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THE RESULTS OF DEEP SEA INVESTIGATION IN THE  
TASMAN SEA.

II.—THE EXPEDITION OF THE “WOY WOY.”

I. FISHES AND CRUSTACEANS FROM EIGHT HUNDRED FATHOMS.

By ALLAN R. McCULLOCH, Zoologist.

(Plates lxiii.-lxv.).

In continuation of the investigations carried on by means of a grant from the Royal Society of London detailed on page 271 of these Records, Professor W. A. Haswell, M.A., made a second expedition on 26th to 27th October, 1906 in the “Woy Woy,” a boat that had already been engaged in this direction (*ante* p. 211). He kindly invited me to accompany him and has further honoured me by placing the Fishes and Crustacea in my hands for description. In the first instance, the Crustacea were undertaken by my lamented friend Mr. F. E. Grant, but the untimely death of that gentleman occurred before he had dealt with them.

The specimens here discussed were obtained in a single cast of a small trawl which Professor Haswell had built on the principle of one designed and successfully used by the Prince of Monaco. It was lowered in 800 fathoms at a point thirty-five miles due east of Sydney, on the 152nd Meridian.

Besides the subject of this paper, the trawl produced numerous representatives of Echinodermata, conspicuous among which were a hundred living specimens of *Porocidaris elegans* which choked the net, and with their long spines scraped most of the scales off the fishes that lay near them. Upon their arrival on deck fishes, crustaceans, and echinoderms alike were quite paralysed and rigid, while the stomachs and intestines protruded from the fishes' mouths and the eyes from their sockets. Only when they were placed in formalin did they exhibit any traces of life and then merely by erecting the fins and gill-covers before they died.

At the suggestion of Professor Haswell, I examined the stomachs of the fishes for any invertebrates that might be undigested, but in every case they were quite empty, the fishes having probably vomited the contents at an early stage of their ascent.

## A.—PISCES.

Eight species were taken belonging to five families, and seven genera of which five have not been recorded from the coast of New South Wales before, and four are new to Australia. The species are—

- Optonurus denticulatus*, Rich.  
*Macrourus nigromaculatus*, sp. nov.  
*Cœlorhynchus fasciatus*, Günther.  
*Cœlorhynchus innotabilis*, sp. nov.  
*Trachichthys intermedius*, Hector.  
*Symphurus strictus*, var. *australis*, var. nov.  
*Scorpena percoides*, Rich.  
*Hoplichthys haswelli*, sp. nov.

## MACROURIDÆ.

OPTONURUS DENTICULATUS, *Richardson*.

*Macrourus denticulatus*, Richardson, Zool. "Erebus and Terror," 1848, p. 53, pl. xxxii., figs. 1-3.

Richardson's specimen appears to have had the tail incomplete, and in his figure it is indicated by dotted lines only. In three of the six of our specimens it is perfect and in these the total length is 6.2 times that of the head. The first dorsal spine is unarmed, and the second dorsal and anal fins have 153, 156, 134, and 144, 143, 125 rays respectively.

One other specimen is of interest inasmuch as though the tip of the tail is clearly missing, the wound has healed over, and the dorsal and anal rays have grown together around it, thus giving it the appearance of a perfect member.

MACROURUS NIGROMACULATUS, *sp. nov.*

(Plate lxiii., figs. 1, 1a).

D. II. 10-11, 143-150; A. 140-145; P. 20; V. 13-15.

Head 7, depth of body at first dorsal spine 6 to 6.7 in the length without the caudal rays.

Head compressed, a little longer than deep, cheeks vertical. Snout much shorter than the eye and but little overhanging the mouth, very obtusely pointed and with three bony angles which, however, are not prominent. Infraorbital ridge obscure. Interorbital space with an elongate-triangular depression, the apex

directed backwards. Eye very large, its upper margin just cutting the profile of the head. Maxillary extending to beneath the front margin of the pupil. Teeth in villiform bands in both jaws, the outer series being slightly enlarged. Angle of the preopercle not produced, its posterior margin directed upwards and backwards. Barbel rather longer than half the diameter of the eye.

Body compressed, very deep, its greatest depth being at the origin of the first dorsal and greater than the length of the head. The dorsal profile ascends rapidly to the first dorsal spine, whence it drops abruptly so that the fin is attached to the posterior slope of a prominent hump. The ventral profile ascends rapidly backward from the origin of the anal; the tail is therefore abruptly narrower than the trunk, but tapers uniformly to its tip. Scales small, armed with seven or eight rows of slender spines which overlap the edge; about sixteen in a transverse series between the origin of the first dorsal and the lateral line. Whole head scaly. Lateral line strongly arched over the pectoral fin.

Second dorsal spine serrate along its entire length, its tip fine and flexible, and rather longer than the depth of the body; posterior rays very small. Origin of the second dorsal separated from the first by a space longer than the base of the first. Anal originating below the second dorsal spine. Pectorals slender, 1.3 in the head, situated far in advance of the dorsal and a little behind the ventrals. Outer ventral ray produced, reaching beyond the origin of the anal. Vent placed midway between the origin of the ventrals and the anal.

Colour greyish, abdomen and posterior part of the head black. A large round black spot on the first dorsal fin. Ventrals black.

The differences between the young specimen and the adult lie in its having a larger eye, about two in the head, fewer teeth on the second dorsal spine and longer anal rays.

This species is nearest allied to *M. gibber*, Gilb. and Cram., but is distinguished by its larger eye and shorter snout. From *M. ectenes*, Gilb. and Cram. and *M. hirundo* Coll., which it also resembles, it differs in the fin formulæ and the scales. It would enter the genus *Nezumia*, Jordan<sup>1</sup> which is separated from *Macrourus* by having an increased number of ventral rays, "13 to 15 instead of 7 to 10, as in all other *Macrouridae*," but as *M. gibber* has 12-13, and *M. semiquincunciatus*, Alc., *M. pumiliceps*, Alc., and *M. polylepis*, Alc., have 11-12, *Nezumia* is not here adopted. These species show the one to pass into the other by complete and gradual transition.

<sup>1</sup> Jordan—U. S. Fish. Comm. Bull., xxii., 1904, p. 620.

Type 227 mm. long from 800 fathoms, thirty-five miles east of Sydney. Four other specimens ranging from 114 mm. to 205 mm. taken with the type.

CÆLORHYNCHUS FASCIATUS, *Günther*.

*Macrurus (Cælorhynchus) fasciatus*, Gunther, Challenger Report, Zool., xxii., 1887, p. 129, pl. xxviii., fig. a.

D. xii. 101 ; A. 100 ; P. 17 ; V. 7. 1lat. 120.

A single specimen, 220 mm. long, which though not in entire agreement with Günther's description and figure, is so similar that despite the wide range between South America and the present locality, I hesitate to regard it as distinct. It differs from the Challenger figure in having the tail about two-thirds the length of the head longer, and produced into a fine point. The whole body is rather more slender and the anal rays are longer. The fins are dusky, and the outer anterior half of the anal is black. In all other characters it is in agreement with the figure.

It may be that the type specimen had the tail imperfect as in one of our specimens of *Optonurus denticulatus* (see p. 346) in which case these differences would be of little importance.

CÆLORHYNCHUS INNOTABILIS, *sp. nov.*

(Plate lxiii., figs. 2, 2a).

D. II. 8 ; P. 18 ; V. 7.

Greatest depth of the body 11·5 in the total length. Head including the spine on the snout 5·5 in the same. Snout 2·4 in the head, longer than the eye which is almost 3 in the head.

Snout broad, its terminal half tapering abruptly and tipped with a sharp triangular spine. Orbit elliptical, a little longer than the post-orbital portion of the head, and touching the dorsal profile. Interorbital space 1·8 in the longitudinal diameter of the eye. Width of the mouth at the angle of the gape nearly twice in the width of the head in the same line ; maxillary reaching to below the posterior margin of the eye. Barbel very small, one-fifth the length of the eye. Ridges on the head very pronounced. A median one from the rostral spine to between the first-third of the eyes. The supraorbital ridge extends round the posterior edge of the eye before turning off in a horizontal line to the upper end of the gill-opening. The inner pair of ridges branch off from the supraorbitals slightly in advance of the middle of the eye, and converge gently, becoming parallel till about the middle of their length, where they again separate a little. The spaces between the ridges, other than on the top of the head and the nape, are quite bare and formed of soft, membranous, and translucent skin.

CÆLORHYNCHUS FASCIATUS, *Günther*.

As the foregoing was passing through the press I received the following letter from Dr. G. A. Boulenger regarding the type specimen.

“You are perfectly right in suspecting the specimen of *Cælorhynchus fasciatus* figured by Günther in the “Challenger Report” to have a mutilated tail. Its companion has the tail intact, and is therefore longer and ends in a fine point, as normal in the *Macrourus*. I have besides seen several further specimens obtained off the Cape of Good Hope by Dr. Gilchrist.”

Body and tail very long and slender, covered with small scales of which there are 5 between the middle of the first dorsal fin and the lateral line, and 14 in the same row below. The scales on the sides have 5 sub-parallel rows of spines which overlap the edges.

Space between the two dorsals much shorter than the base of the first. Second dorsal spine smooth, not produced, and equal to about one-half the head in length; it is placed a little behind the vertical from the insertion of the ventrals, which are again posterior to the pectorals. Origin of the second dorsal behind that of the anal, its anterior rays about half the length of the eye; those of the anal slightly longer. Longest pectoral rays barely reaching to below the origin of the second dorsal. Outer ventral ray produced, overlapping the anterior anal rays and equal to those of the dorsal in length. Space between the ventrals and the vent shorter than the eye.

Colours, light grey with minute black specks. Iris, lips, belly and ventral fins black.

This species is characterised by its long and slender form. Without larger material it is impossible to be quite certain of its determination, but with the characters as presented by the young examples it appears to differ from all of the many described species. *C. tenuicauda*, Garm. is a closely allied species.

Type 138 mm. long from 800 fathoms, thirty-five miles east of Sydney. One other specimen 110 mm. long taken with the type.

#### BERYCIDÆ.

##### TRACHICHTHYS INTERMEDIUS, *Hector*.

*Trachichthys intermedius* (Hector), Günther, Challenger Report, Zool., xxii., 1887, p. 24, pl. v., fig. d.

One specimen, 120 mm. long, constitutes a new Australian record.

#### PLEURONECTIDÆ.

##### SYMPHURUS STRICTUS, *Gilbert*, var. AUSTRALIS, var. nov.

(Fig. 55),

*Symphurus strictus*, Gilbert, Bull. U. S. Fish. Comm., xxiii., pt. ii., 1903 (1905), p. 691, fig. 272.

D. 116; A. 103; V. 4; C. 14; scales lat. 130; sc. tr. 51.

Length of the head (in the median line of the body) 6.1, height of body 4 in the length without caudal. Eyes very small, the upper slightly in advance of the lower, and half the length of the

snout which is one fourth that of the head. Interorbital space scaly, the anterior part with a broad flap covering the posterior nostril. Anterior nostril tubular, situated midway between the end of the snout and the lower eye. Head and body, with the exception of the snout, covered on both sides with small ctenoid scales which on the coloured side, extend over the bases of the fin rays. No lateral line. The dorsal fin commences over the front edge of the eyes, its middle rays equal in length to those of the anal, 3.6 in the height of the body and shorter than the caudal, which is pointed. Anal separated from the ventral by a space nearly equal to the snout.

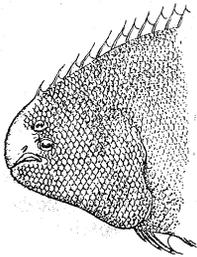


Fig. 55.

Colour light brown without darker markings. Peritoneum black, showing through the abdominal walls. Blind-side colourless.

A single specimen 120 mm. long agrees fairly well with Gilbert's description, but differs in having a somewhat deeper body and shorter head. The eyes also are smaller than as shown in his figure and the snout longer. In all other characters however it appears too closely related to *S. strictus* to admit of specific distinction.

#### SCORPÆNIDÆ.

##### SCORPÆNA (HELICOLENUS) PERCOIDES, *Richardson*.

*Sebastes percoides*, Richardson, Ann. Mag. Nat. Hist., ix., 1842, p. 384; Voy. "Ereb. and Terr.," ii., 1845, p. 23, pl. xv.

One specimen, a female with unripe ova, 363 mm. long. Colours in life, pink suffused with yellow, with indistinct darker cross-bars. Pectorals, dorsal and caudal pink, the spinous fin deeper coloured than the others. Ventrals and anal white. Iris golden, surrounded with pink.

(Note.—All the scales were rubbed off the sides by the spines of echini taken in the same haul. Otherwise the cross-bars may have been more marked).

Richardson assigned this species to the genus *Sebastes*, but was corrected by Günther<sup>2</sup> who transferred it to *Scorpena*. Waite<sup>3</sup>

<sup>2</sup> Günther—Challenger Rept., Zool., xxii., 1887, p. 17.

<sup>3</sup> Waite—Mem. Aust. Mus., iv., 1899, p. 100.

placed it under *Sebastapistes* which was considered by Jordan and Evermann<sup>4</sup> to be a synonym of *Scorpaena*, and later by Jordan<sup>5</sup> as a close ally of the same.

I cannot refer to Street's diagnosis of *Sebastapistes*, which apparently includes only "numerous dwarf species less than three inches long" (Jordan *loc. cit.*) but as our fish presents all the characters of *Helicolenus*, a genus doubtfully distinct from *Scorpaena*, I place it under the above heading.

There appears to be some considerable variation in the relative lengths of the dorsal spines of this species. The present specimen is in perfect agreement with Richardson's original description and figure, but a number of others of smaller size, including those taken by the "Thetis" Expedition, are rather better represented by McCoy's figure,<sup>6</sup> wherein the longest spines are higher than the anterior rays.

#### HOPlichthyidæ.

HOPlichthys HASWELLI, *sp. nov.*

(Plate lxiv.).

D. v. 14 ; A. 16 ; P. 14+4 ; V. I. 5 ; lateral plates 27.

Depth of body  $8\frac{3}{4}$ , length of head to opercular flap 2.6 in the length of the body without the caudal fin. Length of snout 2.74, diameter of eye 5.48 and width of head 1.15 in its length.

Snout broadly rounded, with a median notch at its extremity. The lateral profile of the head is formed by a minutely denticerous ridge which bears four large spines ; the first, which has a smaller spine at its base, placed before the anterior margin of the eye, another similar one before the posterior margin, a third directed inwards at the end of the preopercular margin, and the fourth and largest forming the preopercular spine. A bony plate, wider than the interorbital space, extends backwards from the nostrils, between which and the lateral margins is a soft fleshy area. Back of head covered with rough bony plates and smooth naked areas. The sculpture on the plates consists of minutely denticulated, radiating ridges, the centres of which are larger or smaller spines. The opercles bear three strong ridges which are armed with small spines along their length, and terminated by larger spines. A pair of large humeral plates, each bearing a strong spine.

<sup>4</sup> Jordan and Evermann—Fishes of N. and Middle America, ii., 1898, p. 1839.

<sup>5</sup> Jordan—Guide Study of Fishes, ii., 1905, p. 434.

<sup>6</sup> McCoy—Prodr. Zool. Vict., i., 1879, pl. 33 not very good).

The lower jaw is longer than the upper. A broad band of villiform teeth in both jaws, the innermost ones being the largest. A very long band on each palatine, and a large patch on the vomer which sends backwards two other parallel rows. All the inner teeth are larger than those of the jaws. The maxillary reaches almost to the front margin of the orbit. Gill membranes united to the isthmus, without a free fold, and separated by a space equal to half the interorbital width.

Above the lateral series of plates and posterior to the first dorsal fin, are some widely scattered, thin, cycloid scales, almost entirely imbedded in the skin. On the caudal peduncle they are more numerous, overlapping and smaller. The large lateral plates are roughened by a number of minutely denticulated ridges radiating from the large blade-like spines, which latter increase in size backwards. The pores of the lateral line are placed below the middle of these spines, and there are no smaller secondary spines. The hinder edges of the plates are smooth and deeply cleft in the middle.

The spines of the first dorsal are slender, the second being the longest, 1.38 in the snout (this fin is malformed in the larger specimen, the measurement being therefore taken from the smaller one). The second dorsal ray is the highest and more than once and a half longer than the highest (7th) anal ray. The anal commences beneath the 2nd or 3rd dorsal ray and terminates far behind that fin. Caudal almost truncate, the upper rays a little longer than the lower. The four lower pectoral rays are free except for a low membrane at their extreme base. They are thickened, and longer than the rays above them. The following one or two rays may be also simple but are joined by membrane to their tips. The ventrals are inserted well in advance of the pectorals, the rays increasing in length backwards. Both specimens have a small anal papilla.

Colours in life pinkish yellow above, white beneath. Dorsals, caudal and pectorals pinkish, the latter finely edged with white. The vertical fins and tail with darker markings.

I have pleasure in associating with this fish the name of Professor W. A. Haswell, the leader of the expedition.

This species is closely allied to *H. platophrys*, Jord. and Everm., but appears to be distinguished by its different fin formula, the character of the lateral plates, the lower pectoral rays being divided to their base, and by the shape of the snout.

Type 430 mm. long, from 800 fathoms, thirty-five miles east of Port Jackson. One other specimen, 340 mm. long, taken with the type.

## B.—CRUSTACEA.

The trawl obtained three species, two of which, *Latreillopsis petterdi*, Grant, and *Pandalus martius*, A. M.-Edw. are dealt with here. The third is reserved for further consideration.

## LATREILLIDÆ.

LATREILLOPSIS PETTERDI, *Grant*.

(Plate lxxv.).

*Latreillopsis petterdi*, Grant, Proc. Linn. Soc. N. S. Wales, xxx., 1905, p. 317, pl. x., fig. 2.

A giant specimen with a carapace measuring 79 mm. long enables me to add further details to the original description of this species. It is a male, and though presenting characters markedly different from Grant's description and figure, a comparison with the type in the Museum collection, which is only 6.55 mm. long, convinces me that it is the adult of this species. The following is a description of the specimen.

Carapace subquadrilateral, but the width across the hepatic regions narrower than the hinder margin; the length to the base of the rostral spine very little more than the greatest breadth, which is behind the middle of the length. Sides vertical, the greatest depth, which is at the base of the chelipeds, just half the length.

Rostral spine slightly deflexed, about half as long as the supraocular spines, its base broad and depressed. Supraoculars uptilted and armed with two spines, the one nearest the base directed outwards and upwards, and the other outwards only.

Whole carapace, with the exception of the frontal and hepatic regions, covered with small granules which are more numerous along the lateral and posterior margins. Regions moderately well defined. The middle and medio-lateral parts with deep grooves. Linea anomurica distinct. Epigastric region with two large sub-spiniform granules, and smaller approximated ones between them. Proto-, meso-, and metagastric regions each with a large tubercle, that of the first-named being spiniform and the anterior of a series of six arranged parallel with the sides of the carapace. Cardiac and epibranchial regions prominent, with larger (worn) tubercles. Hepatic region inflated, with three large mammiliform spines above and three smaller ones below. A similar spine at the anterior hepatic angle and another above the base of the antennæ.

Eye-stalks less than half the length of the supraocular spines, which do not conceal them from dorsal view ; eyes very large, though comparatively smaller than those of the young specimen.

Coxæ and ischia of all the pereopoda with spiniform granules below. Meri with spines on both margins which are largest behind, and each armed distally with a strong spine above ; their hinder and lower surfaces bespread with spiniform granules.

Chelipeds about  $2\frac{1}{4}$  the length of the carapace and slightly more than half that of the third pair of ambulatory legs. The carpus is granular. Hand very large and swollen, only a little deeper than thick and covered on both inner and outer faces with very small rounded granules, the largest of which tend to form rows. Fingers curved inwards, with widely spaced tufts of short bristly hairs, the mobile finger with a large blunt tooth near the base.

Ambulatory legs of the first to third pairs with the carpus almost smooth. The propodus is roughened with minute forwardly-directed spines which are most numerous below. Dactylus with five rows of spinules of which two are above, one on each side and one below.

Last pair of legs much shorter than the preceeding, a little longer than the chelipeds. Propodus short and broad with four slender spines placed close together on its hinder margin, into which the very small dactylus closes.

The ischium and merus of the maxilipeds are very long and narrow and coarsely granular. Their inner margins thickly clothed with long bristles. The following joints smooth and cylindrical. Exopodite slender, its basal portion granular.

All seven segments of the abdomen are distinct and faintly granular, and completely covering the space between the bases of the maxilipeds and legs. The middle line of segments 1-6 is raised and on 1-4 bears a small spine. Segments 3, 4, and 6 have also small spines on either side of the raised portion.

Colour in general pink, the carapace becoming whitish on the sides. Eyes orange above. Hands dark yellow, separated from the black fingers by a white interspace. Distal end of the joints of the ambulatory legs and the dactyli rose-colour, the latter with rows of yellow spines.

The most striking differences between the young and adult specimens are, in terms of the latter, the broader and much less quadrilateral form of the carapace, and the less prominent hepatic regions ; the granulations and spines of both carapace and legs though much stronger and more numerous, are not so long in

proportion. The two terminal joints of the last pair of legs are also less modified than in the young specimen.

#### PANDALIDÆ.

##### PANDALUS (PLESIONIKA) MARTIUS, *A. M.-Edw.*

*Pandalus (Plesionika) martius* (A. M.-Edw.), Alcock, Cat. Crust.  
"Investigator" 1901, p. 95. Rathbun, Bull. U.S. Fish Comm.,  
1903 (1906), pt. iii., p. 914.

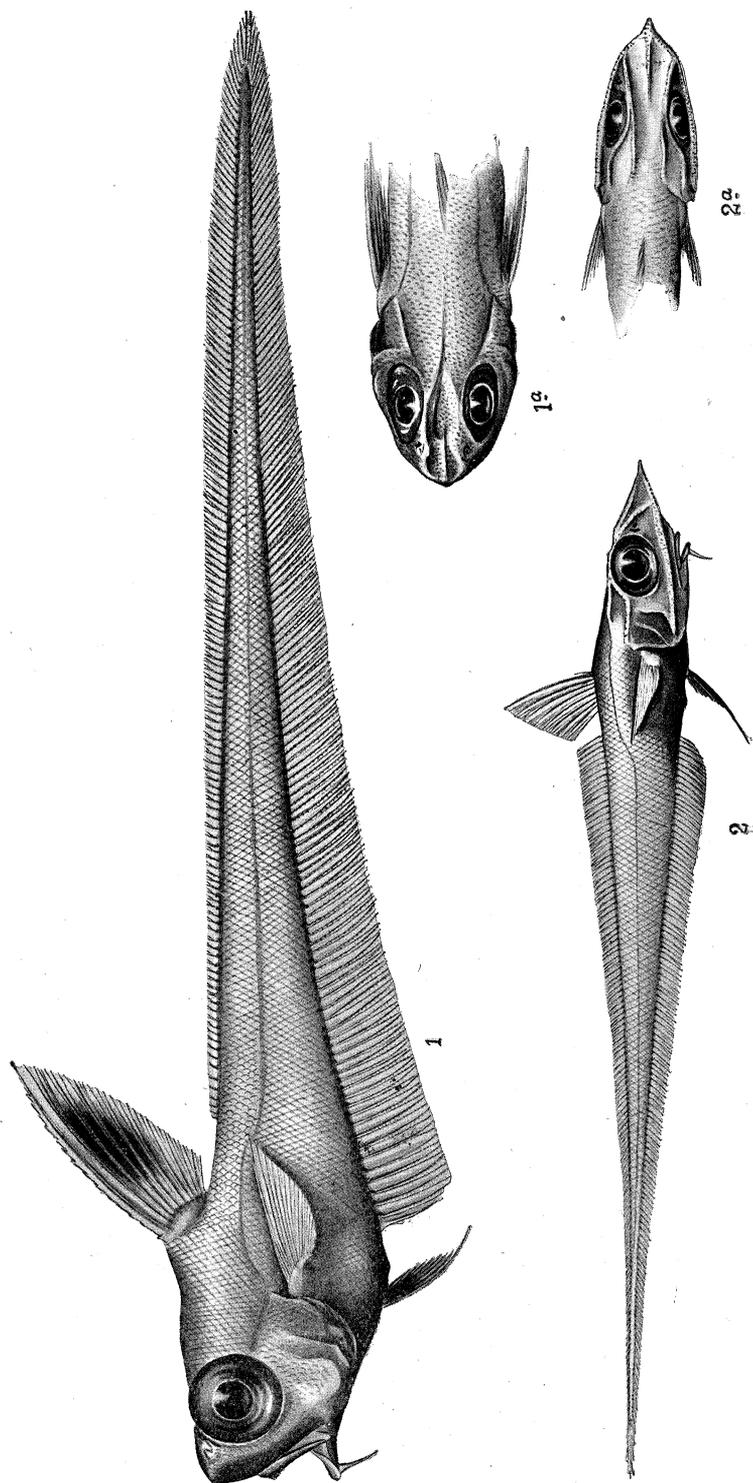
A large series, agreeing well with Alcock's detailed description. This species was dredged by the Challenger at Station 164a off Sydney, in 1,200 fathoms, while it has also been recorded from various localities eastward to the Kermadec and Hawaiian Islands and west through the Indian Ocean to the Mediterranean Sea.

EXPLANATION OF PLATE LXIII.

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- Fig. 1. *Macrourus nigromaculatus*, sp. nov.  
    , 1a.        "          "          top view of head.  
    , 2. *Cælorhynchus innotabilis*, sp. nov.  
    , 2a.        "          "          top view of head.

(All the figures are of the natural size).



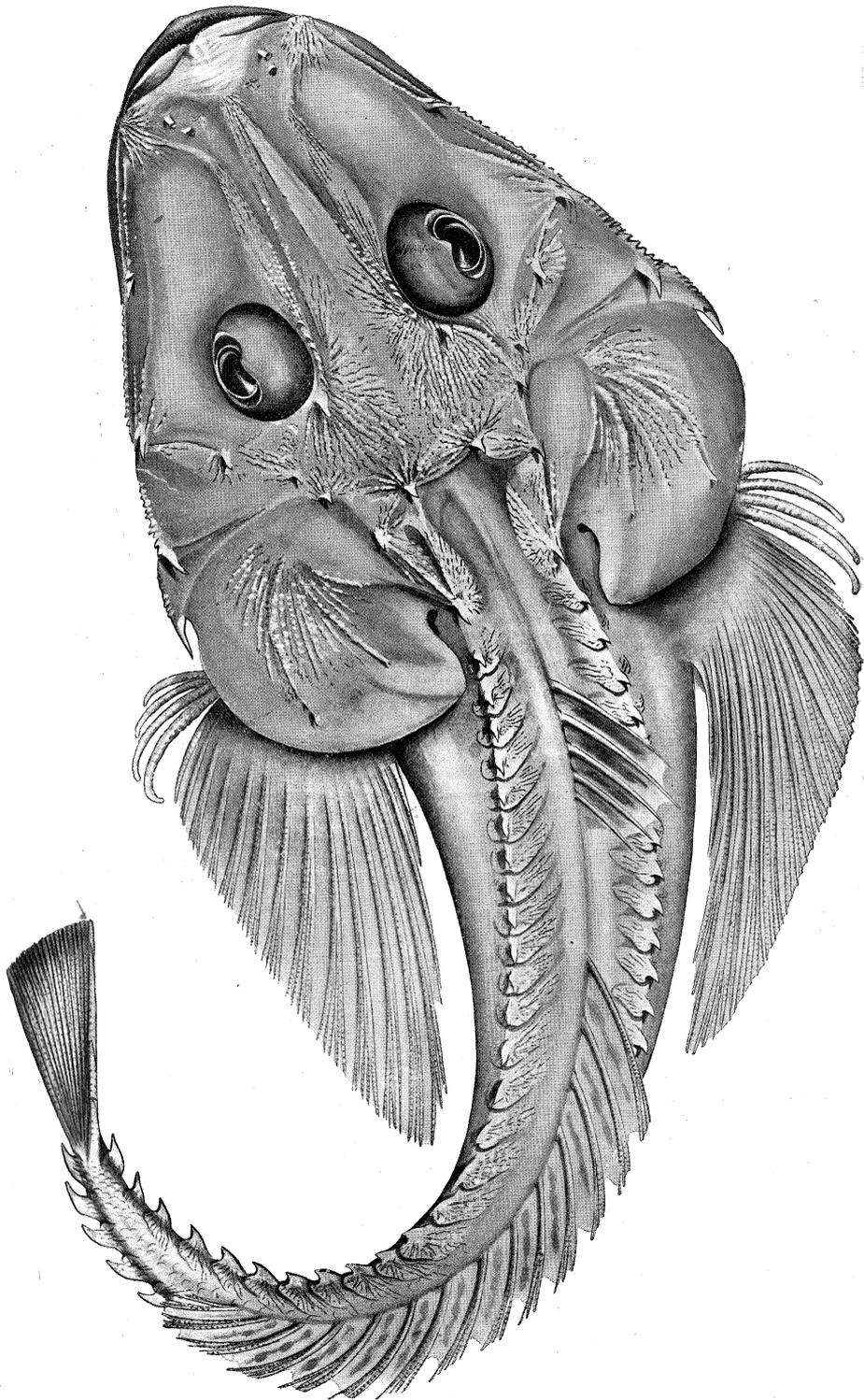
A. R. McCULLOCH, del.,  
Austr. Mus.

EXPLANATION OF PLATE LXIV.

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*Hoplichthys haswelli*, sp. nov.

(Reduced).



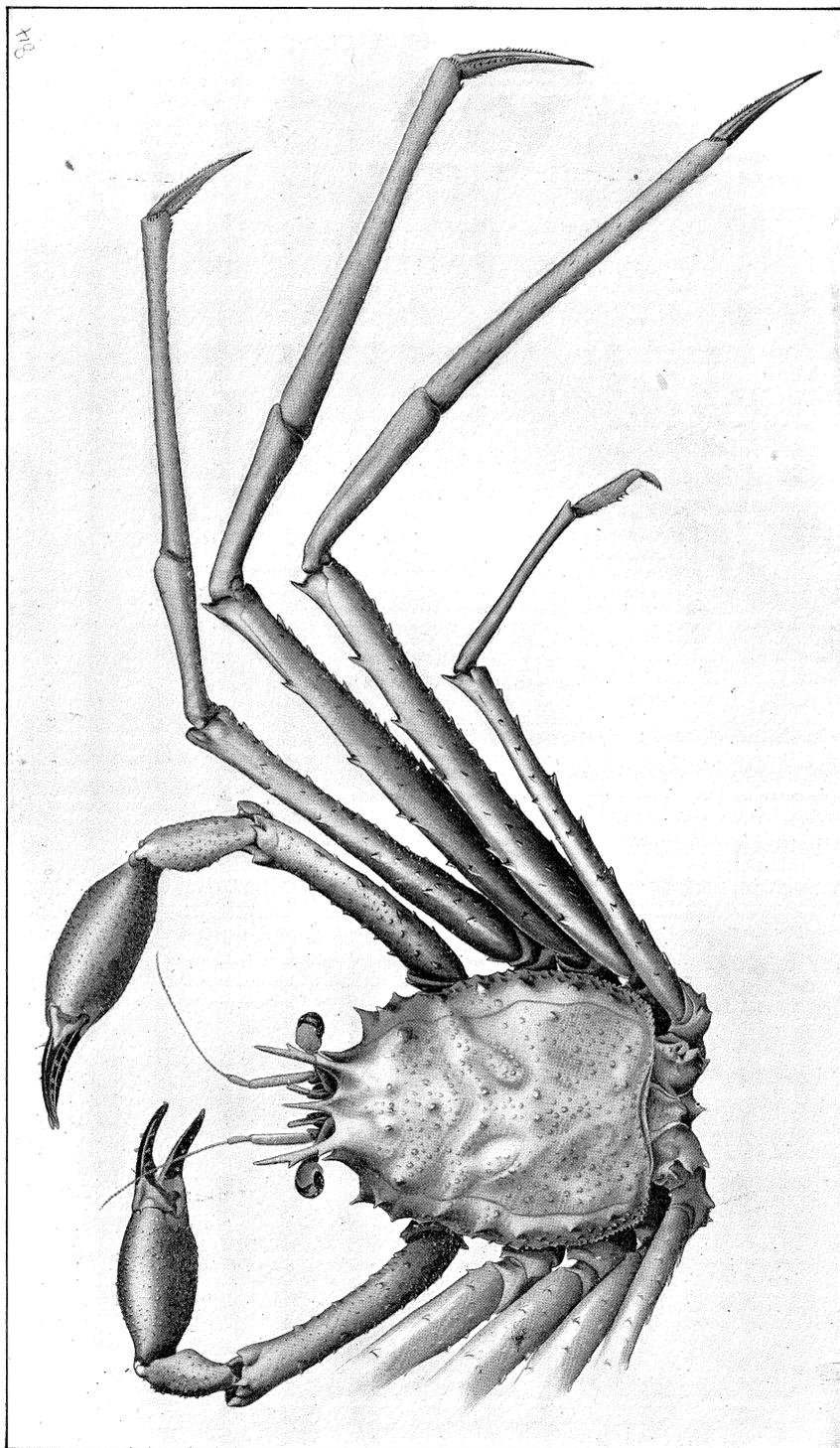
A. R. McCULLOCH, del.,  
Austr. Mus.

EXPLANATION OF PLATE LXV.

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*Latreilopsis petterdi*, Grant.

(Reduced).



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Austr. Mus.