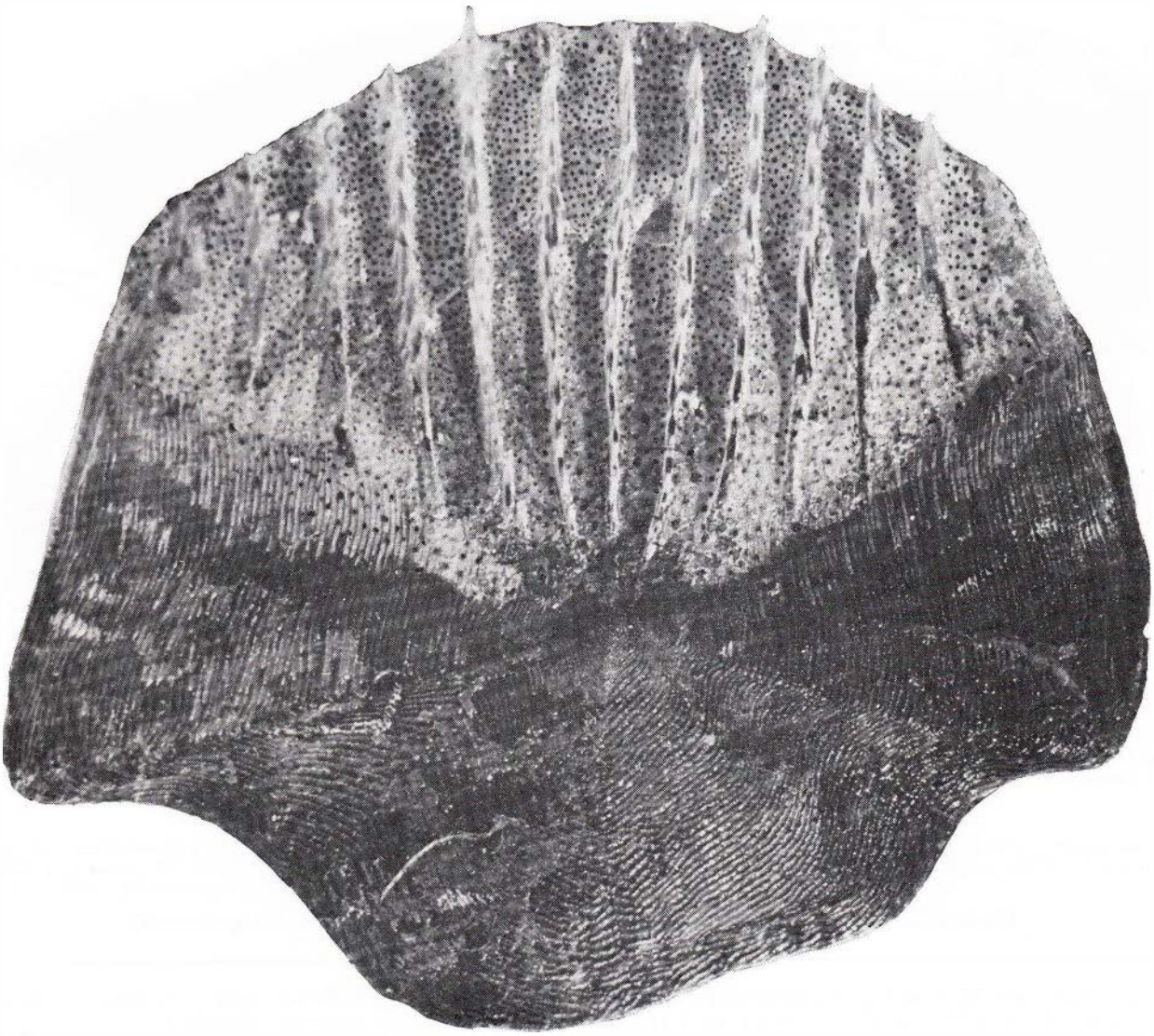


Fig. 57. *Coelorhynchus (Paramacrurus) australis* (Stn Z2077, SL 147 mm): body scale (enlarged).

HEAD CHARACTERS: Snout tapering, bluntly rounded in dorsal aspect, more acute in lateral aspect; orbit ellipsoidal. Head ridges weakly developed, broad. Frontal ridge extending to or just past anterior orbital margin, low. Occipital ridges similar, slightly divergent proximally; postorbital only slightly developed. Infraorbital slightly sinuous, rising anteriorly, with a sharp ventrolateral edge. Mouth inferior, cleft extending from slightly before anterior orbital margin to midline of orbit or just beyond. Teeth small, in bands in both jaws.

SCALES: Body scales subrectangular, as long as wide or longer, with spinules in subparallel rows, up to 20 such rows on flank scales. Six scales between base of first dorsal fin and lateral line, seven between second dorsal fin and lateral line. Head scalation dense, scales of varying size and shape but tending to be elongate. Median series of scales on frontal ridge flanked on either side by four series. A very narrow, naked, depressed area between frontal and nasal ridges. Edge of nasal fossa scaled. Several series of scales between lower orbital rim and ventrolateral edge of infraorbital ridge. Underside of head and lower jaw completely scaled.

FINS: Second ray of first dorsal smooth, the fin arising just behind pectorals and ventrals. Ray counts: D_1 (11)–12; P (15)–16–(18); V 7; D_2 151±; A 136±.

LUMINOUS ORGAN: An ellipsoidal naked area extends anteriorly from the anus, but does not reach the bases of the ventral fins.

COLOUR: Generally greyish, with or without darker vertical bars; margins of opercular and branchiostegal membranes with small, black dots; base of anal fin black, portions of other fins dark grey to blackish.

SUMMARY OF MEASUREMENTS (11 specimens): *see* p. 78.

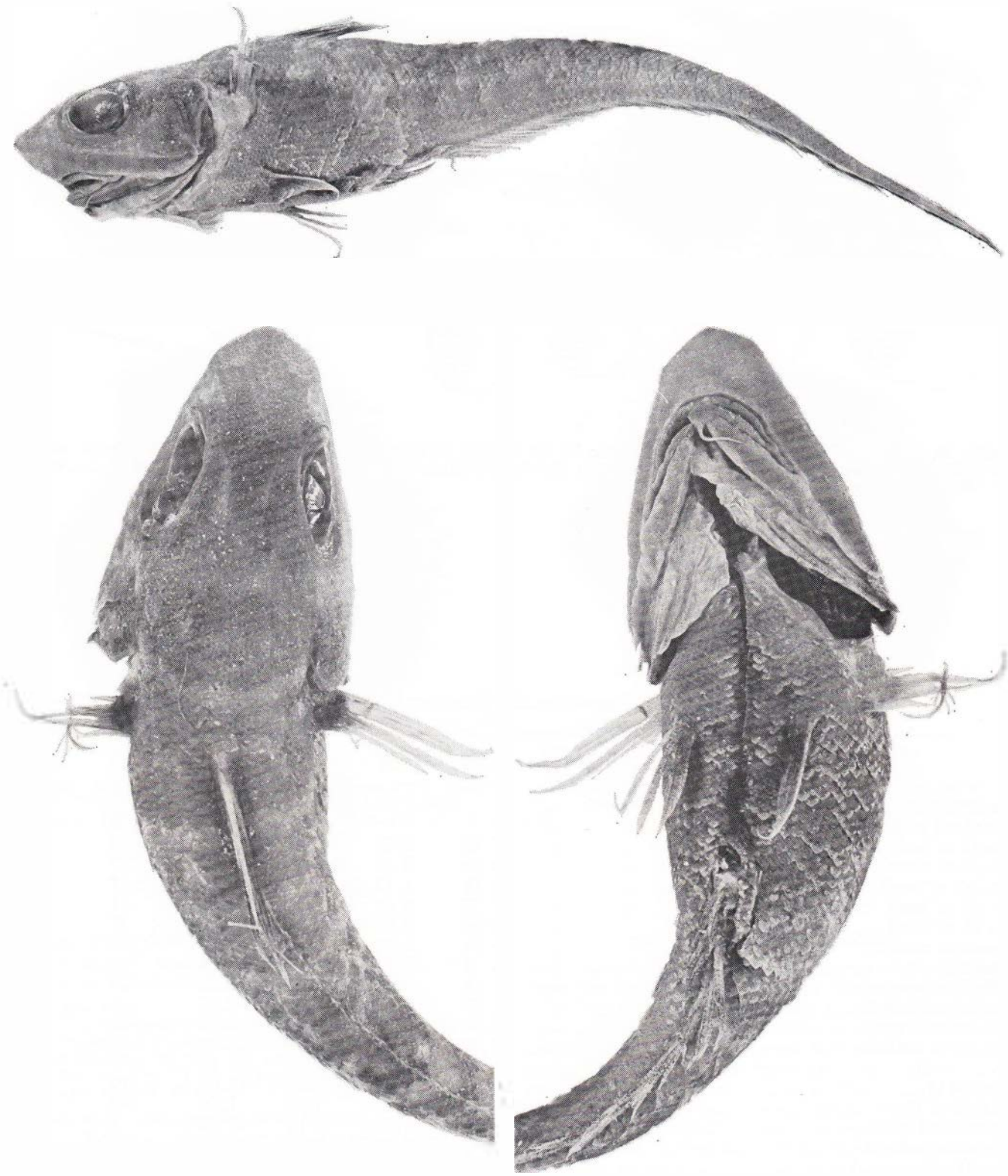


Fig. 58. *Coelorhynchus (Paramacrurus) aspercephalus* (Stn D38; SL 92 mm).

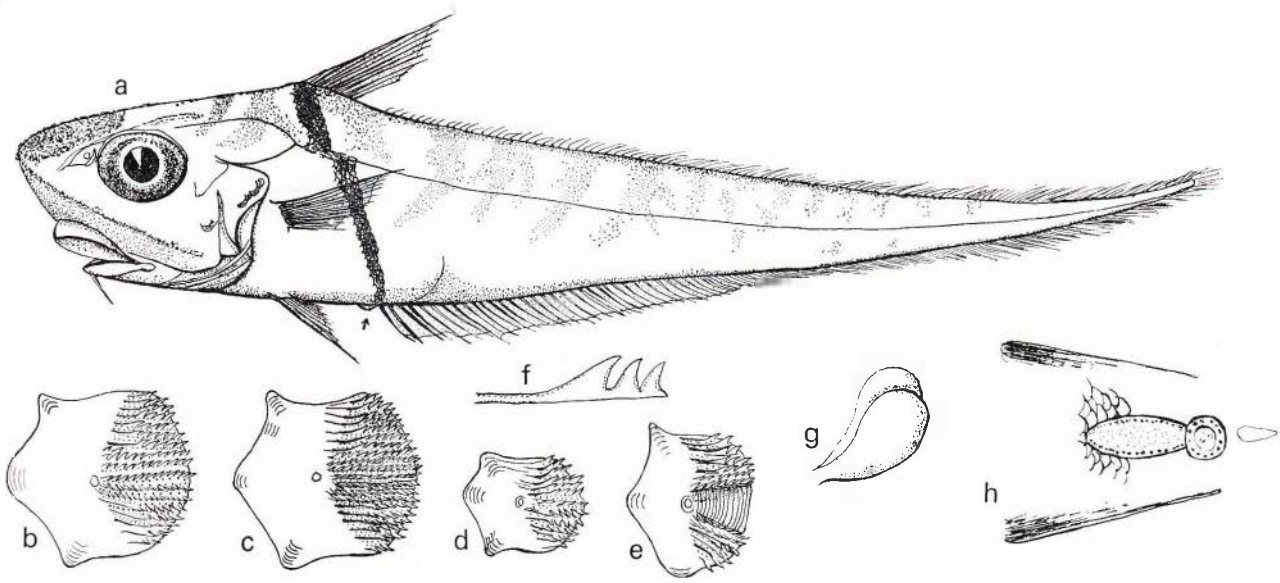


Fig. 59. *Coelorhynchus (Paramacrurus) aspercephalus* (♀, Stn D38; SL 92 mm): a, profile (anus arrowed); b–f, scales (b, below LL; c, above LL; d, gular; e, LL; f, spinous ridge on scale (enlarged)); g, ovary; h, luminous organ. Scales (approx.)–a, g, x0.6; b–e, x4; h, x1.4.

Coelorhynchus (Paramacrurus) aspercephalus: Summary of measurements (11 specimens)

	Mean	SEM	SD	CV	Min.	Max.
Total length (mm)					111	290
Standard length (mm)					30	92
Depth of body at D_1	47.82	0.92	3.04	6.36	42	53
Depth at anus	40.00	0.35	1.15	2.87	32	45
Length of head	74.18	1.17	3.88	5.23	67	81
Depth of head	43.73	0.64	2.14	4.88	41	47
Width of head	40.00	0.68	2.26	5.64	37	43
Snout to nostril	15.91	0.45	1.50	9.46	13	18
Snout to orbit	24.73	0.64	2.14	8.64	21	27
Orbital diameter	28.18	0.70	2.33	8.26	24	31
Postorbital length	21.27	0.53	1.76	8.29	18	25
Interorbital width	19.09	0.52	1.73	9.06	16	22
Length of barbel	9.45	0.50	1.67	17.68	8	14
Snout to D_1	81.73	0.79	2.65	3.22	77	87
Base of D_1	23.27	0.84	2.80	12.03	19	27
Length of D_1	49.73	1.19	3.96	7.96	42	56
Interdorsal space	11.30	0.94	3.13	27.72	8	18
Snout to pectoral	75.55	1.10	3.65	4.83	71	83
Length of pectoral	44.00	1.49	4.94	11.22	34	50
Snout to ventral	78.18	1.08	3.59	4.59	73	84
Length of ventral	44.45	2.34	7.76	17.46	30	58
Snout to anal	105.82	0.69	2.29	2.16	103	110

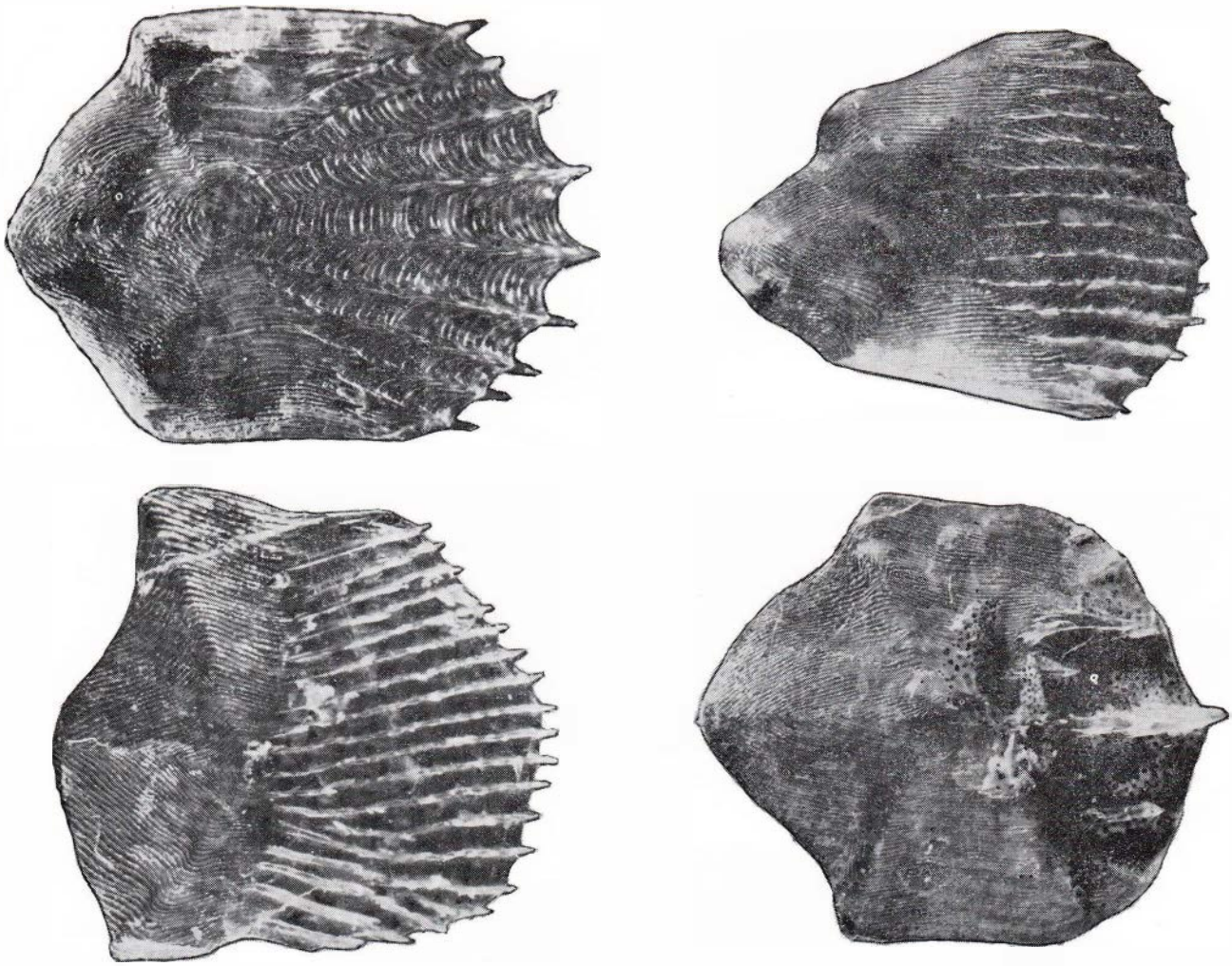


Fig. 60. Body scales of *Coelorhynchus* spp.: upper left–*C. (Quincuncia) campbellicus* n. sp. (holotype ♂, Stn F149; SL 116 mm); lower left–*C. (Paramacrurus) aspercephalus* (Stn D38; SL 92 mm); upper right–*C. (Paramacrurus) innotabilis* (Stn E757; SL 111 mm); lower right–*C. (Oxygadus) kermadecus* (Stn F761; SL 150 mm). All enlarged.

MATERIAL EXAMINED:

NZOI Stns B175 (3), B196 (1), D35 (1), D38 (1♀), D121 (5), D172 (1), G153 (1), G154 (6), G155 (3), G159 (2), G169 (1).

OTHER RECORDS:
New Zealand Government Trawling Expedition stations: 5, E of Foveaux Strait, 335–119 m; 22, NE of Taiaroa Head, 55–73 m; 26, S. of Oamaru, 73–79 m; 35, off Timaru, 38–53 m; 51, Pegasus Bay, 33–51 m; 58, NE of Cape Campbell, 46–64 m; 59, NE of Cape Campbell, 46–64 m; 63, S of Wellington, 106–137 m.

DISTRIBUTION: East coast of New Zealand, from Cook Strait to off Foveaux Strait; also Chatham Rise (Reserve Bank) and Auckland and Campbell Islands. Depth range 33–335 m (accurate records from 95 to 210 m).

REMARKS: This species has been discussed under *C. australis*, with which it forms a rather isolated group with no other close relatives.

Subgenus **Oxymacrurus** Bleeker

Body subcylindrical or slightly compressed, greatest depth less than 1.5 times the width. Snout produced and lanceolate or shorter and bluntly rounded. Postorbital ridge continuous with supraorbital, directed backwards, slightly to conspicuously curved. Suboperculum with an acute flap at lower angle. Spinules on scales sharp and strong, arranged in divergent series, the median slightly enlarged, spinules overlapping distal edge of scale, becoming large distally. Luminous organ short, visible as a blackish, subrectangular to ovoid structure immediately anterior to anus, the length equal to or less than half orbital diameter. Anus close to anal fin. Ventral fins usually nearer to isthmus than anus, rarely equidistant. Intestine with four or six bends, the canal between the third and fourth elongate.

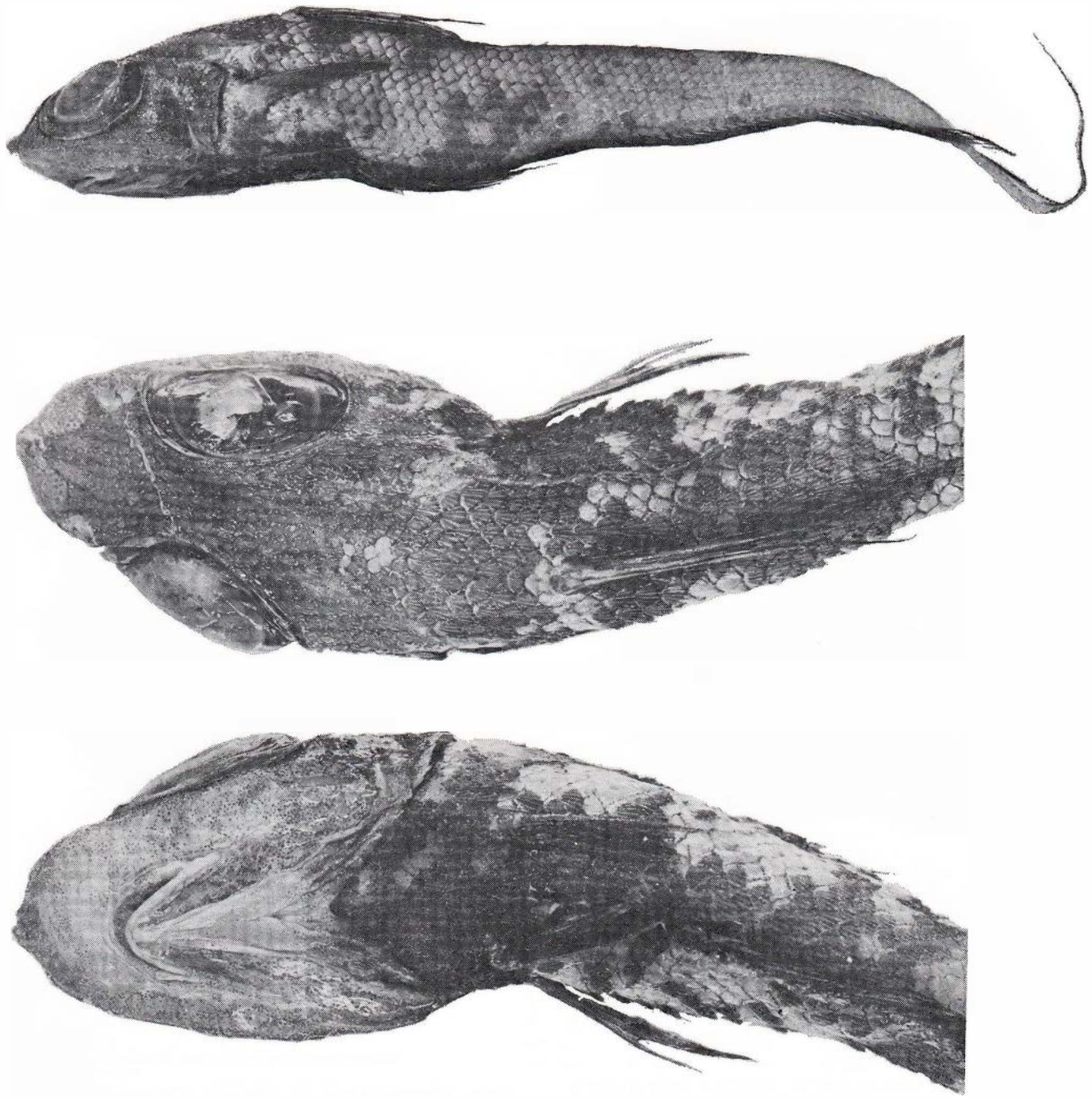


Fig. 61. *Coelorhynchus (Oxymacrurus) bollonsi* n. sp. (holotype, Stn E715; SL 67 mm).

Coelorhynchus (Oxymacrurus) bollonsi n.sp.

(Figs 61–64)

Coelorhynchus sp. A Singleton & Skerman, 1973.

GENERAL CHARACTERS: Head moderately large. Dorsal contour slowly rising to base of first dorsal fin, body then gradually tapering. Lateral line descending to beyond anterior end of second dorsal fin. Seven spiny, tubercular gill-rakers on inner side of first gill-arch, none on outer side. About 30 short pyloric caeca, 8–10 mm in length.

HEAD CHARACTERS: Snout short, depressed, obtusely angled at tip and anterolateral angles; orbit ellipsoidal. Ridges of head moderately developed. Frontal ridge broad, extending for about one-third orbital diameter beyond anterior orbital margin; nasal ridge similarly broad. Occipital ridges slightly convergent for about anterior quarter of length, then divergent. Postorbital ridge weakly indicated. Infraorbital ridge well developed, more-or-less straight, with an obscure terminal sclerite. Mouth small, ventral, cleft extending from below nasal

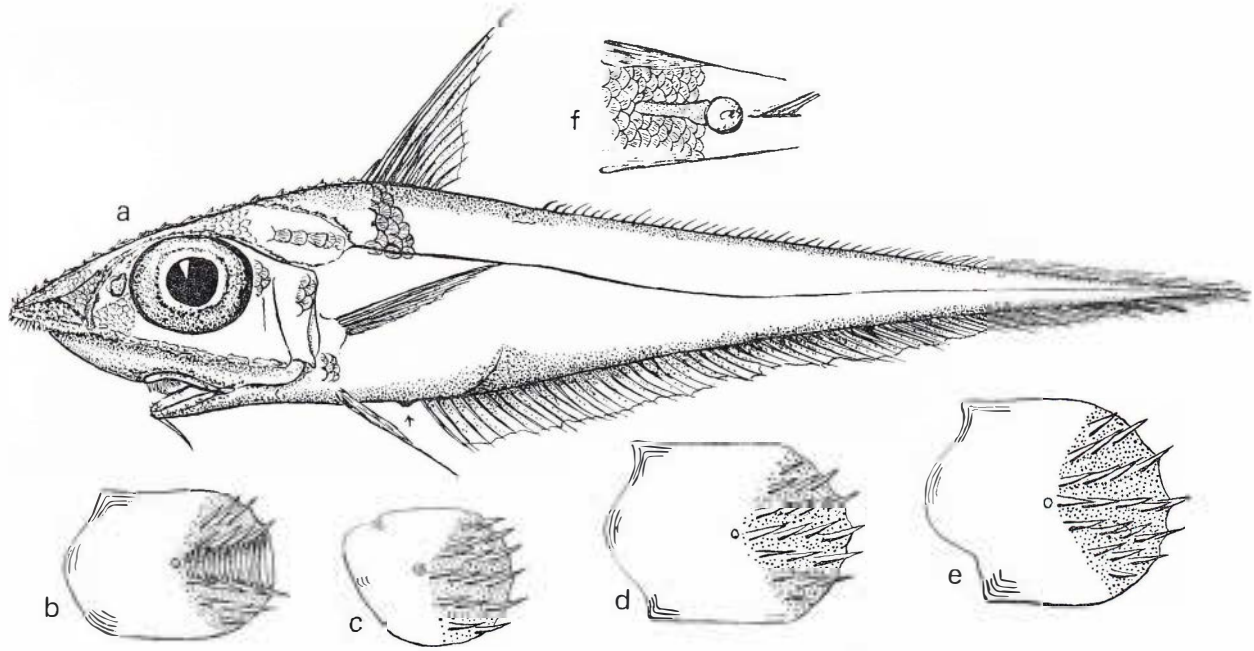


Fig. 62. *Coelorhynchus (Oxymacrurus) bollonsi* n. sp. (holotype, Stn E715; SL 67 mm): a, profile (anus arrowed); b–e, scales (b, LL; c, gular; d, below LL; e, above LL); f, luminous organ. Scales (approx.)–a, x0.6; b–e, x4; f, x1.2.

fossa almost to midline of orbit. Teeth small, curved, in bands in both jaws.

SCALES: Body scales relatively large, slightly longer than wide, with five to seven divergent series of spinules, median strongest. Four series of scales between first dorsal fin and lateral line, 4.5 between second dorsal fin and lateral line. Head scales more elongate, two lateral series on either side of median series of frontal ridge. Scales subcarinate on occipital and postorbital ridges, median series between slightly enlarged and convex. Scales in a double series on infraorbital ridge posteriorly from anterior orbital margin. Lower part of nasal fossa scaled, no naked area between lower orbital margin and infraorbital ridge. Anterolateral area of snout scaled, a very small and narrow scaleless area between nasal and frontal ridges. Underside of head and lower jaw scaleless.

FINS: Second spine of first dorsal smooth. First dorsal arising behind pectoral and ventral fins. Outer ventral ray slightly produced. Ray counts: D_1 11; P 15; V 7; D_2 ?; A?.

LUMINOUS ORGAN: There is a small, blackish, ovoidal area extending from the anus to about half way to the base of the ventral fins.

COLOUR: Generally light brownish, with 9–10 darker, broad, vertical bands extending to abdominal region proximally and to base of anal fin in caudal region; fins dark grey except second dorsal, which is light grey.

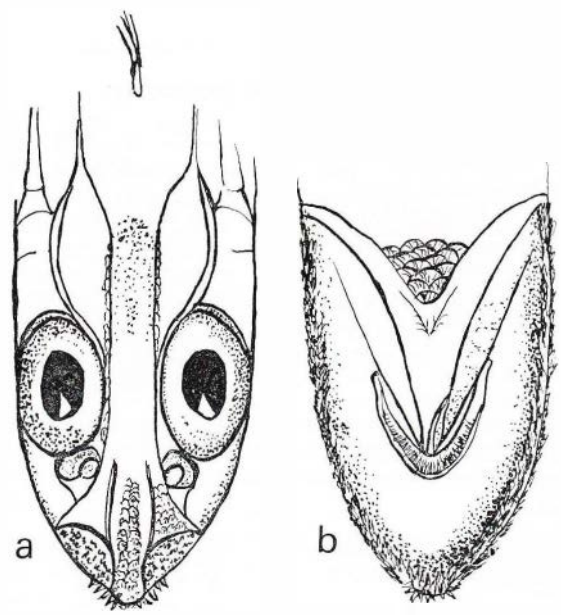


Fig. 63. *Coelorhynchus (Oxymacrurus) bollonsi* n. sp. (holotype, Stn E715; SL 67 mm): head–a, dorsal aspect; b, ventral aspect. Enlarged.

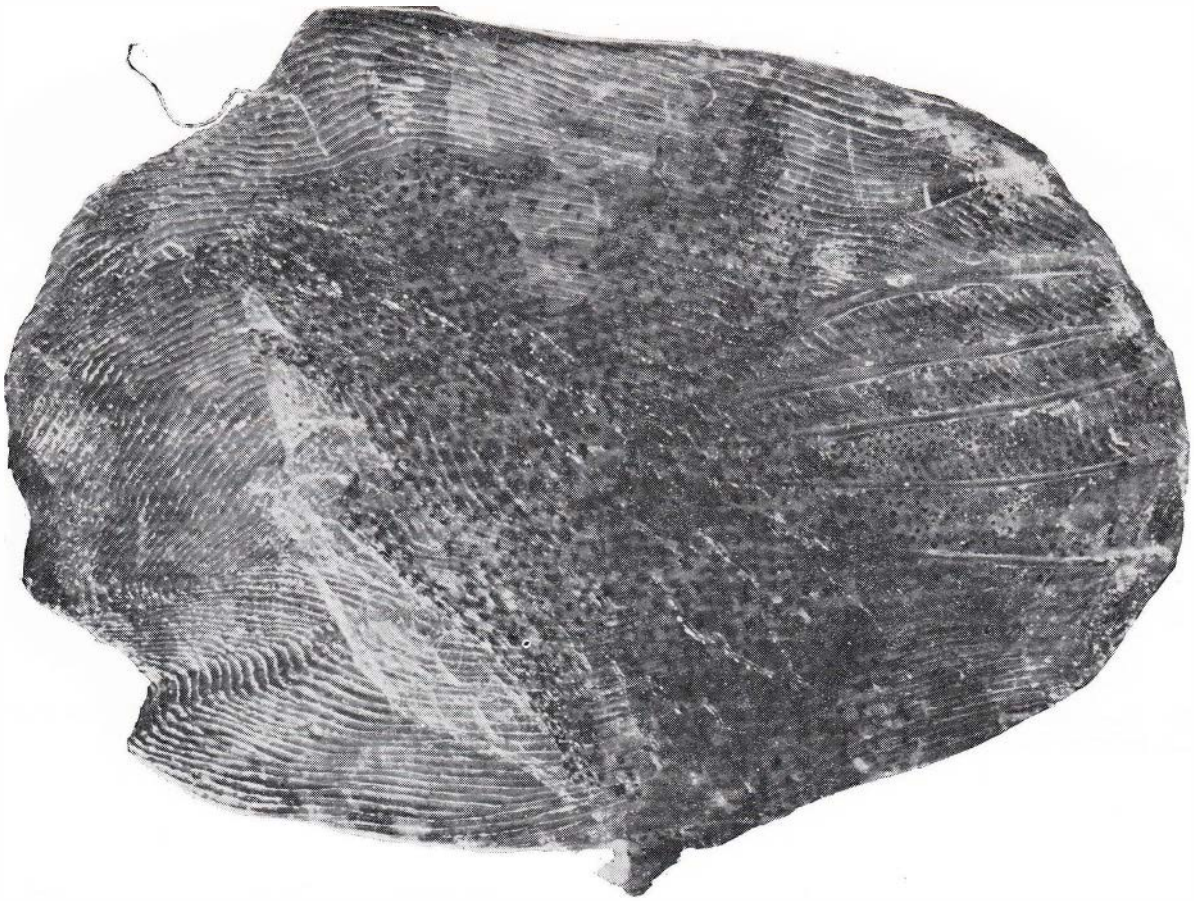


Fig. 64. *Coelorhynchus (Oxymacrurus) bollonsi* n. sp. (holotype, Stn E715; SL 67 mm): body scale (enlarged).

SUMMARY OF MEASUREMENTS (4 specimens):

	Mean	Min.	Max.
Total length (mm) ..		111	260
Standard length (mm) ..		32	92
Depth of body at D_1 ..	43.75	41	47
Depth at anus	39.60	38	40
Length of head	71.50	71	72
Depth of head	42.25	41	44
Width of head	38.75	35	41
Snout to nostril	15.75	15	16
Snout to orbit	22	21	23
Orbital diameter	29	28	30
Postorbital length	20.50	19	22
Interorbital space	14.0	13	15
Length of barbel	6.25	6	7
Snout to D_1	73.0	72	74
Base of D_1	18.50	17	19
Length of D_1	52.25	51	54
Interdorsal space	17.0	16	18
Snout to pectoral	70.75	69	72
Length of pectoral	41.0	40	43
Snout to ventral	73.75	71	75
Length of ventral	28.75	35	44
Snout to anal	103.25	103	104

MATERIAL EXAMINED:

Holotype: NZOI No. 196 (Stn E715). Paratypes: NZOI No. P274 (Stn E735; ♂), P725 (Stn G293), P276 (Stn G675).

DISTRIBUTION: Off Gisborne to off Otago. Depth range 322–792 m.

REMARKS: This species is closely related to *C. cookianus* n.sp., but is distinguishable by the fewer spinulose ridges on the scales, one less scale between the first dorsal fin and lateral line, and the slightly longer, deeper, and wider head. *C. platorhynchus* Smith & Radcliffe differs in having the underside of the head scaled and a smaller orbit; *C. acantholepis* Gilbert & Hubbs and *C. carinifer* Gilbert & Hubbs have a smaller orbit. *C. chilensis* Gilbert & Thompson usually has fewer spinulose ridges on the scales, and the distance from the anus to the ventral fins longer, not shorter, than the orbital diameter. The testes of a male specimen (Stn E735, 26.iii.1967) were well developed.

Coelorhynchus (Oxymacrurus) cookianus n.sp.

(Figs 65–67)

Coelorhynchus sp. *B* Singleton & Skerman, 1973.

GENERAL CHARACTERS: Head moderately large. Dorsal contour slowly rising to base of first dorsal fin, body

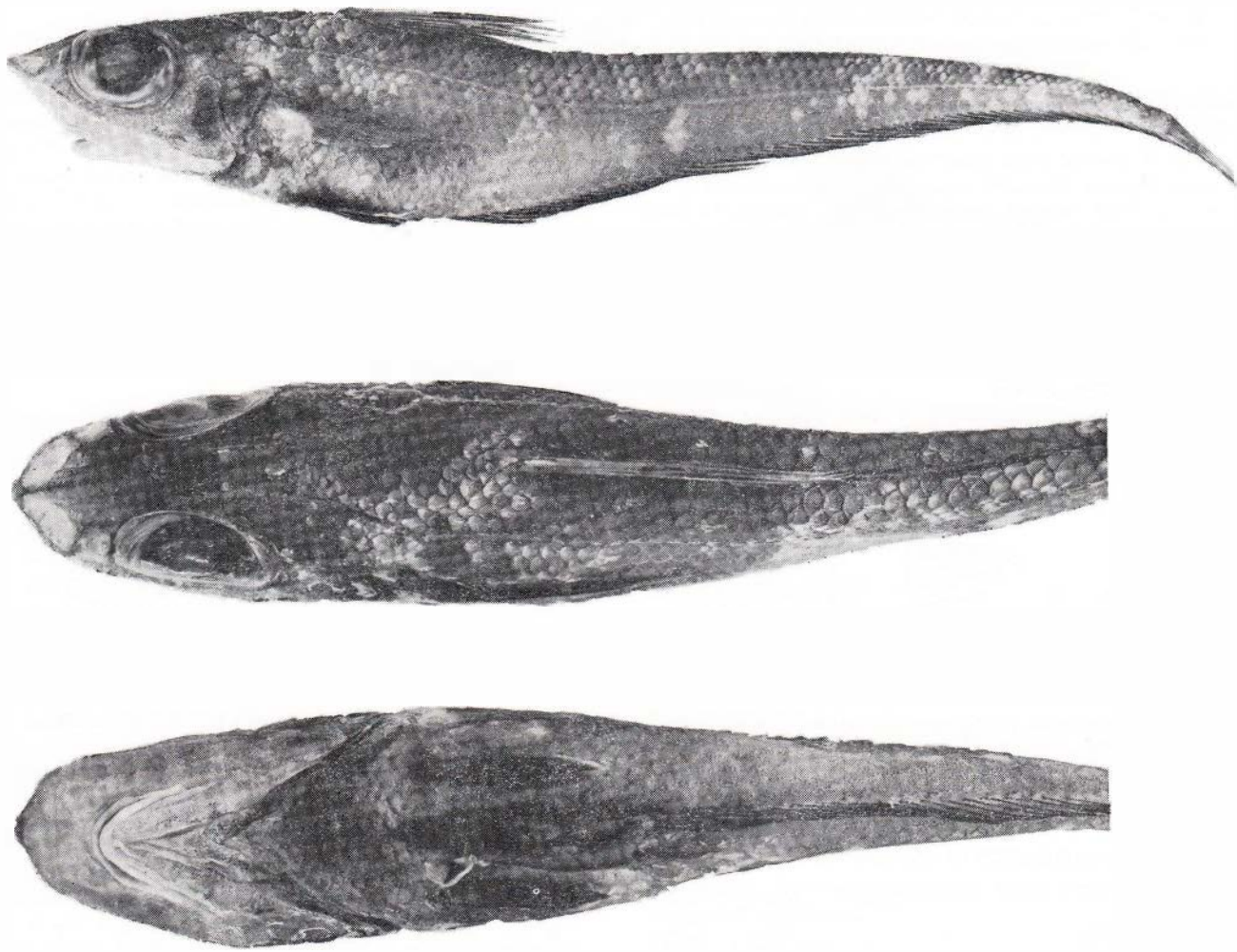


Fig. 65. *Coelorhynchus (Oxymacrurus) cookianus* n. sp. (holotype, Stn E719; SL 87 mm).

then gradually tapering. Body appears rather shallow. Lateral line more-or-less descending from origin to anterior end of second dorsal fin. Seven tubercular gill-rakers on inner side of first gill-arch, none on outer side. Pyloric caeca short, comparatively numerous.

HEAD CHARACTERS: Snout short and obtuse with a broad terminal sclerite and two smaller sclerites at anterolateral angles; orbit strongly ellipsoidal. Ridges of head comparatively well developed. Frontal ridge broad, extending to beyond anterior orbital margin; nasal ridge relatively broad. Occipital ridges parallel in anterior part, then divergent; postorbital ridge weakly developed. Infraorbital ridge well developed, continuous, more-or-less straight. Mouth small, ventral, cleft extending from below nasal fossa to just beyond midline of orbit. Teeth small, curved, in bands in both jaws, larger externally.

SCALES: Body scales moderately large, subovoid, longer than wide, with 8–17 slightly divergent series of spinules. Five scales between base of first dorsal fin and lateral line, six between anterior end of second dorsal fin and lateral line. Head scales elongate, median series of frontal ridge flanked by two series on either side. Scales on occipital ridge strongly carinate, and median series between occipital and postorbital ridges subcarinate. Scales on infraorbital ridge in a double series from anterior orbital margin. A narrow area between lower orbital rim and infraorbital ridge scales, area of nasal fossa, a narrow area between infraorbital ridge and scaled anterolateral area of snout, and underside of head and lower jaw scaleless.

FINS: Second ray of first dorsal smooth. First dorsal arising just behind pectoral and ventral fins. Ventrals inserted below pectorals, outer ray produced. Ray counts: D_1 11; P 17; V 7; D_2 ?; A?.

LUMINOUS ORGAN: A blackish, subrectangular to ovoid, naked area extends from the anus almost to the base of the ventral fins.

COLOUR: Generally light brown, darker over opercular plates, behind eye, and over abdominal region; fins dark grey except whitish outer ventral ray, anal fin almost blackish. Large specimens with darker vertical bars.

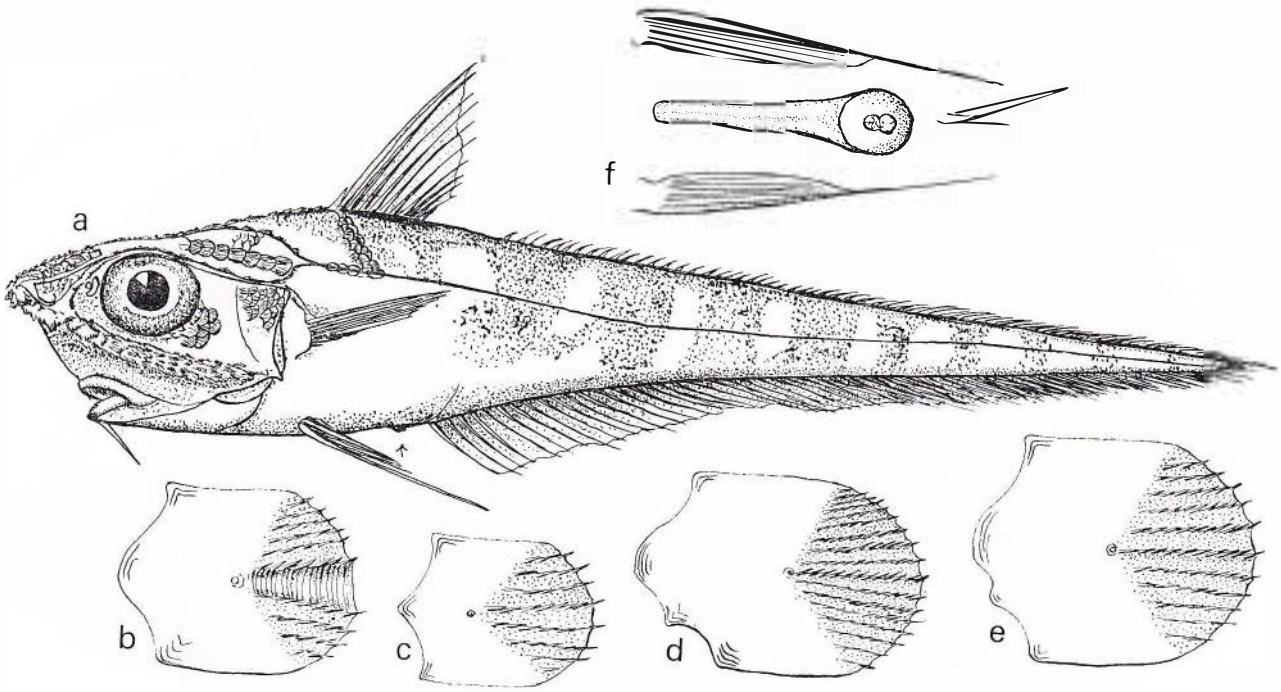


Fig. 66. *Coelorhynchus (Oxymacrurus) cookianus* n. sp. (holotype ♀, Stn E719; SL 87 mm): a, profile (anus arrowed); b–e, scales (b, LL; c, gular; d, above LL; e, below LL); f, luminous organ. Scales (approx.) a, x0.8; b–f, x4.

SUMMARY OF MEASUREMENTS (5 specimens):

	Mean	Min.	Max.
Total length (mm)		232	268
Standard length (mm) ..		67	87
Depth of body at D_1 ..	47.2	44	51
Depth at anus	40.8	35	45
Length of head	68.2	67	70
Depth of head	37.8	36	40
Width of head	37.0	35	42
Snout to nostril	15.4	15	16
Snout to orbit	22.2	21	23
Orbital diameter	27.2	25	30
Postorbital length	19.0	20	17
Interorbital width	13.4	12	15
Length of barbel	9	7	10
Snout to D_1	79.6	78	82
Base of D_1	20.6	19	21
Length of D_1	55.0	47	62
Interdorsal space	18.2	16	20
Snout to pectoral	70.8	68	72
Length of pectoral	41.2	35	49
Snout to ventral	73.2	70	75
Length of ventral	38.8	32	49
Snout to anal	104.6	104	106

MATERIAL EXAMINED:

Holotype: NZOI No. 195 (Stn E719; ♀). Paratypes: NZOI No. P271 (Stn E719; ♀), P272 (Stn E751) (2), P273 (Stn E793) (1).

DISTRIBUTION: Off Gisborne, off Cape Palliser, and off Fiordland. Depth range 240–913 m.

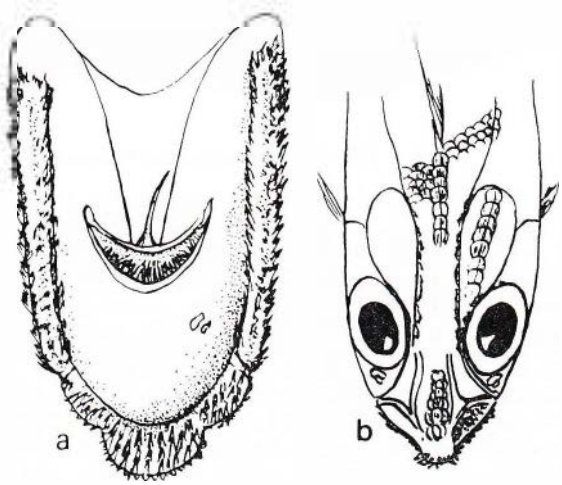


Fig. 67. *Coelorhynchus (Oxymacrurus) cookianus* n. sp. (holotype ♀, Stn E719; SL 87 mm): head–a, ventral aspect; b, dorsal aspect. Enlarged.

REMARKS: *C. chilensis* Gilbert & Thompson has a similarly large orbit but only three to five spinulose ridges on the scales, and also has the distance between the anus and ventral fins longer than the orbital diameter, not shorter as in the present species. *C. acantholepis* Gilbert & Hubbs has a smaller orbit and fewer ridges on the scales; *C. carinifer* Gilbert & Hubbs also has a smaller orbit, and a double series of scales in only the preopercular region of the infraorbital ridge.

Subgenus **Oxygadus** Gilbert & Hubbs

Body slightly compressed. Head comparatively large; snout produced, lanceolate, with a terminal spine. Post-orbital ridge strong, continuous with supraorbital ridge, descending posteriorly. A spinous scute near posterior end off occipital sensory canal. Suboperculum with a conspicuous flap at lower angle. Spinules on scales strong, in parallel series, median largest. Luminous organ very short (length less than half orbital diameter), appearing as a small, crescent-shaped, dark area immediately before anus. Anal fin close to anus; ventral fins nearer to isthmus than anus. Intestine usually with six bends, elongate between third and fourth bends.

Coelorhynchus (Oxygadus) kermadecus Jordan & Starks (Figs 60, 68, 69)

Coelorhynchus kermadecus Jordan & Starks, 1904: 619. Gilbert & Hubbs, 1916: 145; 1920: 431, 515.
Oxygadus kermadecus Whitley, 1968: 37.
Macrurus parallelus Günther, 1887: 125 (in part), pl. 29 (A, A″, a″, a‴). [Non] *M. parallelus* Günther, 1877: 438.

GENERAL CHARACTERS: Head large. Dorsal contour rising gradually to base of first dorsal fin, body then gradually tapering. Head and body less compressed than in other New Zealand members of the genus. Lateral line descending gradually from just behind head.

HEAD CHARACTERS: Snout acutely pointed, lanceolate, with a small, sharp, terminal spine; orbit elliptical. Ridges of head well defined, carinate. Frontal ridge extending to just past anterior orbital margin; nasal ridges slightly convergent, not extending to infraorbital, continuous with supraorbital and postorbital ridges. Occipital ridge subparallel, extending anteriorly to about midline of orbit. Postorbital ridge descending posteriorly. A narrow flap on suboperculum extending below pre-operculum. Infraorbital ridge strong, slightly sinuous. Mouth small, entirely ventral, cleft extending from below nasal fossa to about midline of orbit. Teeth small, in bands in both jaws. Mucus tubules scattered over head.

SCALES: Body scales relatively large, subovoid, wider than long to longer than wide, with three to seven series of strong, subparallel spinules, median series largest. Four series of scales between base of first dorsal fin and lateral line, five between second dorsal fin and lateral line. Head scales more elongate, variable in shape, spinular ridges generally radiating posteriorly on either side of median series. Frontal ridge with five series of scales (median plus two on each side), nasal ridge with one series on inside of carinal series. Supraorbital, postorbital, and occipital ridges with a single carinate series. Infraorbital ridge scales in a single series to about midline of orbit, then in two series to posterior end. Nasal fossa, area below anus, area between infraorbital ridge and lower orbital rim, and a narrow depression between nasal and frontal ridge scaleless. Anterolateral area of snout scaled. Underside of head except lower jaw scaled.

FINS: Second spine of first dorsal smooth. First dorsa arising just behind pectoral and ventral fins. Ray counts: D_1 10; P 17; V 7; D_2 118±; A 131±.

LUMINOUS ORGAN: There is a small, naked, blackish, transverse-ovoidal area immediately anterior to the anus.

COLOUR (ex alcohol): Generally light brown, blue-black over abdominal region; fins blackish except anterior part of second dorsal, which is brown. Mucus tubules blackish.

SUMMARY OF MEASUREMENTS (1 specimen):

Total length (mm)	400
Standard length (mm)	150
Depth of body at D_1	32
Depth at anus	33
Length of head	65
Depth of head	34
Width of head	33
Snout to nostril	21
Snout to orbit	28
Orbital diameter	18
Postorbital length	19
Interorbital width	17
Length of barbel	11
Snout to D_1	73
Base of D_1	21
Length of D_1	31
Interdorsal space	19
Snout to pectoral	68
Length of pectoral	27
Snout to ventral	78
Length of ventral	25
Snout to anal	103

PARASITES: Parasitic copepods were present under the branchial membrane.

MATERIAL EXAMINED:
NZOI Stn F761 (1).

OTHER RECORDS:
Challenger Stns 169, 170a (3), 171 (2).

DISTRIBUTION: Kermadec Islands, off East Cape, and just north of Chatham Rise. Depth range 1097–1250 m.

REMARKS: This species has been separated from *C. parallelus* by having five to seven series of spinules on the scales, 'stellate' ridges on the head scales, and an interdorsal space about twice as long as the base of the first dorsal fin. The specimen examined agrees in these characters except for the interdorsal space. However, the measurements given by Gilbert & Hubbs (1920: 516) show that the present specimen has a shorter head, orbital diameter, interorbital space, and postorbital region, and a longer first dorsal base and interdorsal space. Gilbert & Hubbs (1920: 516) also suggest that New Zealand specimens may represent a species distinct from *C. kermadecus*. The specimen examined here differs from Günther's illustration (1887, pl. 29, fig A) mainly in the shorter interdorsal space, which is considered insufficient evidence for erecting a new species.

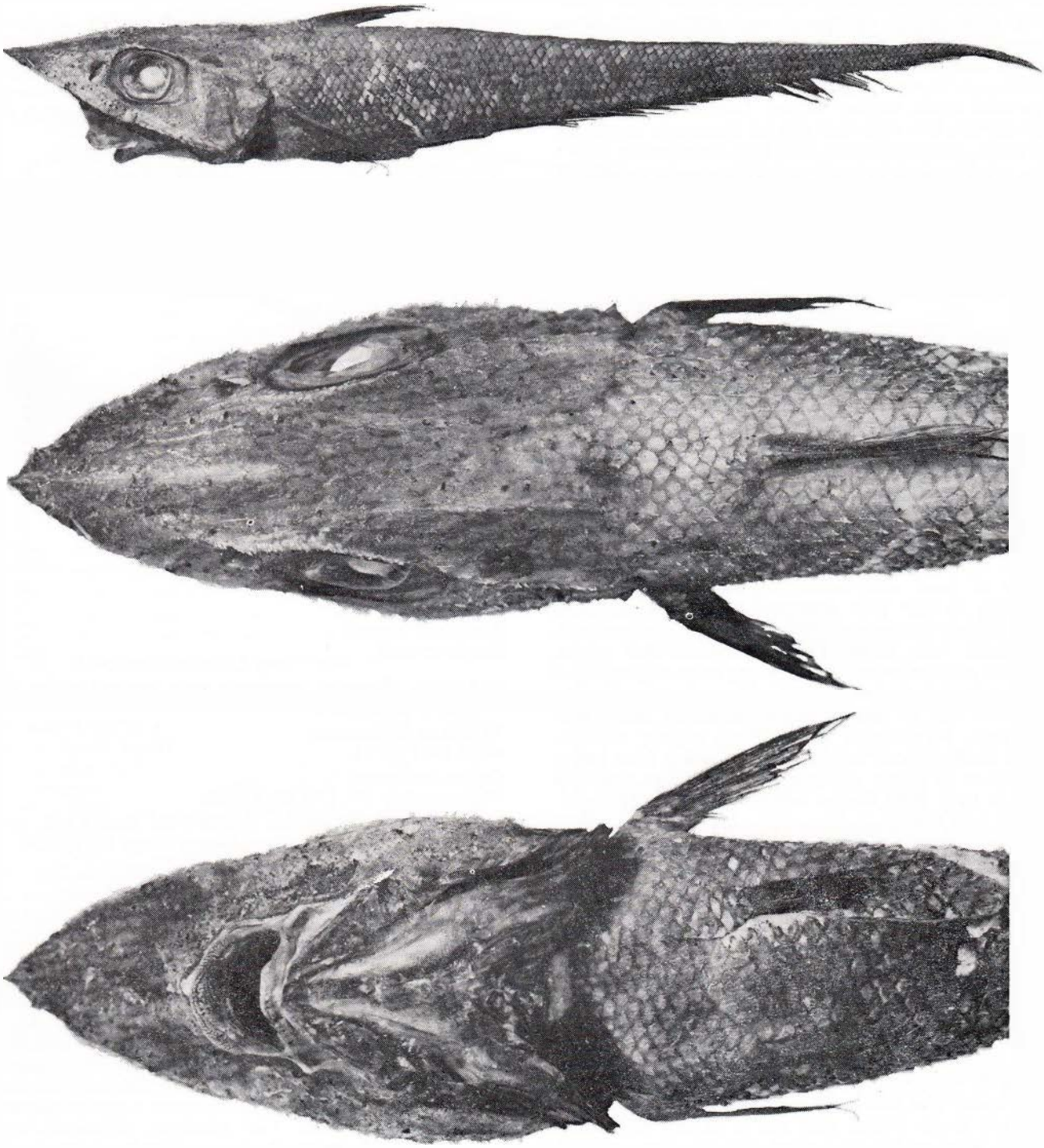


Fig. 68. *Coelorhynchus (Oxygadus) kermadecus* (Stn F761; SL 150 mm).

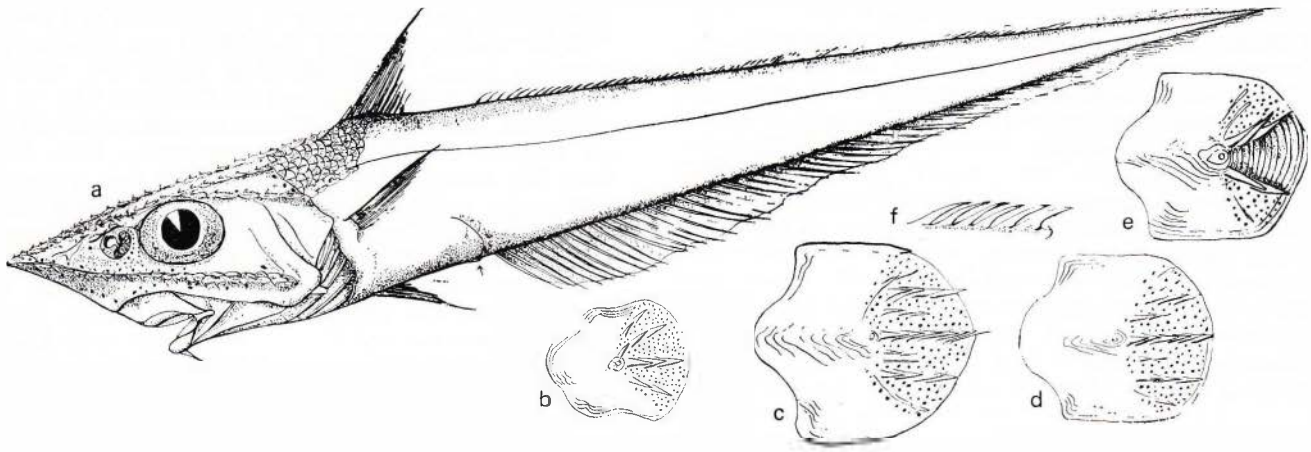


Fig. 69. *Coelorhynchus (Oxygadus) kermadecus* (Stn F761; SL 150 mm): a, profile (anus arrowed); b–f, scales (b, gular; c, above LL; d, below LL; e, LL; f, spinous ridge of scale (enlarged)). Scales (approx.)–a, x0.4; b–e, x3.

OTHER SPECIES

Two further species have been included in the key, since both may occur in the New Zealand region. The first, *Malacocephalus laevis* (Lowe), is a widespread species recorded from Australian waters and the Pacific, Indian, and Atlantic Oceans. It is one of the few widespread macrourids of the continental slope, and may have an extended bathypelagic young stage (Marshall 1964: 319). The second is *Cynomacrurus pirei* Dollo, apparently a circumpolar, subantarctic bathypelagic species. Both forms are relatively easily distinguished from the remainder of the New Zealand macrourid fauna.

GENERAL ASSESSMENT

While acknowledging that much of the New Zealand region has yet to be adequately sampled, and also that several species described herein are known from only a few specimens, the data presented obviously significantly exceed those previously available, and hence a general assessment of the fauna is desirable even if somewhat tentative.

Abundance

An analysis of photographs enabled Marshall (1965) to estimate a density of one fish per 160 m² in depths around 2600 m off Nova Scotia; about 75% of the fish (which occurred in groups) were macrourids, referred to *Chalinura* and *Lionurus*.

From similar analyses, Marshall & Bourne (1964) estimated fish densities ranging from one per 25 m² to one per 120 m² in the Gulf of Aden and the Red Sea. No such data are at present available for localities within the New Zealand region, but some measure of the abundance of individual species can be made from the data detailed previously.

Only 3 species (12% of the fauna) have been recorded more than 20 times; 6 species (24% of the fauna) have been recorded between 10 and 20 times; 16 species (64% of the fauna) are known from fewer than 10 records, 3 of them being recorded only once.

Species	No. of records
Coelorhynchus oliverianus	47
Coelorhynchus fasciatus	33
Lepidorhynchus denticulatus	30
Coelorhynchus aspercephalus	18
Coelorhynchus innotabilis	17
Coelorhynchus australis	14
Coryphaenoides serrulatus	14
Nezumia nigromaculata	12
Coryphaenoides quadripennatus	11

Bathygadus cottoides		5
Macrourus carinatus		5
Trachyrhynchus longirostris		5
Coelorhynchus bollonsi		4
Coelorhynchus kermadecus		4
Coelorhynchus cookianus		3
Coryphaenoides murrayi		3
Gadomus aoteanus		3
Coryphaenoides armatus		2
Coryphaenoides rudis		2
Mahia matamua		2
Nezumia namatahi		2
Coelorhynchus campbellicus		2
Coelorhynchus mirus	(?)	1
Cetonurus crassiceps		1
Nezumia toi		1

Differing methods of collecting and types of collecting gear prevent the assessment of numbers of specimens in a similar fashion. However, only 5 species – *Coelorhynchus aspercephalus*, *C. fasciatus*, *C. oliverianus*, *Coryphaenoides serrulatus*, and *Lepidorhynchus denticulatus* – are known from more than 20 specimens, while at least 10 species are known from less than 5 specimens.

Bathymetric Distribution

In general, macrourid fishes are benthopelagic, living near the ocean floor, and Marshall (1964) estimates that only 5% are bathypelagic, i.e., living in the intermediate waters. Since many macrourids have relatively limited geographic ranges, somewhat similar bathymetric ranges may be expected.

Two species – *Coelorhynchus aspercephalus* and *C. australis* – (8% of the fauna) extend into the shallower shelf waters, ranging from possibly 33–503 m. It is possible that these two species range above the thermocline, in contrast to almost all other macrourids (Marshall 1964).

One species – *Coryphaenoides murrayi* – (4% of the fauna) appears exclusively abyssal, ranging from 1180–2012 m; another two – *C. armatus* and *C. serrulatus* – (8% of the fauna) are mainly abyssal, ranging from 732–2070 m.

Seven species – *Coelorhynchus bollonsi*, *C. cookianus*, *C. fasciatus*, *C. mirus*, *C. oliverianus*, *Lepidorhynchus denticulatus*, and *Nezumia nigromaculata* – (28% of the fauna) occur from above 500 m to about 1000 m, mainly 250–290 m, with a total range of 188–1086 m.

Seven species – *Coelorhynchus campbellicus*, *C. innotabilis*, *Cetonurus crassiceps*, *Coryphaenoides quadripennatus*, *Mahia matamua*, *Nezumia toi*, and *Trachyrhynchus longirostris* – (28% of the fauna) occur in slightly deeper water, 554–1280 m.

The remaining six species (24% of the fauna) form a group occurring in deeper water than the last, 951–1353 m. They are *Bathygadus cottoides*, *Coelorhynchus kermadecus*, *Coryphaenoides rudis*, *Gadomus aoteanus*, *Macrourus carinatus*, and *Nezumia namatahi*.

Geographic Distribution

Four species (16% of the fauna) are widespread, occurring over most of the area between latitudes 26°S and 54°S. Records for three of these species – *Coryphaenoides armatus*, *C. serrulatus*, and *Trachyrhynchus longirostris* – are few, but the fourth, *Lepidorhynchus denticulatus*, has been taken 30 times within this area.

Eight species (32% of the fauna) are more-or-less northern forms. Their individual ranges are variable, but none occur on or south of the Chatham Rise on the east coast, and on the west coast records extend only to off Raglan. All these species are known from fewer than five records. The species forming this group are *Bathygadus cottoides*, *Coelorhynchus kermadecus*, *Cetonurus crassiceps*, *Coryphaenoides rudis*, *Gadomus aoteanus*, *Mahia matamua*, *Nezumia namatahi*, and *N. toi*.

Four species (16% of the fauna) occur between the Bay of Plenty and Otago. Two of these species, *Coelorhynchus australis* and *C. innotabilis*, are each known from more than 10 records, while the others, *C. bollonsi* and *C. cookianus*, are each known from fewer than 5. All except *C. bollonsi* are recorded from off the west coast between Greymouth and Fiordland.

Nine species (36% of the fauna) range from the Campbell Plateau northward to the Challenger Plateau on the west coast, and the Chatham Rise northward to off Gisborne on the east coast. Species of this group are *Coelorhynchus aspercephalus*, *C. campbellicus*, *C. fasciatus*, *C. mirus* (probably), *C. oliverianus*, *Coryphaenoides murrayi*, *C. quadripennatus*, and *Nezumia nigromaculata*.

Faunal Diversity

Marshall & Bourne (1964) note that the diversity and density of benthic fishes is greatest over the upper part of the continental slope, the numbers of species and individuals decreasing below 1000–2000 m, and that a restricted abyssal fish fauna occurs below 2000–3000 m. Similar variation is apparent in the distribution of the larger invertebrate fauna of the slope and abyssal regions (Zenkevitch 1963).

Analysis of the depth ranges and bathymetric groupings of the New Zealand macrourids shows that the greatest number of species occurs between 800 and 1000 m, and the least below 1400 m. Species are relatively common below 400–600 m (over 25% of the fauna is present), the number increasing to 800–1000 m (60%), then falling to 1200–1400 m, where 44% of the fauna is present. Beyond 1400 m the number of species falls very sharply to 4–8%, i.e., only one or two species. Undoubtedly the bathymetric spread of samples is insufficient to delineate this deeper fauna.

Depth (m)	No. of species	% of fauna	No. of NZOI samples
0–200	4	16	15
200–400	6	24	15
400–600	7	28	47
600–800	9	36	28
800–1000	15	60	22
1000–1200	10	40	11
1200–1400	11	44	11
1400–1600	1	4	0
1600–1800	1	4	0
1800–2000	2	8	2
2000–2200	1	4	2

Diversity of the fauna may also be analysed in geographic terms. Hence all but one species of the fauna

occur on the New Zealand slope, compared with only five species at the Kermadec Islands. Similarly, most species occur between latitudes 35°–40°S and 40°–45°S, and least between latitudes 25°–30°S and 30°–35°S.

Latitude	No. of species	% of fauna	No. of NZOI samples
25°–30° ..	6	24	0
30°–35° ..	6	24	4
35°–40° ..	18	72	31
40°–45° ..	17	68	76
45°–50° ..	12	48	35
50°–55° ..	11	44	8

The faunal diversity of the Challenger and Campbell Plateaux and the Chatham Rise can also be compared.

Area	No. of species	No. of stations
Challenger Plateau	6	17
Chatham Rise ..	8	40
Campbell Plateau	9	26

Eleven species are recorded from these areas; none is restricted to the Challenger Plateau, one occurs on the Chatham Rise but not the other areas, and two occur on the Campbell Plateau only. Hence, almost all of the species involved occur on each area, and there is little change in the degree of diversity between the three areas.

Faunal Regionalism

The concept of New Zealand regional faunas and faunal provinces has been discussed by several authors since it was originally proposed by Finlay (1925). Geographic analyses of molluscs by Powell (1961) and Dell (1962), and of echinoderms by Fell (1949), McKnight (1969), and Pawson (1961, 1965, 1970) have been made, as well as more general discussions, e.g., Knox (1963). Several groups of marine animals show definite geographic ranges among their component species, but the concept of faunal provinces has been criticised by some workers, e.g., Dell (1962). McKnight (1969) points out that the echinoids of the continental shelf which are endemic to the faunal provinces as defined by Powell (1961) are in fact the rarer members of the fauna, and that the commoner members cannot be used to define any exclusive faunal region. The fauna of the continental slope and abyssal zone is generally accepted as being more widely distributed than that of the continental shelf, and faunal regionalism should therefore be considered on a wider scale. Further, the bottom temperature and salinity data presented by Ridgway (1969) shows little latitudinal variation within the New Zealand region, which suggests that the bathyal fauna may be zoned vertically rather than horizontally. Some preliminary studies on the distribution of slope-dwelling echinoderms in the New Zealand area suggest that the boundary between the bathyal and abyssal zones for these animals lies between 1000 and 1400 m. This is in general agreement with the usage of the 4°C isotherm by Bruun (1957) for the bathyal/abyssal boundary. It is also apparent in the bathymetric distribution of the macrourid fishes, of which 16 species (64% of the fauna) occur above about 1400 m. Regionalism, if it applies to the macrourid fishes, is most likely to be pronounced among this group of species.

Features of the fauna of the Challenger and Campbell Plateaux and the Chatham Rise have been discussed previously. Unfortunately, samples are lacking from the Bounty Platform, a further relatively extensive area of sea floor within the bathyal zone to the east of the Campbell Plateau. These three areas are the most extensive parts of the bathyal zone around New Zealand, and might be expected to show evidence of regionalism within the fauna. It has been shown that, in general terms, this is not so. However, a closer examination of the data shows some differences between the areas. In all three areas three species predominate, but the relative numbers of each vary from area to area. On the Chatham Rise *Lepidorhynchus denticulatus* is fairly common, being present at 32% of the stations; *Coelorhynchus oliverianus* is present at 34% of the stations, while *C. fasciatus* is present at only 9% of the stations. On the Campbell Plateau *C. fasciatus* is present at 50% of the stations, while the other two species are present at less than 20%. On the Challenger Plateau *C. oliverianus* is present at 59% of the stations, and the other two at less than 10%. In addition, statistical analyses of measurements of *C. oliverianus* have revealed some significant differences between populations from the three areas. Hence, regionalism of the fauna can be demonstrated between these areas, although the degree of regionalism is not large and is not apparent in simple presence/absence presentations.

Dealing with the narrower bathyal zone around the New Zealand mainland, one feature is apparent. Many species are recorded mainly or entirely from off the east coast. This is also apparent in some other animal groups, e.g., echinoids (McKnight 1969), and appears not to be completely related to sampling intensity, although no other explanation has been attempted. The area between North Cape and East Cape is notable in that several groups of animals, particularly molluscs and echinoderms, have rare or exotic species restricted to this area. No macrourid is limited to this area, and in fact the species recorded from there are few and relatively widespread. Only rare species are limited to the other areas defined as faunal provinces (Powell 1961; Pawson 1970), and the fauna is dominated by the more widespread and commoner species.

Regionalism on a broader scale is apparent. In discussing geographic distributions, two main groups of species were noted. The first, comprising 32% of the fauna (eight species), occurred north of the Chatham Rise and Challenger Plateau, whereas the second, comprising 36% of the fauna (nine species), occurred mainly on and south of these features, though some species extended north to off Gisborne. Much more detailed sampling of the fauna will be necessary, however, before this regionalism can be adequately assessed.

Speciation in the Fauna

One interesting feature of the fauna is the presence of several species pairs, especially in the genus *Coelorhynchus* but also to a lesser degree in *Coryphaenoides* and *Nezumia*.

In *Coelorhynchus* one pair is made up of *C. aspercephalus* and *C. australis*. As previously indicated, *C. australis* has wider geographic and bathymetric ranges

than *C. aspercephalus* and occurs also in Australian waters. However, *C. aspercephalus* has a wider latitudinal range within the New Zealand region. The species form a distinct section of the subgenus *Paramacrurus* unrelated to any other species, and occur in relatively shallow water for macrourids in general.

A second species pair is made up of *C. fasciatus* and *C. oliverianus*. The former is partially circumpolar and partially subantarctic, the latter endemic to New Zealand. *C. fasciatus* extends further south and is more common in deeper water than *C. oliverianus*. *C. mirus* is also an apparent member of this 'pair'. These species form a relatively distinct unit within *Paramacrurus*.

A third species pair is made up of *C. bollonsi* and *C. cookianus*, and, if the relationship with *C. chilensis* can be maintained, they form another relatively distinct group of species, but in the subgenus *Oxymacrurus*. All three species pairs of *Coelorhynchus* are southern and partially circumpolar, though not exclusively subantarctic. Dispersal via the West Wind Drift, as inferred by Fell (1962) for some echinoderms, may well be a cause of these relationships.

Species pairs present in other genera are *Coryphaenoides rudis* and *C. serrulatus*, and *Nezumia namatahi* and *N. toi*. These pairs are not so closely related as those in *Coelorhynchus*, and their affinities are much more strongly Indo-Pacific.

Relationships of the New Zealand Macrourid Fauna

Like several other groups of marine animals, the main affinities of the New Zealand macrourids are with the Indo-Pacific fauna. In general terms 3 species (12% of the fauna) are of widespread or unknown affinities, 8 (32% of the fauna) have affinities with a southern group of species, and 14 (56% of the fauna) have affinities with the Indo-Pacific fauna. The group with southern affinities includes five members of the subgenus *Paramacrurus*, basically an Indo-Pacific group, so the Indo-Pacific content can be assessed at up to 76% of the fauna.

Species of widespread or unknown affinities are *Cetonurus crassiceps*, *Coryphaenoides armatus*, and *Lepidorhynchus australis*.

Species of the southern group are *Macrourus carinatus*, *Coelorhynchus aspercephalus*, *C. australis*, *C. fasciatus*, *C. oliverianus*, *C. mirus*, *C. bollonsi*, and *C. cookianus*. As noted above, the first five members of the genus *Coelorhynchus* are derived from the Indo-Pacific fauna. Affinities of other species in this fauna are the remaining species of *Coelorhynchus* with *C. chilensis* from South America, although *C. carinifer*, a Philippine species, also shows some resemblance.

In the large Indo-Pacific group the affinities are, in the main, with species known from Japan or the Philippines. Examples are:

Coelorhynchus campbellicus with *C. acutirostris* (Philippines), *C. gladius* (Hawaii), and *C. hubbsi* (Japan);
C. innotabilis with *C. angulatus* (Philippines);
C. kermadecus with *C. parallelus* (Japan);
Nezumia namatahi and *N. toi* with *N. brevirostris* (Indian Ocean) and *N. proximus* (Philippines-Japan);
Coryphaenoides murrayi with *C. acrolepis* (Japan), *C. cyclolepis* (British Columbia), *C. leocephalus* (Japan), and *C. pectoralis* (Japan);
C. serrulatus and *C. rudis* with *C. nasutus* (Japan);
C. quadripennatus with *C. cinereus* (Japan) and *C. filamentosus* (Japan);
Bathygadus cottoides with *B. antrodes* (Japan) and *B. spongiceps* (Philippines);
Gadomus aoteanus with *G. introger* (Philippines).
Other affinities are:
Nezumia nigromaculata with *N. decimalis and N. pumiliceps* (widespread Indo-Pacific species).

The relationship with the Australian fauna unfortunately cannot be properly assessed. Six species present in the New Zealand fauna are also recorded from Australian waters, and form the bulk of macrourids known from Australian seas. Further collecting, both in Australian and New Zealand seas, will almost certainly increase the number of species known to be common to the two areas.

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