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STUDIES IN ICHTHYOLOGY.

No. 4.*

By

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(Plates xi-xvi and Figures 1-2.)

Family RHINOBATIDÆ.

Genus *Aptychotrema* Norman, 1926.

Aptychotrema rostrata (Shaw and Nodder).

(Plate xvi, fig. 2.)

Raja rostrata Shaw and Nodder, Nat. Miscell. v, Apr. 1, 1794, pl. clxxiii. No locality. Type locality, Botany Bay, New South Wales, by present designation.

Rhinobatus (*Rhinobatus*) *banksii* Müller and Henle, Syst. Plagiost. iii, 1841, p. 123. Ex *Raja rostrata* Banks MS. New Holland. Based on a drawing in the British Museum.

Rhinobatus (*Syrrhina*) *banksii* Müller and Henle, Syst. Plagiost. iii, 1841, p. 192. New Holland. Specimen in Royal coll., Vienna. *Id.* Duméril, Hist. Nat. Poiss. (Suite à Buffon) i, 2, 1865, p. 490. A Banksian specimen in the Paris Museum.

Rhinobatus tuberculatus Macleay, Proc. Linn. Soc. N. S. Wales, vii, 1882, p. 12. Port Jackson. *Nomen nudum.*

Rhinobatus banksii Waite, Austr. Mus. Mem., iv, 1899, p. 38, pl. iii. *Id.* Ogilby, Mem. Qld. Mus., v, 1916, p. 85, fig. 1, left.

Aptychotrema banksii Norman, Proc. Zool. Soc. Lond., 1926, p. 978, fig. 30. *Id.* Whitley, Fish. N. S. Wales (McCulloch), ed. 2, 1927, first page of additions (key characters reversed in error).

Aptychotrema rostrata Musgrave and Whitley, Austr. Mus. Magazine, iv, 1931, p. 150 and photo. (Trial Bay, N. S. Wales).

Whilst at Trial Bay, northern New South Wales, in December, 1929, I secured several embryos of this species from parents nearly three feet long. Four were removed from one female and are preserved in the Australian Museum. These are 122 to 124 mm. long and have each a subspherical yolk-sac about 30 mm. in diameter.

Raja rostrata is apparently the earliest name for this species. Though figured by Shaw and Nodder from no stated locality, it bears the same name as that used by Banks in his manuscripts, and the figure is probably copied from the Banksian drawing in the British Museum upon which Müller and Henle based their name. It agrees well with Waite's figure, published over a century later, and has the eyes closer together than in the allied Australian species, *Aptychotrema bougainvillii* (Müller and Henle).

McCulloch¹ has figured the egg and embryos of *Aptychotrema vincentianus* (Haacke), which I regard as a distinct southern species, distinguishable by its

* For No. 3 see RECORDS OF THE AUSTRALIAN MUSEUM, Vol. xvii, No. 3, 1929, p. 101.

¹ McCulloch.—Biol. Res. "Endeavour," v, 4, 1926, p. 157, figs. 1-4.

less attenuate snout. The accompanying photographs of the Trial Bay specimens of *A. rostrata*, for which I am indebted to Mr. Anthony Musgrave, will serve for comparison. The eggs are evidently hatched within the body of the parent, but I do not know what length is attained by the embryos before birth.

Family RAJIDÆ.

Irolita, gen. nov.

Orthotype, *Raja waitii* McCulloch.

Raja waitii McCulloch² obviously deserves a generic appellation of its own as it is doubtfully congeneric with the South American *Psammobatis* Günther, with which it has been associated by authors. Furthermore, *Psammobatis* Günther³ may be regarded as preoccupied by *Psammobates* Fitzinger,⁴ a genus of reptiles, to which my attention was attracted when looking through some proof-sheets of Sherborn's "Index Animalium." *Malacorhina* Garman⁵ may apparently be employed for the South American genus as Regan⁶ has suggested its identity with *Psammobatis*, and the new genus *Irolita* will apply to the South Australian *Irolita waitii* (McCulloch).

Glauert⁷ has extended the range of this species to south-western Australia.

Family DASYATIDÆ.

Genus *Tæniura* Müller and Henle, 1837.

Tæniura Müller and Henle, Ber. Verh. K. pr. Akad. Wiss. Berlin, 1836 (1837), p. 117; Arch. Naturg. (Wiegmann), iii, 1, 1837, p. 400; Mag. Nat. Hist. (Charlesw.) n.s., ii, 1838, p. 90. Haplotype, *Trygon ornata* Gray.

Trygon Geoffroy St. Hilaire, Egypte (Savigny), i, 1, Poiss. Mer Rouge, 1827, p. 333. Not *Trygon* Cuvier, 1816 (*vide* Sherborn, Index Anim., and Jordan, Gen. Fish.).

Discobatis Miklouho-Maclay and Macleay, Proc. Linn. Soc. N. S. Wales, x, 4, April 3, 1886, p. 678. Haplotype, *D. marginipinnis* M. and M. Preoccupied by *Discobatis* Garman, Proc. U.S. Nat. Mus., 1881, p. 523, another genus of Rays.

Discotrygon Fowler, Proc. Acad. Nat. Sci. Philad., lxii, 2, Aug. 17, 1910, p. 468. New name for *Discobatis* M. and M., preocc. Orthotype, *D. marginipinnis* M. and M.

Tæniura lymnia halgani (Lesson).

(Plate xi.)

Raja lymma Forskaal, Descr. Anim. 1775, p. 17. Loheia, Red Sea. This work is non-binomial.

Raja lymnia Bonnaterre, Tabl. Encycl. Meth. Ichth., 1788, p. 5. Based on *Raja lymma* Forskaal. Red Sea.

? *Raja lymma* Hamilton-Buchanan, Acc. Fish. Ganges, 1822, p. 361 (*vide* Fowler, Proc. Acad. Nat. Sci. Philad. lvii, 1905, p. 460, footnote 8).

Trygon lymna Cloquet, Dict. Sci. Nat., xxxviii, 1825, p. 62.

² McCulloch.—Zool. Res. "Endeavour," i, Dec. 22, 1911, p. 12, pl. iii and text-fig. 4.

³ Günther.—Cat. Fish. Brit. Mus., viii, 1870, p. 470.

⁴ Fitzinger.—Ann. Wiener Mus., i, 1, 1835, p. 113.

⁵ Garman.—Proc. Boston Soc. Nat. Hist., xix, 1878, pp. 203 and 207.

⁶ Regan.—Brit. Antarct. Exp., Zool., i, 1, 1914, p. 22.

⁷ Glauert.—Journ. Roy. Soc. W. Austr., vii, 1921, p. 45.

- Trygon lymma* Geoffroy St. Hilaire, Egypte (Savigny), i, 1, Poiss. Mer Rouge, 1827, p. 333, pl. xxvii, fig. 1. Red Sea (Ref. from Sherborn, Ind. Anim.).
- Trigon lymma* Rüppell, Atlas zu Rüppell, Reise (Senckenb. Nat. Ges.), Fische, 1829, p. 51, pl. xiii, fig. 1; Neue Wirbelth. Abyssin., Fische, 1837, p. 69, pl. xix, fig. 4. Red Sea.
- Trygon lymnae* Swainson, Nat. Hist. Classif. Fish. Amphib. Rept. ii, July, 1839, p. 319. Based on Rüppell, 1829. [Red Sea.]
- Tæniura lymma* Müller and Henle, Syst. Plagiost., pt. 3, 1841, p. 171. *Id.* Richardson, Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (1843), p. 30 (Australia).
- Trygon ornatus* Gray, Illustr. Indian Zool., i, 2, "1829" = March, 1830, pl. xcix. Singapore.
- Trygon halgani* Lesson, Voy. Coquille, Zool. ii, Dec., 1830, p. 100, pl. iii. Waigiou and New Ireland.
- Discobatis marginipinnis* Miklouho-Maclay and Macleay, Proc. Linn. Soc. N. S. Wales, x, 4, April 3, 1886, p. 676, pl. xlvi, figs. 7-15. Based on drawings of a specimen with a mutilated tail from Sorry or Wild Island, Admiralty Group.
- Tæniura lymma* Klunzinger, Verh. Zool.-Bot. Ges. Wien., xx, 1870, p. 681. *Id.* Günther, Cat. Fish. Brit. Mus., viii, 1870, p. 483, and Journ. Mus. Godef., vi, 17 (Fische Südsee, ix), 1910, p. 495. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales, vii, 1883, p. 598 (New Guinea). *Id.* Ogilby, Proc. Linn. Soc. N. S. Wales, x, 1885, pp. 463 and 465 (Cape York, Q., and New Guinea). *Id.* Fowler, Proc. Acad. Nat. Sci. Philad., lxii, 1910, p. 473 (Sumatra). *Id.* Ogilby, Mem. Qld. Mus. i, 1912, p. 31 (Darnley I., Q.). *Id.* Weber, Siboga Exped., Fische, May, 1913, p. 604. *Id.* Garman, Mem. Mus. Comp. Zool. Harvard, xxxvi, Sept., 1913, p. 399, pl. lii, fig. 4; pl. lv, fig. 7, and pl. lxxi, figs. 4-5 (anatomical). *Id.* Ogilby, Mem. Qld. Mus., v, 1916, pp. 87 and 95. *Id.* McCulloch, Rec. Austr. Mus., xiii, 1920, p. 41, pl. x (Murray I. specimen figured). *Id.* Whitley, Austr. Zool., iv, 1926, p. 228. *Id.* Paradise and Whitley, Mem. Qld. Mus. ix, 1927, p. 78 (Pellew Group). *Id.* Barnard, Ann. S. Afr. Mus., xxi, 2, 1927, p. 1015. *Id.* Fowler, Mem. Bishop Mus., x, 1928, p. 25.
- Tæniura lymna* McCulloch and Whitley, Mem. Qld. Mus., viii, 1925, p. 130 (Queensland).

When illustrations of Red Sea, Singapore, Australian, and Pacific specimens of *Tæniura lymna* are compared, slight differences of shape, coloration and size of eyes are noticeable. Perhaps comparison of a series of specimens from diverse localities would show variations of subspecific or even specific value because actual specimens generally differ more than their illustrations; but I am unable to make autoptical comparisons in this case and accordingly use *T. lymna* as the earliest binomial name for this stingray. The teeth of a topotypical example figured in Rüppell's "Neue Wirbelthiere" are notably sharper than in my specimens so that, should further differences be discovered, the Australian form may be called *Tæniura halgani* (Lesson). An excellent illustration of a specimen nine inches in width, from Murray Island, Queensland, was given by McCulloch, whilst a newborn example collected by Mr. M. Ward in the Whitsunday Passage, Queensland, is figured here.

Other specimens in the Australian Museum came from North-west Islet, Brampton Island, St. Crispin Reef, and Cape York, Queensland; Port Darwin

and the Sir Edward Pellew Group, North Australia. I found the species very common at Low Isles, North Queensland. A specimen from Batt Reef, near by, had remains of prawns, mantis shrimps, and polychæte worms in great numbers in the stomach.

Dampier⁸ figured a specimen of *Tæniura lymnia halgani* from New Guinea and remarked: "This Fish is a pale red with blew spots on y^e body the long tail blew in y^e middle and white on y^e side."

Some nominal species of *Tæniura* may be considered here. Gray⁹ recorded *Tæniura meyeri* Müller and Henle¹⁰ from Cape Upstart, Queensland, but I have not seen a specimen of this species from Australia.

Macleay¹¹ described *Tæniura atra* from New Guinea. The type, from Port Moresby, is preserved in the Australian Museum (No. I.9762). It measures 35 inches in length, including the tail, and is 16 inches wide. It belongs to the genus *Pastinachus* Rüppell.¹² Pending comparison with Red Sea specimens of *P. sephen* (Bonnaterre),¹³ it may be regarded as a subspecies: *Pastinachus sephen ater* (Macleay).

Macleay¹⁴ also described *Tæniura mortoni* as a new species from the Burdekin River, Queensland, but the type is lost; no specimen bearing that name is now preserved in either the Macleay Museum, University of Sydney, or the Australian Museum. There is, however, a specimen of *Pastinachus* from Macleay's Burdekin River collection in the Australian Museum and, as it agrees with Macleay's brief description of *T. mortoni*, I regard that species as synonymous with *Pastinachus sephen ater* (Macleay).

Family CHIROCENTRIDÆ.

Genus *Neosudis* Castelnau, 1873.

Neosudis vorax was the name given to a supposed new genus and species of fishes from New Caledonia by Castelnau¹⁵ with the remark, "I can only place this remarkable fish with the *Scopelidæ*, and its dorsal fin, placed on the posterior part of the body, would bring it near *Sudis*." The systematic position of *Neosudis* has been a puzzle to subsequent workers. O'Shaugnessy¹⁶ placed it in the *Scopelidæ*, Jordan and Seale¹⁷ in the *Paralepidæ*, Regan¹⁸ regarded it as a doubtful *Scopelarchid*, Jordan¹⁹ put it in the *Evermanellidæ*, and Parr²⁰ considered it as

⁸ Dampier.—Cont. Voy. New Holland, 1709.

⁹ Gray.—List. Spec. Fish. Brit. Mus., i, Chondropt., 1851, p. 124.

¹⁰ Müller and Henle.—Syst. Plagiost., pt. 3, 1841, p. 172. Mauritius.

¹¹ Macleay.—Proc. Linn. Soc. N. S. Wales, vii, 4, April, 1883, p. 598.

¹² Rüppell.—Atlas zu Rüppell, Reise (Senckenb. Nat. Ges.), Fische, 1829, p. 51,

footnote. Logotype, *Dasybatus sephen* [= *Raia sephen* Bonnaterre], designated by Garman, Mem. Mus. Comp. Zool. Harv., xxxvi, Sept., 1913, p. 375.

¹³ Bonnaterre.—Tabl. Encycl. Meth., Ichth., 1788, p. 4, as *Raia*. *Ex* Forskaal, non-binomial. Red Sea.

¹⁴ Macleay.—Proc. Linn. Soc. N. S. Wales, viii, 2, July 17, 1883, p. 212.

¹⁵ Castelnau.—Proc. Zool. Acclim. Soc. Vict., ii, May 10, 1873, p. 119.

¹⁶ O'Shaugnessy.—Zool. Record, 1873 (1875), p. 120.

¹⁷ Jordan and Seale.—Bull. U.S. Bur. Fish., xxv, 1906, p. 190.

¹⁸ Regan.—Ann. Mag. Nat. Hist., (8), vii, 1911, pp. 127 and 130.

¹⁹ Jordan.—Classif. Fishes, 1923, p. 154.

²⁰ Parr.—Bull. Bingham Oceanogr. Coll., iii, 3, 1928, p. 32, footnote.

possibly deserving of family rank. Fowler²¹ gave a précis of the characters of *Neosudis* and followed Jordan and Seale in placing it in the Paralepidæ.

As the work in which Castelnau's description appeared is apparently rather rare in libraries, though still obtainable in Melbourne, I reproduce herewith the original account.

"NEOSUDIS.

"Body very elongate; height eight and a-half times in the total length; head six times and one-third in the same; eye four and two-thirds in the head; body compressed, very elongate, sharp below; head also compressed; the lower jaw considerably longer than the upper one; chin salient and rounded; teeth strong, slender, almost straight, apart one from the other; those of the upper jaw much shorter than those of the mandible, with the exception of the two front ones, which are often unequal in length and directed obliquely forwards; the lower teeth are very long, pointed, directed backwards. The opening of the mouth is superior, and the maxillaries extend further than the edge of the eye; eyes covered by a veil; the operculum rounded; upper surface of the head depressed between the eyes, with three longitudinal ridges, the central one abbreviated; body covered with minute scales; dorsal unique inserted very considerably behind the middle of the body, and at about two-thirds of its length; this fin is about two-thirds of the length of the head; it has sixteen rays, the posterior ones and the base of the others are covered with scales, and the fin has an adipose appearance; the caudal is very deeply forked, formed of twenty long rays and of a considerable number of shorter ones on each side; anal inserted a little behind the beginning of the dorsal, and over twice as long as this; it is covered in great part by scales, and the rays are difficult to count, numbering twenty-six to twenty-eight; the anterior rays are considerably longer than the others. Ventrals very small, of about one-fifth the length of the pectorals, placed a little nearer to the base of the pectorals than to that of the anal, and formed of eight stiff rays; the lower ones formed of a sort of broad lamina, which is also the case with the dorsal and anal; pectorals situated near the lower edge of the operculum, of fourteen rays; they are nearly as long as two-thirds of the head.

"I can only place this remarkable fish with the *Scopehidæ*, and its dorsal fin, placed on the posterior part of the body, would bring it near *Sudis*.

"NEOSUDIS VORAX.

"Silvery, with the upper parts of a dark slate colour; dorsal, ventrals, and anal, white; caudal rather yellow, bordered with black.

"The largest of my specimens is over twenty-four inches in length.

"Noumea, New Caledonia."

From this it is evident that Castelnau's fish is not even a member of the order Iniomi, to say nothing of the families of that order to which it has been referred. *Neosudis* lacks an adipose second dorsal or fat fin, although Castelnau described the true dorsal as having an adipose appearance. It has small eyes, compressed belly, low pectorals, and insignificant eight-rayed ventrals, but the unusually backward insertion of the single dorsal fin is the main diagnostic character which separates *Neosudis* at a glance from the Iniomi.

I regard *Neosudis* Castelnau as a synonym of the Clupeoid genus *Chirocentrus* Cuvier,²² with which it agrees in detail. *Neosudis vorax* is perhaps a synonym of *Clupea dorab* Bonnaterre,²³ the genotype of *Chirocentrus*, from the Red Sea. Nevertheless it seems inadvisable to sink it as a synonym on present evidence as comparison of Red Sea and Pacific specimens would probably show specific or sub-specific differences. The New Caledonian form may therefore be known as

²¹ Fowler.—Mem. Bishop Mus., x, 1928, p. 66.

²² Cuvier.—Règne Animal, ed. 1, ii, "1817" = Dec., 1816, p. 178.

²³ Bonnaterre.—Tabl. Encycl. Meth., Ichth., 1788, p. 187, *ex* Forskaal, non-binomial.

Chirocentrus dorab vorax (Castelnau) and be removed from the order Iniomi and placed in the family Chirocentridæ of the order Isospondyli, suborder Clupeoidei. A brief note to this effect appeared in the Abstract of the Proceedings of the Linnean Society of New South Wales, No. 429, September 27, 1929, subsequently reprinted in the Proceedings, Vol. liv, 6, 1930, p. 1.

The tautotype of the genus *Chirocentrus* is "l'esoce chirocentrus" or *Esox chirocentrus* Lacépède,²⁴ based on a drawing by Commerson of a fish without definite locality. This and *Clupea dentex* Bloch and Schneider,²⁵ from the Red Sea, are regarded as synonyms of *Chirocentrus dorab* (Bonnaterre). *Chirocentrus nudus* Swainson²⁶ is based on a figure of an Indian example, with the scales rubbed off, given by Russell.²⁷ Richardson²⁸ introduced the name *Esox clupeoides*, from the MSS. of Broussonet for a Madras specimen. *Chirocentrus hypselosoma* Bleeker²⁹ from Singapore and Samarang has been shown to be distinct from *C. dorab* by Hardenburg³⁰ and this name and *C. nudus* have precedence over *vorax* Castelnau if conspecific. It is noteworthy that Cockerell³¹ in describing the scales of "*Chirocentrus dorab*" from Queensland, suggested that this species may not be identical with *C. dorab* from the Philippines. Ogilby³² has given further notes on the Queensland form, which is probably identical with the New Caledonian *C. dorab vorax*.

Family MURÆNIDÆ.

Genus *Gymnothorax* Bloch, 1795.

Gymnothorax Bloch, Nat. ausl. Fische, ix, 1795, p. 83; Ichtyologie, vi, pt. 12, 1797, p. 67. Logotype, *G. reticularis* Bloch.

Taxonomy.—I am unable to consult the original "Nat. ausl. Fische" in which *Gymnothorax* was first proposed, but quote from the "Ichtyologie" edition wherein the genus is defined as follows: "Mr. Thunberg l'a séparée des anguilles et en a fait, et avec raison, un genre séparé ^a [Footnote ^a] (Specimen ichthyologie de Muræne. Upsal. 1789). Mais, comme Mr. Thunberg [sic] a donné à ces poissons le nom de Murènes, nom que Linné donne aussi aux anguilles, je leur ai donné celui de *Gymnothorax*, afin d'éviter toute confusion; et cette denomination fait connoître en même temps la marque distinctive du genre." It is thus obvious that *Gymnothorax* is a substitute name for *Muræna* Thunberg (*nec* Linné, Syst. Nat., ed. 10, 1758, p. 244). Bloch, however, added two species to those already described by Thunberg; *viz.*, *G. catenatus* (pl. 415, fig. 1) from Surinam, and *G. reticularis* (pl. 416) from Tranquebar. It is thus reasonable to suppose that one of the species of *Muræna* Thunberg (non Linné³³) should be the genotype of *Gymnothorax* and not *G. reticularis* as selected by Bleeker.³⁴

²⁴ Lacépède.—Hist. Nat. Poiss., v, 1803, p. 296, pl. viii, fig. 1.

²⁵ Bloch and Schneider.—Syst. Ichth., 1801, p. 428.

²⁶ Swainson.—Nat. Hist. Classif. Fish. Amphib. Rept. ii, July, 1839, p. 295.

²⁷ Russell.—Fish. Vizag., ii, 1803, p. 78, pl. excix, as *Clupea dorab*?

²⁸ Richardson.—Rept. 15th meet. Brit. Assn. Adv. Sci., 1845 (1846), p. 311.

²⁹ Bleeker.—Nat. Tijdschr. Ned. Ind., iii, 1852, p. 71.

³⁰ Hardenburg.—Treubia, xii, 1, 1930, p. 51.

³¹ Cockerell.—Mem. Qld. Mus., iii, 1915, p. 37.

³² Ogilby.—Mem. Qld. Mus., v, 1916, p. 96.

³³ Linné.—Syst. Nat., ed. 10, 1758, p. 244. Type, *Muræna helena* Linné.

³⁴ Bleeker.—Atlas Ichth., iv, 1865, p. 73.

Thunberg's work on the eels is not available to me, but I find from Sherborn's invaluable "Index Animalium" and Jordan and Gilbert's notes³⁵ that he described the following species:

<i>Muraena nebulosa</i>	Thunberg,	De Muraena,	1789,	p. 7.
<i>Muraena annulata</i>	„	„	„	p. 8.
<i>Muraena picta</i>	„	„	„	p. 9.
<i>Muraena fasciata</i> ³⁶	„	„	„	p. 9.

Bloch mentioned these four species in a footnote and, therefore, perhaps the correct course to pursue would be to name one of them as genotype of *Gymnothorax*, but I prefer not to add to the confusion which has been caused in spite of Bloch's desire to avoid it and I therefore regard *G. reticularis* as the logotype of *Gymnothorax* as selected by Bleeker; this is one of the species mentioned under the original definition of the genus and is therefore available as genotype.

Jordan³⁷ was in error in stating that *Gymnothorax* "was plainly a substitute name for *Muraena* and must retain the same type, *Muraena helena* L." He quoted Günther's restriction of *Gymnothorax* to the allies of *Muraena afra* but Günther made no formal genotype designation, as Bleeker did. It may be noted that Jordan later³⁸ accepted Bleeker's interpretation of this genus.

Thus *Gymnothorax* Bloch is not a synonym of *Muraena* Linné and the genotype, selected by Bleeker, is *G. reticularis* Bloch. By accepting this finding, it will not be necessary to alter the customary usage which the International Commission on Zoological Nomenclature has sought to stabilize by opinion.³⁹

Family SYNGNATHIDÆ.

Genus *Phyllopteryx* Swainson, 1839.

Phyllopteryx lucasi sp. nov.

(Plate xv, fig. 1.)

Hippocampus foliaceus Richardson, Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (1843), p. 28. "New Holland" = Western Australia, by present designation. *Nomen nudum*.

Phyllopteryx elongatus Castelnau, Proc. Zool. Acclim. Soc. Vict., ii, May, 1873, p. 144. Fremantle, W. Austr. Not *P. elongatus* Castelnau, *ibid.* i, 1872, p. 243, from South Australia.

Phyllopteryx foliatus Duncker, Faun. S.W. Austr., ii, Pisces i, 1909, p. 236. W. Australian ref. only. Not *Syngnathus foliatus* Shaw, Gen. Zool., Pisc., v, 2, 1804, p. 456 = *Phyllopteryx foliatus* Swainson, 1839, from eastern Australia.

D.30; A.4; P.21; Annuli 17 plus 37. Sub-dorsal annuli 7.

Snout (43) 1.4 in head (62). Eye (7) 6.1 in snout or 8.9 in head. Postorbital (13) 3.3 in snout. Tail (121) 2.2 in total length of fish when extended (277). Depth at 10th body-ring (29) 2.1 in head.

Snout very long, three and one-third times postorbital, lacking processes below but with a pair of small spines on the upper surface two-thirds of its length

³⁵ Jordan and Gilbert.—Proc. U.S. Nat. Mus., v, 1882, p. 648.

³⁶ This name is preoccupied by *M. helena* var. *fasciata* Meuschen, Index Zoophylac. Gronov., 1781, No. 164. Thunberg's species is *Chlevastes colubrina* (Boddaert).

³⁷ Jordan.—Gen. Fish., i, 1917, p. 53, and Smithson. Miscell. Coll., lxxiii, 4, 1926, p. 7.

³⁸ Jordan.—Gen. Fish., ii, 1919, p. 168.

³⁹ Smithson.—Miscell. Coll., lxxiii, 4, 1926, p. 7.

from the tip. A small preorbital spine and several serrations between it and the supraorbital spines, which are long and acute, the anterior pair pointing obliquely upwards and backwards and the posterior pair flaring outwards. A series of irregular serrations around orbit and two small spines below the eye at the vertical of the posterior supraorbital spines. Interorbital concave, pitted. Occiput elevated, with a leafy process. Opercles, nape, and top of head strongly granulated. A large blunt spine and several smaller ones in front of pectoral base. A long, slender, nuchal spine, bearing a process; a pair of similar, but curved, spines on the back between the tenth and eleventh body-rings and another pair on the ventral surface between the eighth and ninth body-rings. A short spinous bony plate on each side of the anterior rays of the dorsal fin. Two pairs of compressed spines, bearing each a leafy process, on top of tail. These and the ventral spines are very strongly serrated, more especially on their anterior edges. Three unpaired spines on the posterior half of the tail, the first two of which bear a leafy process; perhaps in the more elongated ancestors of *Phyllopteryx*, these spines, too, were paired and more separated than they are now, as there are traces of obliterated spines on the sides of the unpaired ones.

Body ridges with short, thorn-like spines, strongest along sides and ventral surfaces of body, but obsolete on dorsal arch, where there are numerous granulated ridges. Body strongly compressed, its width one-third of its depth. Upper profile evenly arched; lower profile convex anteriorly, concave behind the ventral spines, and gibbous before the anal fin. A hump in the dorsal outline on each side of the dorsal fin. The anterior part of the body forms a longer and thinner "neck" than is met with in *Phyllopteryx foliatus* (Shaw).

The colour-markings have faded in my specimen, which was received dry. The general tone is now horn brown becoming blackish under nearly all the tail and around its posterior portion. Snout, head, sides of abdomen, and dorsal surface of tail covered with yellow spots which are smaller than those of *P. foliatus*; the spots tend to become drawn out to form vertical bars on the end of the snout and are very small on the cheeks. Seven oblique violet bars on lower part of body between pectoral fin and ventral spine and a large dark blotch surrounding the small preanal spines.

Phyllopteryx lucasi is allied to *P. foliatus* (Shaw) from eastern Australia but is smaller, more slender, much more rugose on head and back, with more distinct and longer spines on the bony processes above tail and below thorax. The leafy processes are longer in the new species than they are in *P. foliatus* and the preanal dark spot is larger.

Described and figured from the holotype (Austr. Mus. No. IA.4119) which was found attached to some seaweed sent from Middleton Beach, Albany, Western Australia, to Mr. A. H. S. Lucas, M.A., B.Sc., to whom I have much pleasure in dedicating the species.

Family MYCTOPHIDÆ.

Genus *Lampanyctus* Bonaparte, 1840.

Lampanyctus piabilis sp. nov.

(Figure 1.)

Lampanyctus braueri Waite, Rept. Austr. Antarct. Exped., Zool. iii, 1, June 30, 1916, p. 61, figs. 14-14a. Macquarie Island. Not *Myctophum* (*Lampanyctus*)

braueri Lönnberg, Schwedisch. Südpolar-Exped., v, 6, Fish., 1905, p. 64, fig. 1, from the South Atlantic Ocean. *Id.* Parr, Bull. Bingham Ocean. Coll., iii, 3, 1928, p. 78 (Antarctic ref. only). *Id.* Norman, Discovery Report ii, 1930, p. 327 (Macquarie Island record only).

D.18-19; A.18; P.13; V.8; C.19. L. lat. 42.

Depth (17 mm.) 5.7 in length to hypural joint (98). Head (28) 3.5 in same. Eye (7.5) 3.3 in the head.

Snout formed by a convex crest which bifurcates anteriorly. Preopercular crest very oblique above but vertical behind the maxillary. A band of villiform teeth in each jaw. Origin of the dorsal fin much nearer the snout than the base of the caudal and slightly behind the vertical of the first ventral ray; the length of its base is considerably longer than that of the anal fin and its posterior ray is over the fifth anal ray. Anal terminating just before the vertical of the adipose dorsal. Pectorals in the lower third of the depth, not reaching the ventrals. Ventrals reach origin of anal.

Photophores.—Two well-developed luminous glands on the anterior margin of the eye and within the orbital border, the upper above the nostrils and the lower at the antero-inferior margin extending backwards to below the pupil. One photophore is present behind the preopercular crest above the level of the maxillary; a second perhaps occurs lower down. A single thoracic is present anteriorly and is separated by a wide space from three equidistant pairs arranged near the median line of the ventral surface. A fifth pair is widely spaced, each being placed in front of the base of the first ventral ray. A photophore is situated just before the base

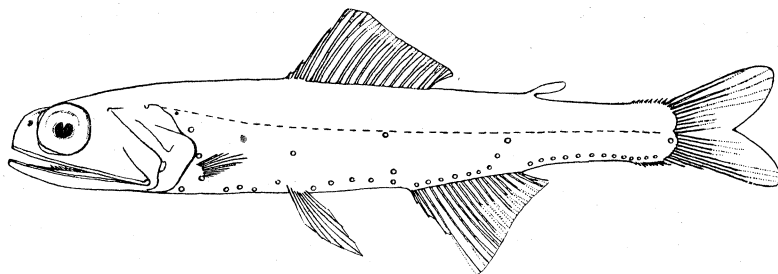


FIGURE 1.

Lampanyctus piabilis Whitley. Holotype from Macquarie Island.
(Ethel A. King, del.)

of the pectoral fin; two suprapectorals, one a little above the base of the pectoral fin and the other close to the lateral line, the two forming an oblique line bending forward and upward. Supra-ventral midway between the ventral fin and the lateral line. Five pairs of ventral photophores forming an evenly curved line on each side, the first and fifth being about equidistant from the median line and the fourth most widely separated. Apparently three supra-anals forming an oblique line, the lowest above the last ventral and the uppermost touching the lateral line a little in advance of the vertical of the anal origin. Seven or eight anal photophores forming a very slightly curved line, the last a little higher than the others: Waite's figure shows an elevated anteroanal above and slightly before the first of the lower series but all trace of this is lost in the specimens under review.

Two posterolaterals, the upper close to the lateral line, below the adipose dorsal. Posteroanal and lower precaudals forming a single row of thirteen photophores. A single precaudal behind the hypural joint, below the level of the lateral line. No photophores above the lateral line.

Described from two specimens 98 and 103 mm. in standard length. They are in imperfect condition, being denuded of scales and their fins are much broken. The photophores are imperfect in both, a number having been lost and no trace of their position remains. The accompanying figure represents the smaller specimen which is the holotype, though some details have been added from the larger paratype. These specimens are two of the three recorded from Macquarie Island by Waite as *Lampanyctus braueri*, but they differ from that species in several details. The dorsal fin has eighteen or nineteen rays and is longer than the anal instead of shorter as shown in Lönnberg's figure of *L. braueri*. There are two suprapectoral photophores instead of one and two well developed preocular luminous organs instead of a minute antorbital.

Locality.—Stranded on a beach at Macquarie Island, collected by the Australasian Antarctic Expedition, March 2, 1913. Holotype and paratype in Australian Museum, registered numbers IA.504 and 505 respectively.

Family HEMIRAMPHIDÆ.

Loligorhamphus, gen. nov.

Orthotype, *Loligorhamphus normani*, sp. nov.

The remarkable development of the cutaneous flaps below and on each side of the beak separates this genus at sight from all the other members of the family.

Loligorhamphus normani sp. nov.

(Plate xii, figs. 2 and 3.)

D.14; A.15; P.12; V.i/5; C.14. L. lat. *circa* 60. Br. 14.

Head, measured from tip of upper jaw (31 mm.), 4.1 in length from tip of upper jaw to hypural joint (127). Beak, measured from tip of upper jaw (59.5) 2.1, or entire lower jaw (66.5) 1.9 in same. Eye (7.5) 4.1, interorbital (8) 3.8, postorbital (11) 2.6 in head. Width of upper jaw (6) 1.3 in its length (8). Depth of body (12) 10.5, width of body (8) 15.1, width of head at opercles (9) 14 in standard length (127). Pectoral (16) 1.9, ventral (7.5) 4.1 in head, the latter fin equal to eye. Entire head (90) 2.2 in total length (193).

Head compressed, flat above. Eye large. Triangular part of upper jaw pointed and with a slight median keel, longer than broad. Preorbital rounded, scale-like, entire, with a subvertical groove before eye. Maxillary not entirely concealed. Opercles entire, operculum with a pointed flap. The nostrils occupy large basins, on the floor of which are two ridges diverging anteriorly. The nostrils themselves are in the form of a bunch of densely packed finger-like papillæ arranged in transverse rows. A band of minute pointed teeth on each intermaxillary is broadest anteriorly and separated from its fellow by a narrow symphyisial interspace. A very much narrower band of similar teeth in lower jaw, not extending along beak. A buccal velum in both jaws. Beak elongate, tapering, with a narrow median groove formed by two bony rods extending the length of the beak. The main feature of this genus and species is the breadth attained by the folds of

skin on each side of the beak. Each lateral fold is broader than the beak itself. The width of the beak, with folds extended, is 10 mm., whilst that of the beak itself is only 4 at its base. On the chin, a pair of cutaneous folds coalesces on the median line and extends along the lower jaw apparently forming a closed tube. Branchiostegal rays fourteen. The left branchiostegal membrane overlaps the right and is joined to it and not to an isthmus. There are apparently no pseudo-branchiæ. Gill-rakers slender, with small asperities anteriorly, about forty on lower portion of first gill-arch. A series of large pores around the top of each eye.

Body elongate, compressed, but flattened on dorsal and ventral surfaces, and tapering towards the tail. It had evidently been covered with large cycloid scales, but, owing to their deciduous nature, nearly all of these are now missing. From the scale-pockets it appears that there were about sixty scales along the lateral line, nine rows of scales between the dorsal and anal fins, forty-three predorsal scales, and about six rows of scales on each side of the caudal peduncle. Tubes of the lateral line straight, with a few short, simple, lateral branches. Vent a little in advance of anal fin. A small genital papilla.

Dorsal originating in advance of anal and terminating behind it. The first few rays appear to be simple and longest and the rest branched and shorter; the last two rays are markedly longer than those immediately preceding them. Anal with one short and spine-like ray and the rest branched; the anterior rays are longest and there are no produced posterior rays. Pectorals pointed, the upper rays longest, equal to distance from pupil of eye to opercular flap. Ventrals short, separate, originating much nearer base of caudal than base of pectoral. Caudal forked, the lower lobe apparently longer.

Colour, after long fixation in formalin and subsequent transference to alcohol, brownish above and lighter below. Beak and folds nearly all black, as are also the edges of the lowermost folds and areas on top of head and on operculum. Each scale-pocket on the back has a blackish mark but there are no definite lines running along the back. A blackish lateral stripe, probably silvery when the fish was alive, extends from the punctulated pectoral base to the base of the tail. It is broadest between the dorsal and anal fins. Fins without colour-marking, but there is a small amount of blackish pigment diffused over the dorsal and caudal.

Described and figured from the holotype, a specimen 127 mm. in standard length or $8\frac{1}{2}$ inches in total length. Australian Museum registered number IA.2319.

Type locality.—Townsville, Queensland. Collected in October, 1924, by the late W. E. J. Paradise, Surgeon-Lieutenant of H.M.A.S. "Geranium," who supplied the following note on this species: "Caught at Townsville within the breakwater and some distance up the river. These fish swam round in pairs of at times up to six and sometimes in company with other species of garfish. Not seen outside the breakwater." Only one specimen, the type, is now in the Australian Museum.

Named in honour of Mr. J. R. Norman, of the British Museum, who has a second specimen.

The first garfish recorded from what is now Queensland was observed by Banks at Cooktown on July 4, 1770.

Family COBITIDÆ.

Enobarbichthys, gen. nov.

When I⁴⁰ proposed the generic name *Enobarbus* to replace *Jerdonia* Day 1870, preoccupied, I was unaware of a prior genus of birds said to have been named *Enobarbus* by Temminck. I have not traced Temminck's original reference but quote from Gray's "Catalogue of the Genera and Subgenera of Birds," 1855, p. 54, No. 908, where the name appears to be published for the first time as there is no earlier introduction listed in Sherborn's "Index Animalium."

Thus a new name is required for *Jerdonia* Day, 1870, and *Enobarbus* Whitley, 1928, both preoccupied, and I propose as a substitute, *Enobarbichthys* with *Platacanthus maculatus* Day as orthotype; this species will now be known as *Enobarbichthys maculatus*.

Family CARANGIDÆ.

The Australian fishes of this family have been reviewed in part or as a whole several times, yet there still remains a great deal of work to be performed before the various species shall all have been correctly determined and placed in their proper genera. It seems likely that, when the geographical limits of the genera of Carangidæ are determined, the Australian forms so far called *Caranx* will be relegated to entirely different genera.

The tautotype of *Caranx* Lacépède⁴¹ is *Caranx carangua* = *Scomber carangus* Bloch⁴² from Martinique. Various authors have accepted other species as genotype and their action has led to some confusion. The generic name *Carangus* is merely a latinization of the French vernacular "les carangues" and is a synonym of *Caranx* Lacépède. Guichenot⁴³ seems to have been the first to use *Carangus* in the Latin sense.

Bleeker⁴⁴ proposed some new generic names on pages 342 to 344 in a list of species, defined the genera on page 352, and described the species later on. His names have, in some cases, been misquoted in Jordan's "Genera of Fishes," so I give here a list of the new Carangoid genera he proposed in that paper.

Bleeker, <i>loc. cit.</i> , p. 342, <i>Megalaspis</i> .	Haplotype, <i>Caranx rotleri</i> Cuv. and Val.
	<i>Decapterus</i> . Logotype, <i>Caranx kurra</i> Cuv. and Val.
p. 343, <i>Selar</i> .	Logotype, <i>Caranx boops</i> Cuv. and Val.
	<i>Carangoides</i> . Logotype, <i>Caranx preustus</i> Raffles.
	<i>Leioglossus</i> . Haplotype, <i>L. carangoides</i> Bleeker, p. 367.
	<i>Selaroides</i> . Haplotype, <i>Caranx leptolepis</i> Cuv. and Val.

On page 160, Bleeker introduced *Gnathanodon*, with haplotype *Caranx speciosus* Cuv. and Val. [= Bonnaterre].

Regarding the genus *Atropus*, Sherborn quotes in his "Index Animalium": *Atropus* Oken, Isis, 1817, 1782 [= 1182] and *Atropus* H. R. Schinz in Cuvier,

⁴⁰ Whitley.—Rec. Austr. Mus., xvi, June 11, 1928, p. 296.

⁴¹ Lacépède.—Hist. Nat. Poiss., iii, 1802, p. 57. See also Jordan and Gilbert, Proc. U.S. Nat. Mus., vi, 1883, p. 192.

⁴² Bloch.—Nat. ausl. Fische, vii, 1793, p. 69 (*vide* Sherborn).

⁴³ Guichenot.—Dict. pittoresque d'Hist. Nat., i, 1834, p. 634. Vernacular in Griffith, Anim. Kingd. (Cuvier), x, 1834, p. 196.

⁴⁴ Bleeker.—Nat. Tijdschr. Ned. Ind., i, 1851.

Thierreich, ii, 1822, 521 [*non* Cuvier *vernac.*]. This name is, however, pre-occupied by *Atropos* Leach 1815, a genus of Orthoptera, also quoted by Sherborn. Oken's names in the "Isis," 1817, have been regarded as *nomina nuda* but *Atropus* Schinz, 1822, should apparently be regarded as a synonym of *Olistus* Cuvier⁴⁵ which Agassiz⁴⁶ emended to *Olisthus*. This genus is characterized by the filamentous median dorsal rays.

I wish to dispose of a *nomen nudum* in a formal manner by making *Caranx filigera* Saville-Kent⁴⁷ a synonym of *Citula gracilis* Ogilby.⁴⁸ The correct name of this species is *Citula oblonga*, originally described as a *Caranx*⁴⁹ but belonging to the genus *Citula* Cuvier, 1816.

Zamora, gen. nov.

Orthotype, *Caranx hullianus* McCulloch.⁵⁰

The remarkable development of the dorsal and anal fins, whose median rays are longest, at once separates this species from any other genus of Carangidæ known to me. The type of *Zamora hulliana* is the only specimen known, and this has been described and figured by McCulloch in his usual complete manner.

Pantolabus, gen. nov.

Orthotype.—*Caranx parasitus* Garman.

Near *Alepes* Swainson⁵¹ but with shorter pectorals and eye longer than snout. *Rastrum* Fowler⁵² is also closely allied but the genotype has larger scales and longer pectoral fins than *Caranx parasitus*.

Pantolabus parasitus (Garman).

(Plate xii, fig. 1.)

*Trichiurus*⁵³ *declivis* Agassiz and Mayer, Bull. Mus. Comp. Zool. Harv., xxxii, April, 1898, p. 18. Cairns Harbour, Queensland; in medusa (*Crambessa mosaica*).

Not *Caranx declivis* Jenyns, Zool. Beagle, Fish., 1841, p. 68.

Caranx parasitus Garman, Bull. Mus. Comp. Zool., xxxix, Aug., 1903, p. 232.

Cairns, Queensland; in tentacles of medusa. Type in Mus. Comp. Zool., Harvard, U.S.A. *Id.* Jordan and Seale, Bull. U.S. Fish. Bur., xxv, 1906, p. 232.

"Fiji" [= Queensland]. *Id.* McCulloch, Mem. Qld. Mus., viii, 1924, p. 68.

⁴⁵ Cuvier.—Règne Anim., ed. 2, ii, April, 1829, p. 209. *Genus cælebs*.

⁴⁶ Agassiz.—Nomencl. Zool., 1846, Index. Univ., p. 257.

⁴⁷ Saville-Kent.—Prelim. Rept. Food-Fish. Qld., Govt. Printer, Brisbane, 1889, p. 10; Great Barrier Reef, 1893, p. 369. Queensland.

⁴⁸ Ogilby.—Mem. Qld. Mus., iii, 1915, p. 75, pl. xxiii. Darnley Island, Queensland.

⁴⁹ Cuvier and Valenciennes.—Hist. Nat. Poiss., ix, March, 1833, p. 128. Vanikoro, Santa Cruz Archipelago.

⁵⁰ McCulloch.—Rec. Austr. Mus., vii, 4, Aug. 30, 1909, p. 319, pl. xci. Freshwater Beach, near Sydney, New South Wales. Type in Australian Museum.

⁵¹ Swainson.—Nat. Hist. Classif. Fish. Amphib. Rept., ii, July, 1839, pp. 176 and 248. Haplotype, *A. melanoptera* Swainson, based on "Wori Parah" Russell, Fish. Vizagapatam, 1803, pl. clv; specimen which had lost its scales.

⁵² Fowler.—Journ. Acad. Nat. Sci. Philad. xii, 1904, p. 509. Orthotype, *Alepes scitula* Fowler.

⁵³ This is an error for *Trachurus declivis* which is correctly reported from Sydney Harbour, but the Cairns specimens are *Caranx parasitus* Garman. These were caught in Cairns Harbour, not on the Barrier Reef.

Id. Paradiçe and Whitley, *ibid.* ix, 1927, p. 82. *Id.* Fowler, Mem. Bish. Mus., x, 1928, p. 148. *Id.* McCulloch, Austr. Mus. Mem., v, 2, 1929, p. 187.

D.i (procumbent), viii, i, 22; A.ii, i, 19; P.21; V.i, 5; C.15. L. lat. 44 scutes. Br. 7-8.

Head (15 mm.) 3.3 in standard length (50). Depth at origin of second dorsal (21) 2.3 in same. Interorbital subequal to eye (5), 3 in head, and longer than snout (4). Pectoral (13) shorter than head.

Jaws subequal; maxillary broad, almost reaching to below middle of eye, with a supplemental bone. A narrow strip of minute villiform teeth in each jaw. No canines and no outer row of larger teeth. A velum in each jaw. A few microscopic teeth on vomer; apparently none on palatines. Tongue triangular, with a free rounded tip, edentulous. Eye large, with a narrow adipose margin posteriorly. Nostrils large, close together on each side of snout; the anterior nostril with a raised rim which becomes flap-like posteriorly. A strong occipital keel and two diverging ridges over eye. Cheeks scaly, rest of head entirely naked. Seven to eight branchiostegal rays. Some pores over the supraorbital ridge and along-side the occipital keel. Radiating mucus-tubes on preorbital and preoperculum. Gill-rakers not projecting into mouth.

Body compressed, deep anteriorly, but tapering to a slender caudal peduncle; the lower profile of the body more oblique posteriorly than the upper, so that the abdominal outline is more convex than that of the dorsal surface.

Small cycloid scales cover practically all of the body and extend on to the fin-sheaths but leave naked a small area on the breast anteriorly and do not extend far over the scapula. Base of pectoral and all head, except cheeks, entirely naked. The body scales are annulated and form wavy rows in some places where they are crowded on the flanks. Curve of lateral line ceasing below anterior rays of soft dorsal. About forty scales on curved part of lateral line, often with short, upwardly directed tubes; they are followed by about forty-four scutes on the straight portion of the lateral line. These scutes are small anteriorly but become largest as they approach the caudal peduncle, where they are less than one-tenth the height of the body, then they decrease rapidly in size to become very small on the tail.

Spinous dorsal preceded by several small crests and a procumbent spine. Anterior dorsal rays higher than spines, not forming a falciform lobe but with their margin rounded. No produced rays; last dorsal and anal rays not larger than or far apart from the others. Margins of dorsal and anal fins slightly excavate. Two uppermost rays of pectoral simple; the rest branched, third and fourth longest. Ventrals shorter than pectorals. Caudal forked, with rounded lobes.

Colour greyish above, sometimes with faint traces of darker shades along the myomeres. Sides brilliant silvery. The fins are whitish, except the spinous dorsal and tips of anterior dorsal rays, which are dusky, and the lobes and margins of the caudal which are black. The second dorsal is yellow in some specimens. A pronounced dark blue-black spot on operculum.

Described and figured from a specimen, 65 mm. in total length. Australian Museum registered number IA.4310, which is one of a series of six (IA.4201) collected by my friends Messrs. Melbourne Ward and William Boardman in Port Curtis, Queensland, where these fishes were swimming under a jellyfish

(*Crambessa*) in December, 1929. The species has not previously been figured and I am indebted to Miss Ethel A. King for the enlarged drawing here reproduced. There is also a young specimen, apparently referable to this species (IA.1544) in the Australian Museum from Pelican Spit, near Pellew Islands, Gulf of Carpentaria, also from a jellyfish; just over and behind each eye of this post-larva there is a dark patch of pigment cells whilst the black opercular spot, spinous dorsal, and tail-tips are characteristic. This specimen was captured by the late W. E. J. Paradise, who also secured specimens at McCulloch Reef, not far from Cairns, Queensland. The following note refers to these specimens.

"Note from Dr. Paradise, Jan., 1925.—Young *Caranx* from medusa near McCulloch Reef (IA.2390) were taken from a large brownish species, which was soft, and with several very thick and particularly soft tentacles, from which depended also many slender stinging threads. The *Caranx* moved about freely beneath the Medusa but some crustaceans secured at the same time were not noticed until the jellyfish was laid upon the deck."

When the late A. R. McCulloch examined the north Australian specimen (IA.1544) he counted D.viii/22; A.iii/19 and Dr. Paradise recognized the jellyfish from which it had been taken as *Crambessa mosaica* in Agassiz and Mayer's paper. Mr. McCulloch wrote to Dr. Samuel Garman asking for a specimen of his *Caranx parasitus* to be figured and received the following reply, which he had copied into his card-index.

"There are two specimens of *C. parasitus*, neither of which is particularly desirable for illustration, not exactly alike, both small, the larger 2½ inches; both have the round spot of black on the opercle. On both, the first dorsal is black and the second dorsal is black-edged; the caudal is edged with black, wider posteriorly. The general colour is yellowish thickly sprinkled with multitudes of minute black dots, except below the pectoral in a triangular space of silvery. Number of fin-rays, scales, and shape of body like *C. chrysos*. Lateral line straight from a point below the foremost rays of the soft dorsal; all of its scales comparatively small. Maxillary extending slightly below orbit. Have compared *C. georgianus* with *C. parasitus* and others, but find no adult of the latter. Am sorry we have not the duplicates for which you inquire."

Pantolabus parasitus is easily distinguishable from all the other Australian species of *Caranx* (sensu latissimo) by the rounded dorsal and anal lobes, the abdominal profile more convex than the dorsal arch, the short pectorals, and by the rounded, heavily-pigmented caudal lobes. The dark opercular spot is characteristic; the eye is longer than the snout and the breast is almost entirely scaly in *P. parasitus*.

The nearest ally of this species is *Alepes kalla* Cuvier and Valenciennes⁵⁴ of which Ogilby⁵⁵ has figured the Queensland form, *A. kalla queenslandiæ* (De Vis).

The following key will differentiate Garman's species.

Height more than 3 times in total length. Last dorsal and anal ray longer than and separated from the others. Pectoral long, falciform. L. lat. scutes one-seventh height of body, broadest under soft dorsal fin	<i>Alepes kalla</i> .
Height about one-third of total length. Last dorsal and anal ray not longer than or separated from the others. Pectoral short, rounded. Scales small; the l. lat. scutes not nearly one-seventh height of body, broadest near caudal peduncle	<i>Pantolabus parasitus</i> .

Cases of commensalism between Carangoid fishes and medusæ and other jellyfishes have frequently been commented upon; perhaps the best known case being

⁵⁴ Cuvier and Valenciennes.—Hist. Nat. Poiss., ix, March, 1833, p. 49. Pondicherry; as *Caranx*, and on p. 51 as *Scomber bimaculatus*, a *nomen nudum*.

⁵⁵ Ogilby.—Mem. Qld. Mus., iii, 1915, p. 62, pl. xx.

that of the Portuguese Man-o'-War Fish (*Nomeus albula*) which is found with *Physalia*. In England⁵⁶ young Whiting (*Gadus merlangus*) have been found under the stinging jellyfish (*Cyanea*). References to literature on this subject are given by Dean,⁵⁷ but I may add that Semon⁵⁸ has recorded *Caranx auratus* and *C. hasselti* as being symbiotic with medusæ.

Family CHÆTODONTIDÆ.

Genus *Microcanthus* Swainson, 1839.

- Microcanthus* Swainson, Nat. Hist. Classif. Fish. Amphib. Rept., ii, July, 1839, pp. 170 and 215. Haplotype, *Chætodon strigatus* Cuv. and Val.
Therapaina Kaup, Arch. Naturg. (Wiegmann), xxvi, 1, 1860, p. 140. Orthotype, *Chætodon strigatus* Cuv. and Val. *Id.* Bleeker, Ned. Tijdschr. Dierk., iv, 1873, p. 140, and Arch. Neerl. Sci. Nat., xi, 2, 1876, p. 298 (*vide* Jordan, Gen. Fish., 1919, and Weber and Beaufort, Fish. Indo-Austr. Archip., 1911).
Neochætodon Castelnau, Proc. Zool. Acclim. Soc. Vict., ii, May 10, 1873, p. 130. Haplotype, *N. vittatum* Castelnau.
Micracanthus Jordan, Gen. Fish., ii, 1919, p. 198. Emendation for *Microcanthus*, "a wilful misprint for *Micracanthus*." Not *Micracanthus* Sauvage 1879 = *Oshimia* Jordan 1919, a genus of Osphromenid fishes (*vide* Gen. Fish., iii, 1919, p. 400).

Microcanthus joyceæ sp. nov.

(Plate xiii, figs. 4 and 5.)

- Chætodon strigatus* Steindachner, Sitzb. Akad. Wiss. Wien, liii, 1866, p. 435 (Port Jackson). *Id.* Schmeltz, Mus. Godef. Cat., vii, 1879, p. 42. *Id.* Ogilby, Cat. Fish. N. S. Wales, 1886, p. 16 (Clarence R.). Not *C. strigatus* Cuv. and Val.
Chætodon (Microcanthus) strigatus Waite, Rec. Austr. Mus., vi, 1905, p. 65.
Microcanthus strigatus Cockerell, Mem. Qld. Mus., iii, 1915, p. 43 (Queensland; scales described). *Id.* McCulloch, Biol. Res. Endeavour, iv, 4, 1916, p. 193. *Id.* McCulloch, Austr. Zool., ii, 3, 1922, p. 91; Check-List Fish. N. S. Wales, 1922, p. 65 (not fig.). *Id.* Ahl, Archiv. Naturg. lxxxix, A., 5, 1923, p. 22. *Id.* McCulloch, Austr. Mus. Mem., v, 2, 1929, p. 248.
D.xi/17; A.iii/14; P.i/15; V.i/5; C.15. Sc. 52. L.tr. 35.

This new species is the fish, vernacularly known as the Stripey in New South Wales, which has hitherto been identified as *Chætodon strigatus* Cuvier and Valenciennes⁵⁹ which is a Japanese species. Although it agrees well with the description of Japanese specimens given by Jordan and Fowler,⁶⁰ the eastern Australian form may be distinguished by its smaller size and differently disposed dark bands. The holotype of *Microcanthus joyceæ* is a specimen 87 mm. in standard length or about 4¼ inches in total length and is one of a series collected at Shell Harbour, New South Wales, by Mr. F. A. McNeill in March, 1924 (Austr.

⁵⁶ Russell and Yonge.—The Seas, 1928, p. 82.⁵⁷ Dean.—Bibliogr. Fishes, iii, 1923, p. 395.⁵⁸ Semon.—Rumphius Gedenkboek, 1902, p. 96.⁵⁹ Cuvier and Valenciennes.—Hist. Nat. Poissons, vii, April, 1831, p. 25, pl. clxx. Ex Langsdorff MS.⁶⁰ Jordan and Fowler.—Proc. U.S. Nat. Mus., xxv, 1902, p. 541.

Mus. registered number IA.4012). Cuvier and Valenciennes' figure of the typical *M. strigatus* shows a fish eight inches long; *M. joyceæ* only attains a length of about six inches and is generally smaller. The differences in colour-marking between the two may be best appreciated by comparing the accompanying figure with the illustrations given by Cuvier and Valenciennes and Temminck and Schlegel.⁶¹

Range.—Southern Queensland and New South Wales.

Named in honour of Miss Joyce K. Allan of the Australian Museum, to whom I am indebted for the excellent illustrations of this species.

***Microcanthus vittatus* (Castelnaud).**

(Plate xiii, fig. 3.)

Neochætodon vittatum Castelnaud, Proc. Zool. Acclim. Soc. Vict., ii, May 10, 1873, p. 130. Fremantle district, Western Australia.

Chætodon strigatus Waite, Rec. Austr. Mus., iv, 1902, p. 189 (Pinjarrah, W.A.).

Id. Woodward, W. Austr. Year Book, 1900-1 (1902), p. 270. Not *C. strigatus* Cuv. and Val.

Microcanthus strigatus Alexander, Journ. Linn. Soc. Lond., Zool., xxxiv, 1922, p. 482 (Houtmans Abrolhos, W.A.).

The "Footballer" of Western Australia is a close ally of the Stripey of the east but differs in the form of the band which extends from the pectoral to the anal. Whereas in *M. joyceæ* this band is not interrupted by any bend or angle, in *M. vittatus*, its western congener, there is a definite kink giving an angular effect just above the anal spines. Also in *M. vittatus* the ends of the bands which extend on to the anal fin are somewhat expanded. I have examined eight specimens of *M. vittatus* in the Australian Museum which were collected in Western Australia by A. Abjornssen many years ago.

Range.—Western Australia.

***Microcanthus howensis* sp. nov.**

(Pl. xiii, fig. 2.)

Chætodon strigatus Ogilby, Austr. Mus. Mem., ii, 1889, p. 55 (7 of reprint). Lord Howe I. Not *C. strigatus* Cuv. and Val.

Microcanthus strigatus Waite, Rec. Austr. Mus., v, 1, 1903, p. 37, and v, 3, 1904, p. 215.

Specimens from Lord Howe Island hitherto identified as *M. strigatus* are characterized by very narrow stripes. As coloration is evidently of specific value in this genus, I name the Lord Howe Island form *Microcanthus howensis*. The type is No. IA.4018 in the Australian Museum. In this specimen, which is 51 mm. in standard length or a little over 2½ inches long, the dark bands are narrower than their interspaces and only extend about half-way across the soft dorsal and anal fins.

Range.—Lord Howe Island.

The similarity in external appearance and facies between *Microcanthus* and the Scorpid "Mado" (*Atypichthys*) in New South Wales and Lord Howe Island is worthy of notice, though an explanation of it is not forthcoming.

⁶¹ Temminck and Schlegel.—Faun. Japon., Poiss., 1844, p. 80, pl. xli, fig. 1.

Hitherto the genus *Microcanthus* has been regarded as monotypic, the species *M. strigatus* having been credited with a very wide range. Whilst separation into species or sub-species is admittedly difficult, I am inclined to think that comparison of specimens from different localities would show that even more forms may later be separable. The species described and figured as *Microcanthus strigatus* by Herre and Montalban⁶² from Amoy and Hong Kong is said to have pectorals and caudal light brown and, as the upper dark bands are very broad in the figure, it seems probable that the Chinese form may have to receive a new name.

Without specimens, I am unable to satisfy myself as to the identity of the *Microcanthus strigatus* of Hawaiian waters, which may be another species. The following are the chief references to literature on this form.

Chætodon strigatus Günther, Journ. Mus. Godef., ii (Fische Südsee, i), 1873, p. 47. Sandwich Is. Perhaps not *C. strigatus* Cuv. and Val.

Microcanthus strigatus Jordan and Evermann, Bull. U.S. Fish. Comm., 1903, i (1905), p. 376. *Id.* Fowler, Mem. Bish. Mus., x, 1928, p. 256, pl. xxviii, fig. a.

Micracanthus strigatus Jordan and Jordan, Mem. Carneg. Mus., x, 1, 1922, p. 61.

Family CORIDÆ.

Halinanodes, gen. nov.

Orthotype, *Halichæres leucostigma* Fowler and Bean.

Head naked. Dorsal and anal bases without scaly sheaths. Less than seventeen dorsal rays. No black ocelli, stripes, or bands on body nor black spots on anal fin, but a median row of large silvery or light-coloured spots along sides.

Halinanodes leucostigma (Fowler and Bean).

Halichæres leucostigma Fowler and Bean, Bull. U.S. Nat. Mus., 100, vii, 1928, pp. 253 and 299, pl. xl. Mindanao, Philippine Is. Type in U.S. Nat. Mus.

Mr. Arthur A. Livingstone collected a specimen of this little-known species in a rock-pool at East Point, Port Darwin, North Australia on 20th June, 1929. This is the only specimen known besides the type and therefore constitutes a new record for Australia. Mr. Livingstone noted the colours as follows: "From top of gills to base of tail, two-thirds distance down body from base of dorsal fin, light brown with large, regularly spaced spots of sea-green. Rest of body greenish-yellow. Dorsal fin indian red with large greenish yellow spots. Top half of head with wide purple lines edged with blue, also yellowish green lines edged with blue. Ventral fins and tail same colour-markings as dorsal fin. Extreme top and bottom tips of tail bright yellow. Body with nine silverish spots arranged in two lines on distal half of body." Four spots on one side and five on the other, on the median line. Australian Museum registered number IA.4288.

Genus *Anampses* Quoy and Gaimard, 1824.

Anampses Quoy and Gaimard, Voy. Uran. Physic., Zool., 1824, p. 276. *Ex* Cuvier MS. Haplotype, *A. cuvier* Quoy and Gaimard. *Id.* Quoy and Gaimard, Ann. Sci. Nat., iii, 1824, p. 419 (9 of reprint). *Id.* Cuvier, Règne Anim. ed. 2, ii, April, 1829, p. 259. *Id.* Cuvier and Valenciennes, Hist. Nat. Poiss. xiv,

⁶² Herre and Montalban.—Philipp. Journ. Sci., xxxiv, 1, 1927, p. 72, pl. xviii, fig. 1.

"1839" = Jan., 1840, p. 3. *Id.* Fowler and Bean, Bull. U.S. Nat. Mus., 100, vii, 1928, pp. 189 and 224.

Anampsis Swainson, Nat. Hist. Classif. Fish. Amphib. Rept., ii, July, 1839, pp. 173 and 233. Error. Type, by present designation, *A. cuvieri* Swainson = *Anampses cuvier* Quoy and Gaimard.

Distinguished from the following genus by having thirty or less scales in the lateral line, instead of about fifty.

Genus *Pseudanampses* Bleeker, 1862.

Pseudanampses Bleeker, Atlas Ichth., i, 1862, p. 101. *Genus cælebs*. Logotype, *Anampses geographicus* Cuv. and Val., by present designation.

Ampheces Jordan and Snyder, Proc. U.S. Nat. Mus., xxiv, May 2, 1902, p. 628. Orthotype, *Anampses geographicus* Cuv. and Val.

In the text of his "Atlas Ichthyologique," Bleeker proposed the name *Pseudanampses* for the non-typical species of *Anampses* Cuvier having a different number of scales and differently formed canines in the lower jaw. Bleeker's generic name seems to have been generally overlooked and, as he does not appear to have designated a genotype, I select *Anampses geographicus* Cuvier and Valenciennes⁶³ as the logotype of *Pseudanampses*. *Anampses cuvier* Quoy and Gaimard, from Hawaiian Islands, has less than thirty scales on the lateral line, and is the typical *Anampses*. Bleeker's *Pseudanampses* therefore obviously applies to the species with about fifty lateral scales. By designating *Anampses geographicus* the logotype of Bleeker's genus, *Ampheces* Jordan and Snyder is made an absolute synonym of *Pseudanampses*.

Family CHEILINIDÆ.

Genus *Cheilinus* Lacépède 1802.

Cheilinus fasciatus (Bloch).

Sparus fasciatus Bloch, Nat. ausl. Fische v, 1791, p. 18 (*vide* Sherborn, Index Anim.); Ichtyologie, iv, 8, 1797, p. 15, pl. cclvii. "Japan" = East Indies. *Id.* Shaw, Gen. Zool., iv, 2, 1803, p. 412. Japan. *Id.* Shaw and Nodder, Nat. Miscell., xviii, 1806, pl. dclv. "American and Indian Seas" = East Indies.

Labrus enneacanthus Lacépède, Hist. Nat. Poiss., iii, 1802, pp. 433 and 480. Locality unknown; probably East Indies.

Sparus bandatus Perry, Arcana, Feb., 1810, eighth plate. "The Eastern Ocean."

Cheilinus fasciatus Cloquet, Dict. Sci. Nat., viii, 1817, p. 344. *Id.* Bleeker, Atl. Ichth., i, 1862, p. 67, pl. xxvi, fig. 2. *Id.* Whitley, Abstr. Proc. Linn. Soc. N. S. Wales, No. 429, Sept. 27, 1929; and Proc. Linn. Soc. N. S. Wales, liv, 6, 1930, p. 1.

Status of Sparus bandatus Perry.—The rarity of Perry's "Arcana" is responsible for the fact that most ichthyologists have overlooked the names of fishes proposed therein. A résumé of the contents of this book was given by Mathews and Iredale,⁶⁴ but since their account was written, the Australian Museum library has acquired a copy, upon which the following notes are based. *Sparus bandatus*

⁶³ Cuvier and Valenciennes.—Hist. Nat. Poiss., xiv, "1839" = Jan., 1840, p. 10, pl. cclxxxix. No locality (probably Amboina).

⁶⁴ Mathews and Iredale.—Victorian Naturalist, xxix, 1, 1912, pp. 7-16.

is the name given by Perry to a species whose illustration is so similar to the figures of Shaw and Nodder and of Bloch as to allow of no doubt that it is conspecific with *Sparus fasciatus* Bloch; indeed, one suspects that the figure has been copied.

A list of the Fishes in Perry's "Arcana" is as follows:

- Feb., 1810. Plate [viii]. *Sparus bandatus*, nov. The Eastern Ocean.
 1 Apr., 1810 [xiii]. The Dolphin. (No scientific name.) Specimen from Bullock's Museum. European Seas.
 1 May, 1810 [xviii]. *Syngnathus* or *Hippocampus foliatus*. Botany Bay.
 July, 1810 [xxvi]. *Stromateus depressus*, nov. No locality. Ex Willshire collection.
 1 Dec., 1810 [xlv]. *Syngnathus* or *Hippocampus erectus*, nov. American Seas and the coasts adjacent to Mexico and the West Indies.
 1 Feb., 1811 [lv]. *Congiopodus percatus*, nov. No locality.
 1 March, 1811 [lxii]. *Esox niloticus*, nov. Nile.
 1 August, 1811 [lxxix]. *Zeus faber*. Coasts of Europe.

I have not been able to determine all Perry's species but offer the following notes and references. *Sparus bandatus* = *Cheilinus fasciatus* (Bloch). "The Dolphin" = *Coryphæna hippurus* Linné. McCulloch⁶⁵ has discussed the status of the Botany Bay seahorse (*Phyllopteryx foliatus*). *Stromateus depressus* = *Selene vomer* (Linné); the type locality may be designated America. *Syngnathus* or *Hippocampus erectus* Perry is an American *Hippocampus* and Perry's illustration has apparently been copied by Goldsmith and reproduced by Osburn.⁶⁶ A note on *Congiopodus* was given by McCulloch.⁶⁷ *Esox niloticus* is apparently a species of *Lepisosteus*, whilst *Zeus faber* Linné is the well-known John Dory. "The Fishing CORMORANT of China" is also mentioned in the "Arcana."

Family CALLIONYMIDÆ.

Yerutius, gen. nov.

Orthotype.—*Callionymus apricus* McCulloch.⁶⁸

Yerutius apricus (McCulloch) is a deep-water form belonging to the same family as *Callionymus* Linné⁶⁹ but characterized by having very large eyes, preopercular spine curved upward distally and without an antrorse spine below it, no broad ventral membrane covering bases of lower pectoral rays, dorsal rays branched, head and body not depressed.

This new genus also includes *Callionymus phasis* Günther⁷⁰ and *C. rubrovinctus* Gilbert,⁷¹ although the latter may be subgenerically distinct as it has simple dorsal rays and a ventral membrane.

⁶⁵ McCulloch.—Rec. Austr. Mus., xv, 1, 1926, p. 28.

⁶⁶ Osburn.—Zool. Soc. Bull., xviii, 2, 1915, p. 1211.

⁶⁷ McCulloch.—Rec. Austr. Mus., xv, 1, 1926, p. 37.

⁶⁸ McCulloch.—Biol. Res. Endeavour, v, 4, June 8, 1926, pp. 196 and 209, pl. liv, fig. 2. Great Australian Bight; 350-450 fathoms. Holotype on deposit in Austr. Mus. Name mis-spelt *C. africanus* in Zool. Record.

⁶⁹ Linné.—Syst. Nat., ed. 10, 1758, p. 249; ed. 12, 1766, p. 433. Logotype, *C. lyra* Linné.

⁷⁰ Günther.—Rept. Voy. Challenger, Zool. i, 6, 1880, p. 28, pl. xv, fig. c. Twofold Bay, New South Wales. Type in British Museum.

⁷¹ Gilbert.—Bull. U.S. Fish. Comm., xxiii, 2, Aug. 5, 1905, p. 650, fig. 252. Hawaiian Islands. Type in U.S. Nat. Mus.

Family PLATYCEPHALIDÆ.
Genus *Neoplatycephalus* Castelnau, 1872.
Neoplatycephalus castelnaui (Macleay).

(Plate xiii, fig. 1.)

Platycephalus castelnaui Macleay, Proc. Linn. Soc. N. S. Wales, v, 4, May 20, 1881, p. 587. King George's Sound, Western Australia. Holotype in Macleay Museum, University of Sydney.

The following description is from some unpublished manuscripts of the late Allan R. McCulloch.

D.viii-ix/14; A.14; P.19; V.i/5; C.11-13. L. lat. 85.

Head 3.25-3.30 in the length to the hypural; the cranial ridges very low, scarcely visible beneath the skin, without spines. Eye without tentacles, 5.5-6.6 in the head, and 1.30-1.53 in the snout, which is 3.7-3.82 in the head. Interorbital space a little concave, 1.57-2 in the eye. Maxillary reaching to below the anterior margin of the pupil. Bony stay of cheek with two slight elevations but without spines; preoperculum with two acute, diverging spines of subequal length. A broad band of villiform teeth in the upper jaw with some canines on either side of the symphysis; three or four rows of very small teeth on the front portion of the lower jaw, which change into a single row of canines on the sides. Vomer with an arched band of teeth, those of the middle part minute and in a single row, while on each side they form a cluster of several canines. Palatines with a row of canines and some smaller teeth at their bases.

Scales rather small, ctenoid, extending on to the head as far as the hinder margins of the eyes, those of the lateral line are similar to the others. There are about 115 rows just above the lateral line. Caudal rounded.

Sandy coloured or greyish with about five indefinite darker crossbands. Head and back closely dotted with black, cheeks with a series of about eight dark blotches between the bony ridges. All the fins, except the anal, with more or less distinct darker spots, the caudal also with a black blotch posteriorly.

Described from three specimens, 257-325 mm. long, including the type. The Australian Museum contains three which were collected by Mr. A. Abjornssen near Albany, one of which (No. I.11453) is figured here, and I have examined one from the Western Australian Museum from the same locality.

According to Macleay's description, this species is scaly to the muzzle, the width of the head between the preopercular spines is about one-fourth of the total length, the eye is scarcely twice in the snout, and there are about eight quadrangular depressions between the bony ridges of the cheek. None of these characters is found in the specimen which is labelled as his type, nor in any others I have seen from the same locality. In the type, the width of the head is 1.7 in its length and 5.6 in the length to the hypural. The eye is 1.43 in the snout. What Macleay possibly supposed to be scales between the eyes and to the muzzle are really minute elevations surrounding pores in the skin, while the so-called depressions on the cheeks are quadrangular brown marks similar to those found in many species of *Platycephalidæ*.

Family GLYPTAUCHENIDÆ.

Genus *Glyptauchen* Günther, 1860.

Glyptauchen Günther, Cat. Fish. Brit. Mus., ii, June, 1860, p. 121. Haplotype, *Apistus* (sic) *panduratus* Richardson. *Id.* Regan, Ann. Mag. Nat. Hist., (8) xi, 1913, p. 170. *Id.* Jordan, Gen. Fish., ii, July, 1919, p. 296, and Classif. Fish., 1923, p. 210.

Goblin Fishes are aptly so named on account of their grotesque and almost hideous appearance. These members of the genus *Glyptauchen* belong to an order of fishes, the Cataphracti, which includes such bizarre forms as *Synanceja*, *Pterois*, *Patæcus*, and *Platycephalus*. Goblin Fishes have the forehead almost vertical, the mouth small, and the occipital region so concave that it seems as if it had been excavated by unnatural means.

Unfortunately, these remarkable Goblin Fishes are very rarely captured and nothing seems to be known regarding their habits. They are probably sedentary, carnivorous fishes of the rocky zone beyond tidal limits, and it is probable that their preorbital and dorsal spines could inflict painful wounds. The largest specimen of *Glyptauchen* on record is only eight inches in length.

This genus is unknown outside Australia, and as it is quite unlike *Scorpena* or *Synanceja*, with which the earlier authors grouped it, *Glyptauchen* may be regarded as typical of a new family, the Glyptauchenidæ.

This genus, which has hitherto been regarded as monotypic, may be divided into the following specific and subspecific groups each typical of a well-marked zoogeographical region.

Glyptauchen panduratus (Richardson).

Apistes panduratus Richardson, Proc. Zool. Soc. Lond., Nov. 12, 1850, p. 58, Pisces pl. i, figs. 3 and 4. King George's Sound, West Australia (Neill). [Location of type unknown.] *Id.* Richardson, Ann. Mag. Nat. Hist., (2) vii, April 1, 1851, p. 274.

Glyptauchen panduratus Günther, Cat. Fish. Brit. Mus., ii, 1860, p. 121. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales, v, 3, Feb., 1881, p. 434, and Descr. Cat. Austr. Fish., i, 1881, p. 134. *Id.* Woodward, W. Austr. Year Book, 1900-1 (1902), p. 271 (listed only). *Id.* McCulloch, Austr. Mus. Mem., v, 1929, p. 391.

The typical form of this species is Western Australian. Critical study of specimens and literature leads me to believe that there are two species confused by authors who have regarded all the Australian forms as conspecific. The eastern Australian form is obviously a new species and is fully described and figured here, but Tasmanian and South Australian specimens identified as *Glyptauchen panduratus* are evidently deserving of subspecific separation.

Glyptauchen panduratus deruptus subsp. nov.

Glyptauchen panduratus Castelnau, Proc. Zool. Acclim. Soc. Vict., i, 1872, p. 244 and *ibid.*, ii, 1873, p. 62 (St. Vincent's Gulf, South Australia). *Id.* Waite, Rec. S. Austr. Mus., ii, 1, 1921, p. 167, not figure. *Id.* Waite, Fish. S. Austr., 1923, p. 192, not figure. Not *Apistes panduratus* Richardson, 1850.

This is the South Australian Goblin Fish which has been well described by Castelnau. It cannot, however, be the true *Glyptauchen panduratus* as Castelnau

describes the height of the dorsal fin as being equal to two-thirds the height of the body and the length of the base of the second dorsal as not one-fifth that of the spinous part. The pectoral fins are said to go two and a half times in the total length of the fish. These differences are sufficient to merit subspecific distinction, and the South Australian form many therefore be called *Glyptauchen panduratus deruptus*, the type-locality being St. Vincent's Gulf.

***Glyptauchen insidiator* sp. nov.**

(Plate xiv.)

Glyptauchen panduratus Ogilby, Cat. Fish. N. S. Wales, publ. Aug., 1886, p. 21 and Rept. Comm. Fish. N. S. Wales, 1886 (1887), append. A., p. 21 (Port Jackson record only). *Id.* Waite, Mem. N. S. Wales Nat. Club, ii, Nov., 1904, p. 47 (listed only). *Id.* Stead, Abstr. Proc. Linn. Soc. N. S. Wales, Oct. 25, 1905, p. iii; Proc. Linn. Soc. N. S. Wales, xxx, April, 1906, p. 486 (South Reef, Port Jackson Heads), and Fishes Austr., 1906, pp. 191 and 195, fig. 68. *Id.* McCulloch, Austr. Zool., ii, 3, 1922, p. 117, not figure. Not *Apistes panduratus* Richardson, 1850.

Br. 7. D.xvii/7; A.iii/5 (last divided); P.14-15; V.i/5; C.10. 27-28 tubes in l. lat. About 30 transverse series of scales between scapula and root of caudal.

Head (41 mm.) 2.48 in length to hypural joint (102). Depth (36) 2.83 in same. Eye (11.5) equal to supraorbital width (11.5). Preorbital spine (8.5) not so long as upper preopercular spine (9). Longest (ninth) dorsal spine (21) almost 2 in head. Height of soft dorsal (19) less than that of anal (21.5); both less than length of caudal (26).

Profile of head almost vertical over mouth, subhorizontal over eye, and squarely excavated on occiput. Back and belly evenly convex. Head entirely naked, much longer than high and longer than broad. Two almost vertical nasal spines on the snout end in two knobs above, and are separated by a narrow furrow. The supraorbitals overhang the eyes and have strong spineless ridges superiorly. Two similar ridges on the interorbital area are separate anteriorly and diverge posteriorly to join a transverse series of irregular ridges behind the eye. The saddle-shaped occipital depression is crossed by two low longitudinal ridges. Preorbital armed with a small anterior and a large posterior spine. The latter is erectile and is attached to the spine at the commencement of the strong, irregular but spineless, suborbital ridge. Two large nostrils, each with a flap, before the eye; the lower pair a trifle in advance of the upper. Eye large. Mouth small, the maxillary reaching to below the anterior third of the eye. A broad dermal flap depends from each side of the mandible. Villiform teeth in jaws and on vomer and palatines. Palatine velum present.

Preoperculum with a series of five spines along its margin. The lower spines are short and triangular, but the uppermost is very long and strong and has a small spine at its base. Two long curved spines on operculum. Two pairs of short, strong, curved spines on each side of the origin of the dorsal fin; the posterior spines are strongest and are striated. The broad opercular flap overlies the base of a strong oblique scapular spine. Branchiostegals seven, the sixth and seventh small and close together. Gill-membranes free, united across isthmus.

Body compressed, with the back elevated. Below the dorsal fin the skin is naked, smooth anteriorly, and plicated posteriorly and towards the scaly sides.

The thorax is scaleless in advance of a line drawn from the origin of the lateral line to the attachment of the last ventral ray and the breast is naked in advance of a line connecting the origins of the last ventral rays. The sides of the body are covered with large, rounded, imbricate, deciduous, cycloid scales which do not extend on to the head or fins and leave naked the space between the vent and the anal fin. The lateral line is marked by a series of tubes, each with a posterior rounded flap, except on the caudal peduncle, where the pore-like opening of each tube is not thus protected.

Dorsal originating behind the occipital concavity and extending almost to the root of the caudal. The ninth dorsal spine is the longest and the margin of the spinous fin is evenly convex. The soft dorsal is high anteriorly, but the last ray is only about one-half the length of the first, and the second ray is longer than the others. Length of base of soft dorsal about one-sixth that of spinous portion. Anal with three spines, the second strongest and subequal to third. Soft portion of anal similar to that of dorsal fin. Pectorals large, rounded, not so long as the head; their fourth or fifth rays are longest and the lowermost rays are very short. All the pectoral rays are branched but the tips of the lowermost rays form finger-like lobes. Ventrals broadly rounded, not nearly so long as pectorals, and with fewer lobe-like branches to their rays. The base of attachment is broad and the origin of the ventral spine is below that of the fifth dorsal spine. Caudal unevenly rounded, the bases of the rays crowded.

After preservation in alcohol, the general colour of the body and fins is blackish, with the light parts of the fins and caudal peduncle light yellowish. Some scattered white spots on first dorsal fin and two small white blotches on the back. Head brownish above, yellowish below, mottled on mouth and around eye. The red colour of the eye and the rosy mark on each operculum have almost faded, yet these colours were most prominent in life. The breast and pectoral axilla are yellowish, suffused with a tinge of brownish. Over the root of the pectorals and extending obliquely for a short distance up the sides, there is a white mark, somewhat similar to the whitish patches formed when scales are rubbed off the sides. Ventrals and pectorals dark brownish; some whitish mottling on upper pectoral rays.

Described and figured from the holotype of *Glyptauchen insidiator*, a specimen 102 mm. in standard length, or $5\frac{1}{8}$ inches in total length. Australian Museum registered number IA.4634. This specimen was caught at Kurnell, Botany Bay, New South Wales, at the end of June, 1930, by Mr. G. W. Dare. It was kept in a lobster-pot, in which it had been caught, for a fortnight, and was then brought to the Museum alive. Sandy worm-tubes were noticed on its erect spinous dorsal fin, on the nape, and over one eye; the construction of these must have taken some time and their presence indicates that the Goblin Fish is of sedentary habits, probably lying practically motionless for hours, or perhaps for days. I have also noticed a galeolarian worm-tube on the head of another curious sedentary local fish (*Aploactis milesii*).

The accompanying plate was painted from the living specimen by Miss Ethel A. King.

Glyptauchen insidiator is allied to *G. panduratus* but differs at sight from Richardson's figure in having a much more arched back, deeper body, shorter anterior dorsal spines, fewer and smaller preopercular spines, and differently arranged colour pattern. Richardson's figure shows three distinct spines on each

side of the origin of the dorsal fin whereas *G. insidiator* has only two. The Western Australian type appears to have a shorter supraorbital ridge and a narrower head than my eastern form. The seventh dorsal spine is longest in *G. panduratus* whereas the ninth is the longest in *G. insidiator*. Several minor differences are also noticeable when Richardson's excellent account is checked with my holotype, which is only $\frac{3}{8}$ in. shorter than his specimen.

***Glyptauchen insidiator mirandus* subsp. nov.**

Glyptauchen panduratus Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 114, and *ibid.* 1890 (1891), p. 31. (Listed from Tasmania). *Id.* Lord, Proc. Roy. Soc. Tasm., 1922 (1923), p. 70, and Journ. Pan. Pacif. Res. Inst., ii, 4, 1927, p. 15. *Id.* Lord and Scott, Syn. Vert. Tasm., 1924, p. 85. Not *Apistes panduratus* Richardson, 1850.

The Tasmanian form of *Glyptauchen* agrees in general with the descriptions of *G. panduratus* and *G. insidiator* but an Australian Museum specimen has the following characters, which suggest that the southern Goblin Fish should at least be regarded as a new subspecies.

D.xvii/7; A.iii/5(6); P.14; L. lat. 27. About 40 transverse rows of scales between scapular spine and hypural joint. Head (53 mm.) 2·8, depth (55) 2·7 in length to hypural joint (150). Longest (ninth) dorsal spine (29) 1·8 in head.

The nasal spines end in sharp points above. The transverse ridges joining the supraorbital ridges form an oblique shelf which overhangs the occipital concavity and is not vertical as in *G. insidiator*, s. str. The anterior spines on each side of the dorsal fin are almost divided, so that each has two points.

Length of base of soft dorsal fin about one-quarter that of the spinous. Height of spinous dorsal fin about half the depth of the body. Anal base terminating below the origin of the last dorsal ray. Pectorals as long as head. Origin of ventrals in advance of the vertical of the fifth dorsal spine. Caudal rays forked but not so much branched as in true *G. insidiator*.

The coloration of the spirit specimen shows that the rosy patch on the gill-covers extends, in this subspecies, well into the excavated occipital region. The margin of the dark area on the soft dorsal fin is roundly convex. There are more whitish blotches on the dorsal and pectoral fins in this subspecies than in typical *G. insidiator* and there are two large white blotches on the back below the first dorsal fin.

Described from the holotype of the subspecies, a specimen 150 mm. in standard length or $7\frac{1}{2}$ inches in total length, from Tasmania. Australian Museum registered number B.5786.

Family NOTOGRAPTIDÆ.

Genus *Notograptus* Günther, 1867.

***Notograptus livingstonei* sp. nov.**

D.lxviii/2; A.xl/2; V.i.; P.19; C.9.

Length from snout to vent (49 mm.) 1·18 in distance between vent and hypural joint (58). Head (15) 2·2 in its distance from the vent (34). Depth at vent (7) 2·1 in head; orbit (2·5) 6·0 in same. Snout (2) 1·25 in orbit and greater than interorbital width (1·5) which is 1·7 in orbit. Pectoral (7·5) 2, caudal (10·5) 1·4, ventral (4) 3·7, posterior dorsal spine (5) 3, and posterior anal spine (4·5) 3·3 in head.

Body anguilliform, somewhat compressed anteriorly, markedly compressed posteriorly, and covered with minute, imbricate, oval scales which extend forwards to the nape and ventral fins, but leave the head, breast, and pectoral base naked. Snout rounded, head swollen posteriorly and flattened above and below. Some simple pores overlie canals around eye, along top of cheek, around preoperculum and chin, and across nape. Nostrils inconspicuous openings situated on a prominence. Mouth oblique, the maxillary extending well beyond eye. Lower jaw shorter than upper. A small barbel present. A broad band of granular teeth in each jaw, with a toothless space at each symphysis. Similar bands of teeth on palatines. Vomer toothless. A velum behind teeth of upper jaw. Tongue long, lanceolate. Eye large, with a superior lid. Opercular bones hidden beneath skin, unarmed; some fine radiating ridges on operculum. Gill-openings wide, lateral, separated by a narrow isthmus. Five branchiostegal rays, with broad membranes. Lateral line originating over operculum, passing obliquely over shoulder, and extending along top of each side to posterior portion of spinous dorsal fin.

Dorsal originating over operculum. Anterior spines short and soft; median and posterior spines longer and pungent, often with a more or less free pencil extending along the intermediate membranes. The two dorsal rays are branched but the second is also divided to its base and, like the last anal ray, joined to the caudal by membrane. Anal originating below the twenty-seventh dorsal spine. Anal spines all strong. Pectoral obtusely pointed, with a broad base. Ventrals each of one divided ray with a thick membrane; they originate in advance of the vertical of the first dorsal spine. Caudal lanceolate, its rays crowded.

General ground colour (in alcohol) brown, becoming lighter on fins, above and below head, and on ventral surface of thorax. Large brown ocelli with white margins extend in three to four rows along the body and tail. Similar but larger ocelli on the head becoming blackish on cheeks. Two to three rows of fuscous ocelli or spots, apparently without white margins, extend along the entire length of the dorsal fin and fade out on the caudal. Anal immaculate.

Described from the unique holotype of *Notograptus livingstonei*, a specimen 108 mm. long in standard length. Australian Museum registered number IA.4124.

Type-locality.—Between tide-marks at Broome, Western Australia; collected September, 1929, by Mr. Arthur Alva Livingstone of the Australian Museum, after whom the species is named.

This new species is closely allied to *Notograptus guttatus* Günther⁷² from Cape York, Queensland, but differs at sight in having fewer rows of ocelli on the body. When compared with the Queensland specimen of *N. guttatus* which has been so beautifully figured by McCulloch,⁷³ the type of *N. livingstonei* is observed to have an increased number of dorsal and anal spines. In *N. guttatus* the anterior dorsal membranes only are usually spotted, whereas in *N. livingstonei* the spots extend the whole length of the dorsal fin and also extend further back on the sides of the tail.

I have compared specimens of *N. guttatus* in the Australian Museum from the following localities with the new species, which is evidently a north-western Australian congener.

⁷² Günther.—Ann. Mag. Nat. Hist., (3) xx, July 1, 1867, p. 64.

⁷³ McCulloch.—Mem. Queensland Museum, vi, December 19, 1918, p. 94, pl. xxix.

Port Denison, Queensland (E. H. Rainford); 4 specimens, including the figured pleistotype. Palm Islands, Q. (Rainford). Black Island, Whitsunday Passage, Q. (Dr. Lockwood). Thursday Island, Torres Strait and Lindeman Island, Whitsunday Passage, Q.; dredged in 9 fathoms (Melbourne Ward).

References to literature on *Notograptus guttatus* and synonymy are given in McCulloch's account quoted above.

Family GOBIIDÆ.

Genus *Parvigobius* Whitley, 1930.

Parvigobius Whitley, Austr. Zool., vi, 2, Jan. 14, 1930, p. 122. Orthotype, *P. immeritus* Whitley.

Head as broad as deep, not compressed. Chin and mandibles without barbels. No prominent ridges or flaps on head. Large scales on nape and on opercles, none on cheeks. Bands of microscopic teeth in each jaw. Snout much shorter than diameter of eye.

Body covered with scales in less than thirty transverse series. Shoulder girdle without fleshy lobes. Length of entire fish less than an inch and a half.

Six spines in first dorsal. Second dorsal and anal free from caudal. Ventral fins not forming a short rounded cup-shaped disc and not adnate to belly. Upper pectoral rays neither free nor differentiated from the others. Caudal rounded or truncate.

Parvigobius immeritus Whitley.

Gobius flavescens De Vis, Proc. Linn. Soc. N. S. Wales, ix, 3, Nov. 29, 1884, p. 689.

Moreton Bay, Queensland. Lectotype in Australian Museum. Name preoccupied by *Gobius flavescens* Bloch and Schneider, Syst. Ichth., 1801, p. 73.

Id. McCulloch and Ogilby, Rec. Austr. Mus., xii, 10, July 14, 1919, pp. 204 and 224, pl. xxxvi, fig. 3 (type). *Id.* McCulloch, Austr. Mus. Mem., v, 3, 1929, p. 369.

Parvigobius immeritus Whitley, Austr. Zool., vi, 2, Jan. 14, 1930, p. 122. New name for *Gobius flavescens* De Vis, preocc. Moreton Bay, Q. Holotype in Austr. Mus.

D.vi/9; A.8; P.15; V.5; C.12. Sc. 23. L. tr. 7.

Depth of the body before the ventrals (5 mm.) 4.2 in length to hypural joint (21); head (6.5) 3.2 in same. Eye (2), longer than snout, 3.2 in head. The interocular width is less than half the diameter of the eye. Depth of caudal peduncle (3) 2.1 in head. Breadth before pectorals (3.5) 1.4 in depth.

Head as broad as deep, with a short snout. The cheeks are naked but there are a few large but weakly developed scales on the operculum. Some large pores around eyes, along nuchal grooves, and along edge of preoperculum. Several rows of microscopic papillæ on operculum. Eyes large, superolateral. Jaws subequal. Nostrils separate, situated on prominences as minute tubes. Maxilla reaching to below the anterior portion of the eye. A buccal velum in each jaw. Teeth microscopic, in bands. Gill-openings lateral. Branchiostegal membranes attached to a broad isthmus.

Body compressed, with a broad and rather long peduncle. Scales large and angular, ctenoid on the body, but apparently degenerating to cycloid on nape and opercula. Seven predorsal scales, the most anterior being behind the interocular space. Some degenerate scales on breast and pectoral bases. A genital papilla.

First dorsal originating over the anterior half of the pectorals; the second spine is longest and there is a broad membrane between the fifth and sixth spines. Anterior dorsal rays higher than dorsal spines. Anal origin a little behind the vertical of the origin of the second dorsal. Pectoral rounded, the middle rays longest, reaching to the eleventh transverse scale-row. Ventrals inserted behind the vertical of the pectoral base and about the same length as the pectoral fins. Caudal margin gently rounded.

Colour, in alcohol, light brown mottled with blackish. There is a blackish blotch on the posterior membranes of the spinous dorsal and about three series of dark spots on the soft dorsal. There are fuscous marks on each lip and crossing the cheeks from the eyes. An irregular series of dark blotches and dark-edged scales along the flanks, especially along the middle of each side. Two black blotches, one above the other, at the root of the caudal. A series of black spots along the ventral surface near the anal fin. Pectorals, ventrals, and anal light, with some fuscous punctulations. Caudal rays chequered with black.

Described from the larger of two specimens in the Australian Muséum. Registered No. IA.3911. These were collected by Mr. Hugh James in the Coraki district, Richmond River, northern New South Wales. The species has not been known previously outside Queensland.

Family ALUTERIDÆ.

Genus *Navodon* Whitley, 1930.

Navodon Whitley, Austr. Zool., vi, 2, Jan. 14, 1930, p. 179. Orthotype, *Balistes australis* Donovan.

Gill-opening short, below eye. Dorsal spine originating over eye, with a row of barbs on each side; a small second dorsal spine. Dorsal and anal fins not angulate, with more than thirty rays. A small immovable ventral spine; ventral flap moderate. Body not elongate, its depth at origins of soft dorsal and anal fins less than half length to hypural or more than length of head. Body covered with small, close-set, spiny scales, some of which may tend to develop a flange, giving them a mushroom-like appearance. No cutaneous flaps on body or fins; no spines or bristles on caudal peduncle.

Navodon australis (Donovan).

Balistes australis Donovan, Naturalists' Repository, iii, May 1, 1824, pl. lxxvi and text. Van Diemen's Land. *Id.* Gray, Narr. Surv. Coasts Austr. (King), ii, 1826, appendix, p. 435.

Monacanthus rudis Richardson, Proc. Zool. Soc. Lond., viii, August, 1840, p. 27; Trans. Zool. Soc. Lond., iii, Jan. 23, 1844, p. 166. Port Arthur, Tasmania. Type in British Museum. *Id.* Richardson, Tasm. Journ. Nat. Sci., i, 1842, p. 105. *Id.* Richardson, Zool. Voy. Erebus and Terror, Fish., 1846, p. 65, pl. xl, figs. 7-8. *Id.* Hollard, Ann. Sci. Nat., Paris, Zool., (4) ii, 1854, p. 339 (Tasmanian specimen described). *Id.* Günther, Cat. Fish. Brit. Mus., viii, 1870, p. 244. *Id.* Saville-Kent, Nat. in Austr., 1897, p. 190, col. pl. vii, central fig. (S. Tasmania).

Cantherhines australis Whitley, Abstr. Proc. Linn. Soc. N. S. Wales, No. 429, Sept. 27, 1929; Proc. Linn. Soc. N. S. Wales, liv, 6, Feb. 15, 1930, p. 1.

In "The Naturalists' Repository," Donovan⁷⁴ gave an excellent description and figure of a Leatherjacket from Van Diemen's Land which has not been generally recognized since it was first named, and is omitted as such from lists of Tasmanian fishes. It has D.36; A.31 and two rows of barbs on dorsal spine. In the Australian Museum, I found an eight-inch specimen (No. B.5594) labelled "*Cantherines* sp. Tasmania." This agrees with *Balistes australis* and shows that Donovan's species is closely allied to *Monacanthus setosus* Waite,⁷⁵ from off Wollongong, New South Wales, which is obviously a deeper water relative with more superior gill-opening, larger eyes and more spinose integument. The two species may be segregated from the other Australian Leatherjackets by being placed in my genus *Navodon*.

Monacanthus rudis Richardson appears to be conspecific with *Balistes australis* Donovan. The fish identified as *Monacanthus rudis* by Castelnau,⁷⁶ having small teeth, and spines on the caudal peduncle, is not this species. Castelnau also suggested the identity of *Monacanthus freycineti* Hollard with *M. rudis* Richardson, but Hollard's figure⁷⁷ shows a very different fish from Mauritius with strong pelvic spine, and with spines on caudal peduncle.

Navodon setosus (Waite).

Monacanthus setosus Waite, Austr. Mus. Mem., iv, 1, Dec. 23, 1899, p. 91, pl. xvi. Off Wollongong, New South Wales; "Thetis" Expedition.

Cantherines setosus Waite and McCulloch, Trans. Roy. Soc. S. Austr., xxxix, 1915, p. 472, pl. xiv (topotype).

Besides the type, I have examined specimens in the Australian Museum trawled off the coast of New South Wales and in Bass Strait.

Family DIODONTIDÆ.

Genus *Allomycterus* McCulloch, 1921.

McCulloch⁷⁸ proposed the genus *Allomycterus* in the following terms:

Near *Dicotylichthys*, having a bifid nasal tentacle without openings, but all the spines are three-rooted and fixed. The greater part of the forehead is naked, and the dorsal and anal fins have each about sixteen rays. The bifid nasal tentacle and increased number of dorsal and anal rays distinguishes this genus from *Chilomycterus*.

Type.—*Diodon jaculiferus*, Cuvier.

The New South Wales fish upon which he based this genus was not, however, the true *Diodon jaculiferus* Cuvier.⁷⁹ The genotype of *Allomycterus* is thus *Diodon jaculiferus* McCulloch (*non* Cuvier), which requires a new name.

⁷⁴ For bibliographical notes on Donovan's "Naturalists' Repository," see Raynell, Proc. Malacolog. Soc. London, xii, 1917, p. 309, and Sherborn's "Index Animalium."

⁷⁵ Waite.—Austr. Mus. Mem., iv, 1, Dec. 23, 1899, p. 91, pl. xvi.

⁷⁶ Castelnau.—Proc. Zool. Acclim. Soc. Vict., ii, 1873, p. 54.

⁷⁷ Hollard.—Ann. Sci. Nat., Paris, Zool., (4) ii, 1854, p. 336, pl. xii, fig. 3.

⁷⁸ McCulloch.—Rec. Austr. Mus., xiii, 4, April 12, 1921, p. 141, pl. xxxiii, fig. 2. Off Botany Bay, New South Wales; trawled in 60 fathoms.

⁷⁹ Cuvier.—Mem. Mus. d'Hist. Nat., iv, 1818, p. 130, pl. vii, "la mer des Indes" (Péron). Type locality, Western Australia, by present designation.

Allomycterus pilatus sp. nov.

Allomycterus jaculiferus McCulloch, Rec. Austr. Mus., xiii, 4, April 12, 1921, p. 141, pl. xxiii, fig. 2. Off Botany Bay, N. S. Wales (60 fathoms). Not *Diodon jaculiferus* Cuvier, 1818. *Id.* McCulloch, Austr. Zool., ii, 3, 1922, p. 130; Check-List Fish. N. S. Wales, 1922, p. 104.

The holotype of *A. pilatus* is the specimen described and figured by McCulloch. Austr. Mus., registered number I.15159. New South Wales; trawled.

The southern Australian form may be a distinct species, but I have no specimens at hand for comparison. The New Zealand form is receiving the attention of my colleague, Mr. W. J. Phillipps.

The true *Diodon jaculiferus* was described by Cuvier from a specimen collected by François Péron. This naturalist obtained specimens in Tasmania, western and eastern Australia, and Timor, but his specimens were mixed, owing to shipwreck, and it is now very difficult to ascertain the type localities of many of the new species which had been collected by him and described by subsequent authors after his death. When Mr. A. A. Livingstone returned from Western Australia, he brought back a porcupine-fish dredged in five fathoms from between Broome and Cape Bossutt (Austr. Mus., registered number IA.4231), which agrees exactly with *Diodon jaculiferus* Cuvier and differs from McCulloch's New South Wales specimens sufficiently to show that it is neither conspecific nor congeneric with them. It is therefore evident that the type of Cuvier's species came from Western Australia and probably from the north-west portion of that State. The genus *Allomycterus* McCulloch must be applied to the New South Wales form, *A. pilatus*, because McCulloch gave a description of it before he named his wrongly identified genotype, but the typical Western Australian species requires a new generic name, which may now be proposed as follows.

Tragulichthys, gen. nov.

Orthotype, *Diodon jaculiferus* Cuvier, as identified by me.

Near *Allomycterus*, but with each nostril in the form of a raised flap, with a perforation anteriorly and posteriorly. All spines three-rooted and fixed, except two long ones behind each pectoral, which are movable. Spines on posterior half of sides much longer and stronger than those on anterior half. A spine beside each nostril and one in centre of forehead. Less than sixteen dorsal and anal rays. Tail slender.

The form of the nostrils distinguishes *Tragulichthys* from *Chilomycterus* as described by Brisout de Barneville.⁸⁰

To summarize, the eastern and western forms may be separated by means of the following key.

Western Australian. D.12. A.12. P.21. Head more than one-third standard length. Caudal pointed, much longer than dorsal or anal. A spine beside each nostril and one on middle of forehead. Spines on body long. Snout shorter than eye. Nostril

⁸⁰ Brisout de Barneville.—Rev. Mag. Zool., ix, April, 1846, p. 140. *Ex* Bibron MS. Haplotype, *C. reticulatus* (Bibron) B. de B. (? = *Diodon reticulatus* Linn.). "Narines non closes au sommet, mais chacune ayant l'apparence de deux lèvres ou formée de deux tentacles réunies à la base."

- closed at the summit, with two perforations. Posterior dorsal and anal rays long. Back not spotted. Three small lateral blotches
 *Tragulichthys jaculiferus* (Cuvier), pl. xv, figs. 2 and 3.
 Eastern Australian. D.16. A.16. P.20. Head one-third of standard length. Caudal rounded, hardly longer than dorsal or anal. No spines beside nostrils or on middle of forehead. Spines on body short. Snout longer than eye. Nostril with an anterior and a posterior lobe, not closed at summit. Posterior dorsal and anal rays short. Back spotted. Large blotches on sides *Allomycterus pilatus* Whitley.

Family MOLIDÆ.

Genus *Mola* Cuvier, 1798.

Mola ramsayi (Giglioli).

(Plate xvi, figs. 1, 3 and 4; and Figure 2.)

- ? *Tetraodon mola* Linné, Syst. Nat., ed. 10, 1758, p. 334; ed. 12, 1766, p. 412, as *Tetrodon*. Mediterranean Sea.
- Orthogoriscus* sp. Aubin, Pap. Proc. Roy. Soc. Tasm., Aug., 1869, p. 28 (Spring Bay, Tasmania).
- Orthogoriscus truncatus* Hutton, Fishes New Zealand, 1872, p. 73 (Auckland, N.Z.). Not *Tetrodon truncatus* Retzius 1785.
- Orthogoriscus mola* Castelnau, Proc. Zool. Acclim. Soc. Vict., i, 1872, p. 211 and Res. Fish. Austr., 1875, p. 3 (Hobson's Bay, Victoria). *Id.* Hutton, Trans. N.Z. Inst., v, 1873, p. 271 (Auckland, N.Z.). *Id.* Macleay, Proc. Linn. Soc. N. S. Wales, i, 1875, p. 12 (Port Stephens, N.S.W.). *Id.* Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 137, and *ibid.* 1890 (1891), p. 38 (Tasmania). *Id.* Hamilton, Trans. N.Z. Inst., xviii, 1886, p. 135 (Napier, Hawkes Bay, N.Z.). *Id.* Williams, *ibid.* xxv, 1893, p. 110, pl. viii^a (Poverty Bay, N.Z.). *Id.* Drew, *ibid.*, xxix, 1897, p. 286 (Napier, N.Z.). *Id.* Parker, *ibid.* xxix, 1897, p. 627 (Otago, N.Z.). *Id.* Fletcher, Proc. Linn. Soc. N. S. Wales, liv, 1929, pp. 225 and 227, *ex* Macleay MS. (Port Stephens and Port Jackson, N.S.W.) Probably not *Tetraodon mola* Linné.
- Orthogoriscus ramsayi* Giglioli, Nature, xxviii, Aug. 2, 1883, p. 315. "Southern Hemisphere" = Sydney, New South Wales. Type presented to British Museum. *Id.* Ramsay, Cat. Exh. N.S.W. Court, Internat. Fisher. Exh., London, 1883, p. 46; Fisheries of the Colony (Legis. Assembly, N.S.W.), 1884, append. B, p. 27.
- "Sunfish" Waite, Austr. Mus. Mem., iv, 1899, p. 7 (Port Stephens, N.S.W.).
- ? *Mola mola* Fountain and Ward, Ramb. Austr. Nat., 1907, pp. 155 and 315 (King George's Sound and Queensland). Records unreliable, as are all the fish notes in this book.
- Mola mola* Waite, Rec. Canterb. Mus., i, 1, 1907, p. 34 (N.Z.). *Id.* Stead, Fish. Austr., 1906, p. 227, fig. 82; Abstr. Proc. Linn. Soc. N. S. Wales, Nov. 25 (27), 1908, and May 25 (27), 1910; and Proc. Linn. Soc. N. S. Wales, xxxiii, 1909, p. 797 (N.S.W.). *Id.* Waite, Trans. N. Zeal. Inst., xlv, 1913, p. 223, pl. ix (Christchurch, N.Z.). *Id.* Phillipps, Rept. Domin. Mus. in Rept. Dept. Intern. Affairs, N.Z., 1919, p. 6 (Picton, N.Z.). *Id.* Waite, Rec. S. Austr. Mus., ii, 1, 1921, p. 198, fig. 332; Fish. S. Austr., 1923, p. 230 (South Australia). *Id.* McCulloch, Austr. Zool., ii, 3, 1922, p. 130, fig. 374a. *Id.* Phillipps, N.Z. Journ. Sci. Tech., viii, 3, 1926, pp. 169-172, figs. 1-3 (New Zealand records reviewed). *Id.* Gudger, The Scientific Monthly, xxvi, 1928, pp. 257-261 and

figs. N. S. Wales record-sized specimens; quotes article on Australian specimen in *Wide World Mag.*, 1910. *Id.* McCulloch, *Austr. Mus. Mem.*, v, 3, 1929, p. 436. Probably not *Tetraodon mola* Linné.

The synonymy of *Mola mola* (Linné) is so extensive and the amount written about this species so large that I have made no attempt to tabulate all the references here, especially as much of the literature is not available to me. It seems, however, that the Australian and New Zealand species is worthy of nominal distinction so I am reviving Giglioli's name for it, as he appears to have been the first to apply a new name to this form. A list of some of the synonyms of *Mola mola* has been given by Günther⁸¹ and extended by Jordan and Snyder.⁸² The references listed above indicate the more important Australasian records. Schmidt⁸³ has recently recorded some observations on *Mola*, and Damant⁸⁴ has discussed its method of locomotion. There is also a varied literature on the anatomy of this peculiar genus.

Description of a Botany Bay Specimen.

Upper profile of head oblique, gibbous; lower profile much less oblique with a deep rounded chin. Two large supraorbital bosses, one over each eye, join anteriorly to form a nose-like protuberance on the snout. A larger but less pronounced gibbosity extends along each cheek to below pectoral fins. Jaws beak-like, entire, without median suture. Lips blackish. Eye nearer snout than pectoral, situated in the broad groove between the bosses over the eye and on the cheek. Eye large, fatty, entirely free at its edges. Pupil dark milky-blue with a silvery ring. Rest of eye white, with a smoky tinge. A broad velum in lower jaw, behind which is the broad, thick, rounded tongue. A deep sulcus before the two small nostrils, which have circular, black lips. Gill-flap rounded, placed somewhat obliquely, subequal in width to the diameter of the eye. A broad flange inside gill-opening. Ventral outline subhorizontal.

Body elongate-elliptical, compressed, and covered, like the head, with a hard integument formed of close-set polygonal scutes. Each scute has a rugose central spine and is silver in colour on the sides. There are about ten scutes to an inch on the cheek.

Quantities of greyish, jelly-like mucus apparently covered the living animal but left the dead specimen a bone-white colour with a faint pink tinge on head and fins.

Dorsal originating slightly in advance of anal and in posterior half of fish. The fin is high, pointed, with a flabby tip, convex posterior margin, and a thick muscular base. Fin-rays indistinguishable through the thick integument but close-set and formed of brittle bone near tip of fin. Anal fin similar and subequal to dorsal. Tail roughly semicircular, with the margin scalloped into about twelve lobes. Pectoral immediately behind gill-opening, thick, broadly rounded, and with a long, muscular base. The pectorals do not reach the vertical of the dorsal

⁸¹ Günther.—*Cat. Fish. Brit. Mus.*, viii, 1870, pp. 317-319.

⁸² Jordan and Snyder.—*Proc. U.S. Nat. Mus.*, xxiv, 1901, pp. 260-261. A later list is given by Jordan, Evermann and Clark, *Rept. U.S. Comm. Fish.*, 1928, pt. ii, 1930, p. 503.

⁸³ Schmidt.—*Medd. Havunders.*, Kjobenhavn, Ser. Fiske, vi, 6, 1921, pp. 1-13, pl. i and text-figs.; and *Nature*, March 17, 1921, pp. 76-79, figs. 1-6.

⁸⁴ Damant.—*Nature*, cxvi, 1925, p. 543, figs.

and anal fins. Anus a small opening a little before anal fin. Below the scutes which cover the body the flesh is firm and white and from about $2\frac{1}{2}$ to 4 inches thick on sides and abdomen.

Intestine over twenty-four feet long and of fairly uniform calibre and surrounded by vascular mesenteries. The intestinal walls are thick and enclose a narrow lumen. Liver very large and of a deep treacle yellow colour and, in the specimen examined, infested throughout with white worms. A search for parasites in the alimentary canal was unproductive.

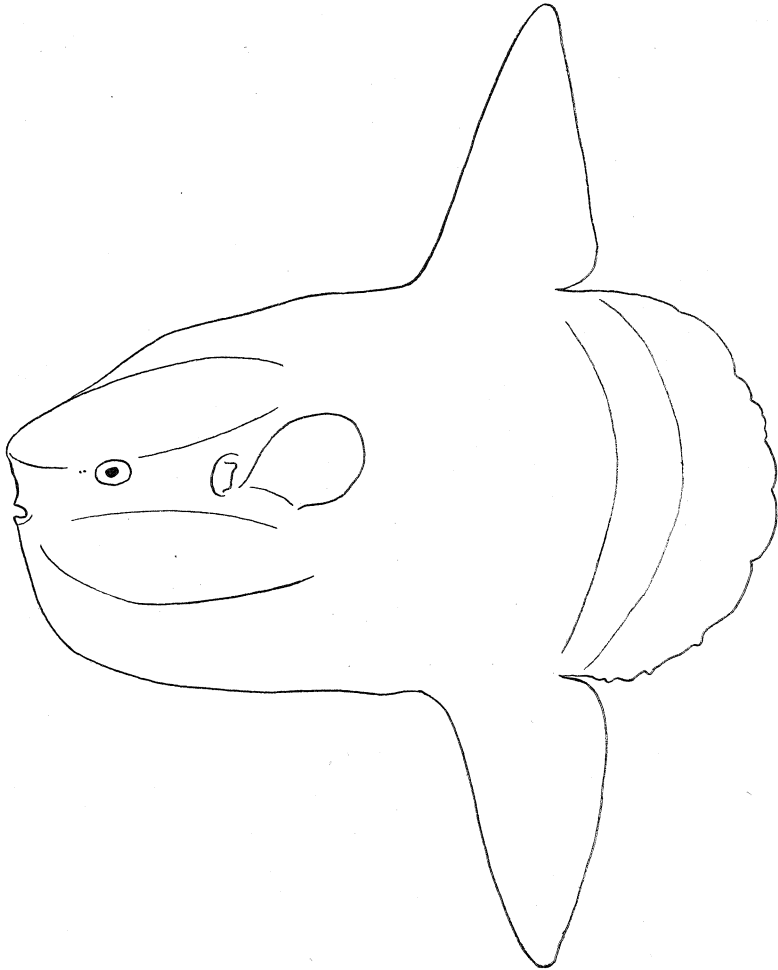


FIGURE 2.

Mola ramsayi (Giglioli).

A small specimen from Yarra Bay, Botany Bay, New South Wales.

Also represented on Plate xvi, figure 1.

(Gilbert P. Whitley, del.)

Described from a not fully grown sunfish, apparently male, seven feet four inches in total length and in a fresh state at Yarra Bay, Botany Bay, New South Wales: November, 1929. Specimen not preserved, but the photograph reproduced here was made on the spot by Mr. G. C. Clutton and the accompanying diagram drawn to scale by myself from sketches and measurements which I made on the same occasion.

This specimen had been caught by some fishermen about a week previously, when it had been swimming upright in the bay with the dorsal fin out of water like a shark. The men had tried to shoot it but the bullets made no mark on the hard integument.

I observed the specimen a few days before it died. The dorsal and anal fins were both moved to one side simultaneously, and then to the other; the anterior margins of the fins had a screwing or twisting motion comparable to that of the pectoral fin of many fishes. The pectorals of the sunfish were continually flapping and the flange in the gill-opening moved up and down. As seen in the water, the general colour in life was olive-greyish, browner above, but this may have been caused by external growths or mucus. The lips and inside of mouth were pinkish and the teeth dirty white.

The fishermen stated that usually water is taken in at the mouth and ejected through the gill-slits but that the fish can squirt a large jet of water from the mouth when it is at the surface. They also mentioned that sunfish may be met with lying flat on the ocean surface as if basking in the sun.

Dimensions of Botany Bay Specimen.

	Feet. Inches.	
Total length	7	4
Tip of dorsal to tip of anal	8	8
Head from tip of snout to gill-opening	1	10
Girth around head	7	8
Anterior margin of eye to snout	1	0 $\frac{1}{2}$
Longitudinal diameter of eye		4 $\frac{1}{4}$
Vertical diameter of eye		3 $\frac{1}{2}$
Width of gill-opening		4 $\frac{1}{2}$
Width of mouth		6
Gape of mouth		4 $\frac{1}{2}$
Eye to posterior nostril		2 $\frac{1}{2}$
Between nostrils		0 $\frac{1}{4}$
Interorbital	1	5 $\frac{1}{2}$
Depth of body from base of dorsal to that of anal	4	0
Termination of dorsal to that of anal	3	9
Breadth at cheeks	2	2
Breadth at centre of body	1	8
Top of supraorbital boss to ventral profile behind eye	2	6
Anterior margin of eye to origin of pectoral	1	6
Anterior margin of eye to origin of dorsal	3	6
Anterior margin of eye to origin of anal	4	2
Dorsal base	1	11
Dorsal height	2	9
Anal base	1	9
Anal height	2	8
Pectoral base		8
Pectoral length	1	1
Width of dorsal at half its height	1	6
Width of anal at half its height	1	6
Anterior insertion of pectoral to origin of dorsal	2	7

Dimensions of Botany Bay Specimen—Continued.

	Feet.	Inches.
Anterior insertion of pectoral to origin of anal	3	0
Anterior insertion of pectoral to end of tail	5	3
Origin of dorsal to tip of snout	4	0
Snout to symphysis of lower jaw		8
Symphysis of lower jaw to rounded angle of chin	1	6
Chin to origin of anal	3	8
Termination of dorsal to that of anal, around tail	5	8

Another specimen was caught at Frenchman's Bay, La Perouse, only a few hundred yards from where the specimen described above had been obtained about a year previously. The La Perouse specimen was larger, being 8 ft. 10 in. long and 11 ft. 2 in. high, but otherwise agreed in general features with the Yarra Bay example. It was caught by Mr. H. Moore of Botany at 6.30 p.m. on 6th December, 1930, and examined by me two days later. General colour steel-greyish, white below. Margin of tail irregular, with more than twelve lobes. The nose-like protuberance on the snout was damaged so some of the head measurements were not taken, but the following may be noted for comparative purposes.

	Feet.	Inches.
Total length	8	10
Tip of dorsal to tip of anal	11	2
Head from tip of snout to gill-opening	2	1
Longitudinal diameter of eye		4 $\frac{1}{4}$
Vertical diameter of eye		4
Width of gill-opening		6 $\frac{1}{2}$
Width of mouth		7
Gape of mouth		4
Eye to posterior nostril		3 $\frac{3}{4}$
Between nostrils		0 $\frac{1}{2}$
Depth of body from base of dorsal to that of anal	4	8
Termination of dorsal to that of anal	4	3
Top of supraorbital boss to ventral profile behind eye	4	1
Anterior margin of eye to origin of pectoral	1	8 $\frac{1}{2}$
Anterior margin of eye to origin of dorsal	4	4
Anterior margin of eye to origin of anal	6	0
Dorsal base	2	2
Dorsal height	3	7
Anal base	2	1
Anal height	3	3
Pectoral base		9
Pectoral length	1	2
Width of dorsal at half its height	1	8 $\frac{1}{4}$
Width of anal at half its height	1	9 $\frac{3}{4}$
Anterior insertion of pectoral to origin of dorsal	3	5
Anterior insertion of pectoral to origin of anal	4	6
Anterior insertion of pectoral to end of tail	6	2

The La Perouse specimen was parasitized by stalked barnacles on the roof of the mouth and copepods on the slimy integument of the body, but chiefly on the side of the head between the eye and gill-opening. The specimen was not dissected. Six "pilot fish" were reported to have been swimming around the fish when first caught, but only one was preserved, and was found to be the young of the New South Wales form of the rare *Centrolophus maoricus* Ogilby.

A large sunfish was caught at Bondi, near Sydney, on 26th September, 1928, but I was in Queensland at the time and thus did not see the specimen, which was not preserved.

Early New South Wales Records.

In an exercise book containing notes on fishes written by the late Dr. E. P. Ramsay, of the Australian Museum, in the eighties of last century, several captures of sunfishes in New South Wales are recorded. The first sunfish to be noticed from this State was that from which Mr. John Brazier obtained so many parasites at Port Stephens on 28th November, 1874 (Macleay, 1875). It seems noteworthy that *Mola ramsayi* is usually caught inshore or stranded in New South Wales at the end of the year and the species seems restricted in distribution to New Zealand and the south-eastern quadrant of Australia. The following notes are taken from Ramsay's MSS., with my annotations in square brackets.

Orthogoriscus sp. Taken Nov., 1882, at Manly, Port Jackson. Bought of J. Skinner for the sum of £5 [Austr. Mus. No. I.2742]. Total length with tail, 5 ft. 8.5 in. From the vent to the base of the dorsal fin across the body, 3 ft. 7 in. From the tip of the dorsal to the tip of the anal fin, 8 ft. 6.5 in. Length of the dorsal fin, 2 ft. 9 in. Width of dorsal at base, 1 ft. 6 in. Length of anal fin, 2 ft. 7.65 in. Width of anal at base, 1 ft. 1 in. The pectoral fin is 11 in. by 8 in. width. From the snout to the gill-opening, 1 ft. 6 in. From the snout to the eye, 8 in. Gill opening, 4½ in. × 2½ in. Eye opening 3 in. × 2½ in. From snout to a line between the dorsal and anal fins, 3 ft. 5 in. Greatest thickness through the body, a little behind and above pectoral, 1 ft.

This fish, weighing about 5 cwt., was taken at Manly Beach, another caught about the same time or a day or two sooner was taken at Botany in the seine.

These fish appear to travel about in pairs or couples. In every instance that they have been seen or taken on our coast this has been the case.

Orthogoriscus sp. [Evidently the holotype of *O. ramsayi* Giglioli.]

A very large specimen was found aground near Chadwick's Mills in Darling Harbour. It was seen first among the shipping and for some unknown reason forced itself up between the vessels and the shallows into black mud. Boats prevented its escape and finally a chain was passed under it and it was hauled bodily up *alive* by a crane on to the timber skids of the wharf and placed on a truck. Here some fools began to hack it about the head and pectoral fin with an axe and greatly mutilated it. The foreman's (Mr. Connelly's) attention was drawn to the fact and he was good enough to order it to be sent to the Museum.

This fish measured 8 feet in length and eleven feet from tip to tip of the fins. The body near the pectoral fins and on other parts was covered with Whale Lice. Intestinal worms were numerous but small. The flesh just under the skin was eaten away in irregular patches and the cavities filled with a greasy core resembling soft ambergris in substance, but *without* any *smell*; these irregular holes were 2-3 inches across and 1-2 deep, about twenty in a space of 3 ft. square. In one hole was found a species of tape worm.

This specimen had in its youth received an injury in having the end of the anal fin bitten off. It weighed 1 ton 3 cwt.

This specimen was ultimately handed over from the Fisheries Exhibition, London, 1883, to the British Museum.

Orthogoriscus sp. Dec. 16th, 1883. A large specimen taken by some fishermen at Manly and sold for £7 10s. to the Museum. [Austr. Mus. No. I.9412.]

This specimen weighed 1 ton 6 cwt. We had great difficulty in bringing it home, having to tow it from Manly, a distance of about five miles or more; across the Heads where there was a sea on we nearly lost it.

Length, 8 ft. 4 in. Width across the fins from tip to tip, 12 ft. Length of dorsal fin, 3 ft. 6 in. Width of the dorsal fin, 2 ft. 6 in. Tail four feet between the paired fins [around tail]; width at central portion [i.e., from base of dorsal to that of anal], 2 ft. From the mouth to opposite the base of the anal fin, 5 ft. 2 in. Anal fin, 3 ft. 6 in. by 2 ft. 5 in. wide. Length of the body in front of the dorsal and anal fins, 5 ft. From snout to eye, 14 in. The eye, 3.5 in. × 3.65 in. From snout to gill-opening, 2 ft. 2 in.

The gill-opening, 5.5 in. \times 5 in. Pectoral fin, 14 in. \times 12.5 in. The greatest thickness is through the hump, behind the eye near the pectoral fin, where it is 2 ft. 3 in. through.

This specimen is mounted and slung in the Central Hall, first floor of the New Wing.

We have had taken on the N.S.W. coast in all [seven] specimens of the Southern Sunfish, which by Dr. Steindachner and Professor Giglioli are considered to be of a different species from the Atlantic *O. mola*.

The first record I have knowledge of concerning any specimen being taken on the N.S.W. coast is the very large one destroyed by Krefft.⁸⁵ This was taken by Skinner at Manly, near Sydney Heads, Port Jackson, and presented by Dr. J. C. Cox to the Museum under certain conditions. This for sake of reference we may call A.

- A. Large specimen, Manly, caught 1871, Dec. 4th. [= November.] The next is B.
- B. Large specimen measuring 15 feet between the tips of the fins caught at Broken Bay, 1874, and now in the Macleay Museum.
- C. Small one captured at Broken Bay by Mr. A. Black. Presented by Dr. J. C. Cox. Stuffed. Taken about the same time, 1874. Aust. Mus. [? No. I.5312, now without precise data.]
- D. Medium sized one bought of Skinner at Manly. Nov., 1882. Stuffed in Aust. Mus. [No. I.2742.]
- E. One about the same size taken in Botany Bay two days before.
- F. Large specimen grounded near Chadwick's Saw Mills, Pyrmont, Darling Harbour, Dec., 1882. Exchanged with British Museum from Fisheries Exhib., London, 1883. Weight, 1 ton 3 cwt. [Holotype of *Mola ramsayi* (Giglioli).]
- G. Another large specimen about the same size but weighing 1 ton 6 cwt. taken on 16th Dec., 1882, by some fishermen near Little Manly. [Aust. Mus. No. I.9412.]

The specimens in the Museum are C, D and G. From A to G appear to be all of one and the same species which have been named by Giglioli *O. ramsayi* but having compared these with a true *O. mola* which I got at Mevagissey [Cornwall, England; coll. A. Dunn, 1883, weight about 3 cwt.], I believe that they are only a southern form of the same species, nevertheless there are several very notable differences, in the scutes on the margin of the tail, nose, and chin, also in the form of the ossicles in the skin.

Orthogoriscus sp. [Note added later.] On Saturday, informed Mr. J. Brazier of a sunfish captured by some of the men of a steam tug just outside Port Jackson Heads. This fish makes the eighth specimen actually taken in (*sic*) Port Jackson. Total length, 7 ft. 10 in. Snout to gill-opening, 21.5 in. Eye to gill-opening, 9.5 in. From tip to tip of dorsal and anal fins, 9.5 ft. From base of fins, 3 ft. 4 in. Tail, 21 in. by 3 ft. 4 in. between the dorsal and anal fins [around tail]. Thickest part, through the tail, 10 in. Length of anal fin, 36 in. From anus to anal fin, 9½ in. Length of dorsal fin, 40½ in. Between the origin of dorsal and anal fins across the body, over 4 feet. From a perpendicular from the snout to the anus, 4½ ft. From chest, through the gill-opening, across the pectoral fin, to top of hump, 4 ft. 6in. Pectoral fin, 13 in. long \times 10.9 in. at the base. Eye, 4.5 in. From snout to the eye, 8.5 in.

The remainder of Dr. Ramsay's notes are incomplete, but the details given above should serve as a basis for establishing whether *Mola ramsayi* is a valid species or not. In view of its large size, apparently different integument, and restricted distribution, I am of the opinion that it is.

⁸⁵ A sunfish was caught at Manly by J. Skinner in November, 1871. Dr. J. C. Cox sent it to the Australian Museum to have it mounted so that it could be shown about the country for a few months and then returned to the Museum, but it had begun to decompose when first brought in and a newspaper controversy took place in Sydney about the nuisance.—G.P.W., *ex* Krefft's MSS., A.261, p. 216, in Mitchell Library, Sydney.

EXPLANATIONS OF PLATES.

PLATE XI.

Tæniura lymnia halgani (Lesson). Dorsal and ventral views of a newborn specimen from Murray Island, Queensland.

PLATE XII.

- Fig. 1.—*Pantolabus parasitus* (Garman). A specimen from Port Curtis, Queensland.
 Fig. 2.—*Loligorhamphus normani* Whitley. Holotype from Townsville, Queensland.
 Fig. 3.—*Loligorhamphus normani* Whitley. Dorsal view of head of holotype.

PLATE XIII.

- Fig. 1.—*Neoplatycephalus castelnau* (Macleay). A specimen from Albany, Western Australia.
 Fig. 2.—*Microcanthus howensis* Whitley. Holotype from Lord Howe Island.
 Fig. 3.—*Microcanthus vittatus* (Castelnau). A specimen from Western Australia.
 Fig. 4.—*Microcanthus joyceæ* Whitley. Holotype from Shell Harbour, New South Wales.
 Fig. 5.—*Microcanthus joyceæ* Whitley. Dorsal view of head of holotype (reduced).

PLATE XIV.

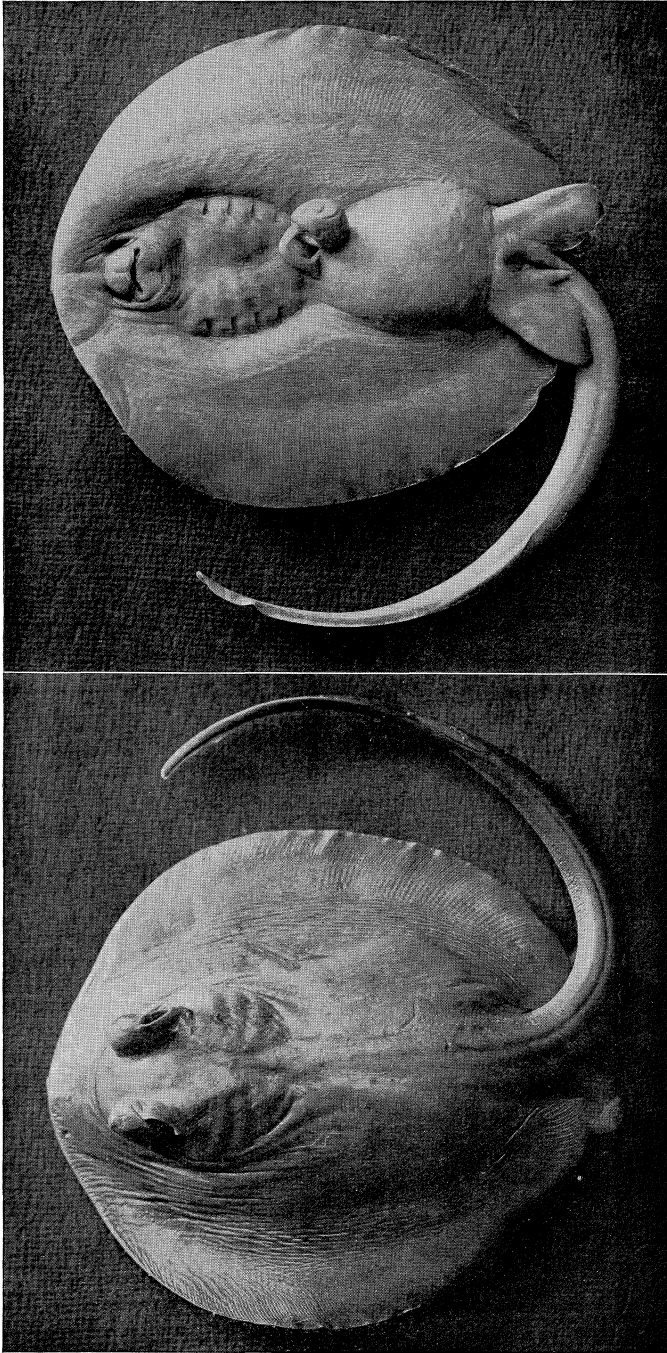
Glyptauchen insidiator Whitley. Holotype from Kurnell, Botany Bay, New South Wales.

PLATE XV.

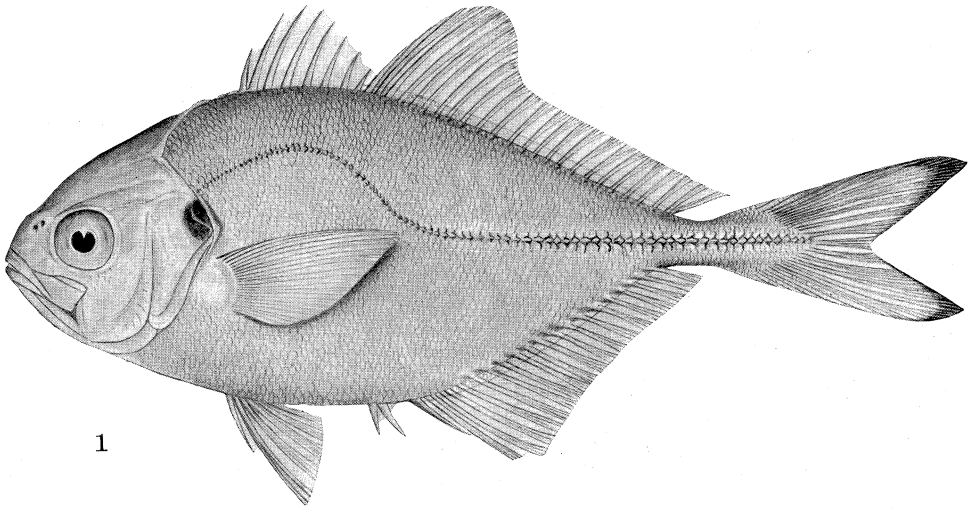
- Fig. 1.—*Phyllopteryx lucasi* Whitley. Holotype from Middleton Beach, Albany, Western Australia.
 Fig. 2.—*Tragulichthys jaculiferus* (Cuvier). A specimen dredged between Broome and Cape Bossutt, Western Australia.
 Fig. 3.—*Tragulichthys jaculiferus* (Cuvier). Dorsal view of specimen shown in Figure 2.

PLATE XVI.

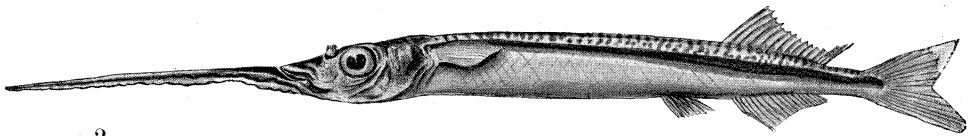
- Fig. 1.—*Mola ramsayi* (Giglioli). A small specimen from Yarra Bay, Botany Bay, New South Wales. Also represented in Figure 2, page 128.
 Fig. 2.—*Aptychotrema rostrata* (Shaw and Nodder). Female and embryos from Trial Bay, New South Wales.
 Fig. 3.—*Mola ramsayi* (Giglioli). A large specimen from La Perouse, Botany Bay, New South Wales.
 Fig. 4.—*Mola ramsayi* (Giglioli). Portion of the integument of the specimen shown in Figure 3.



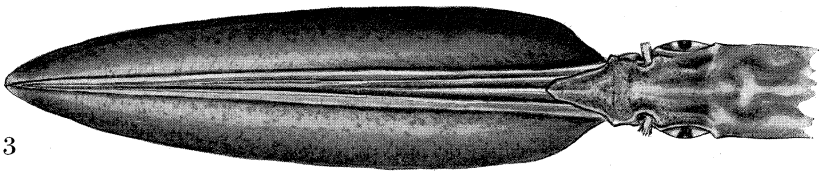
G. C. CLUTTON, photo.



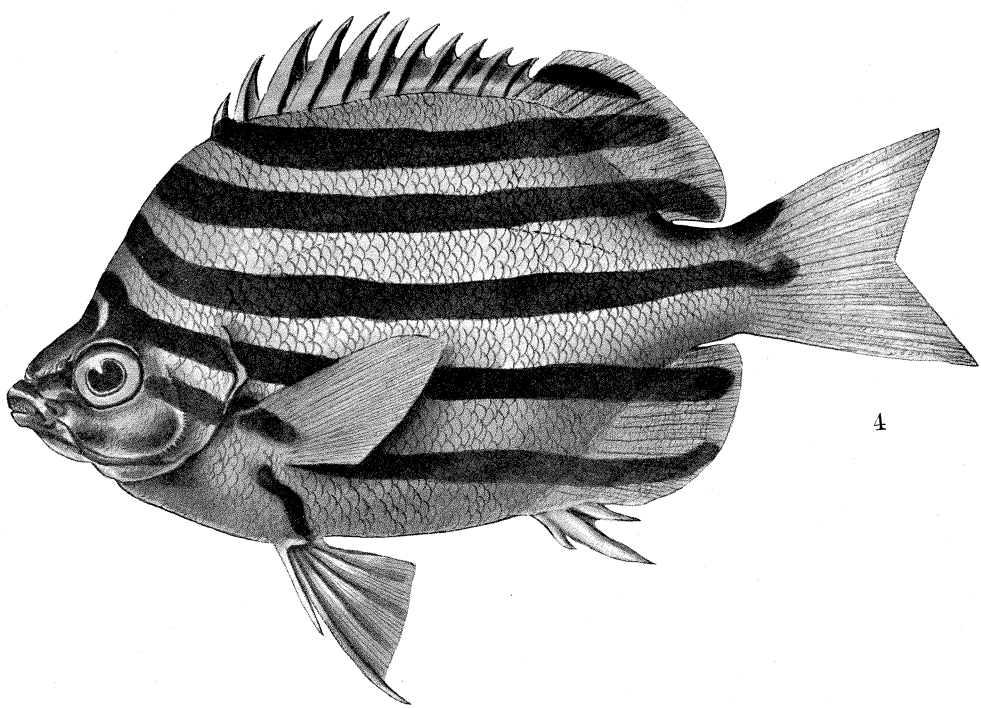
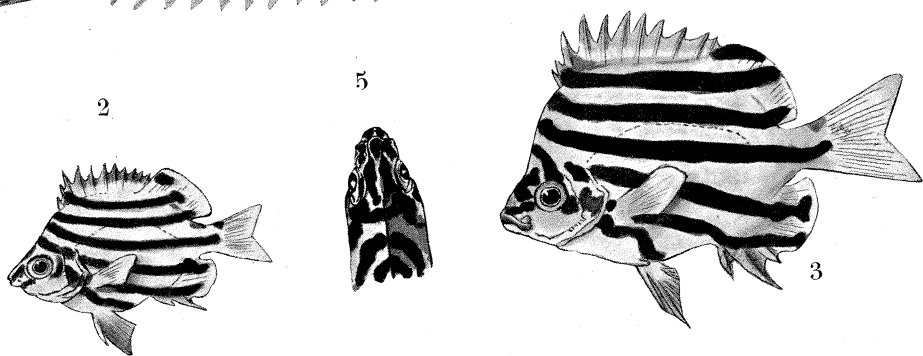
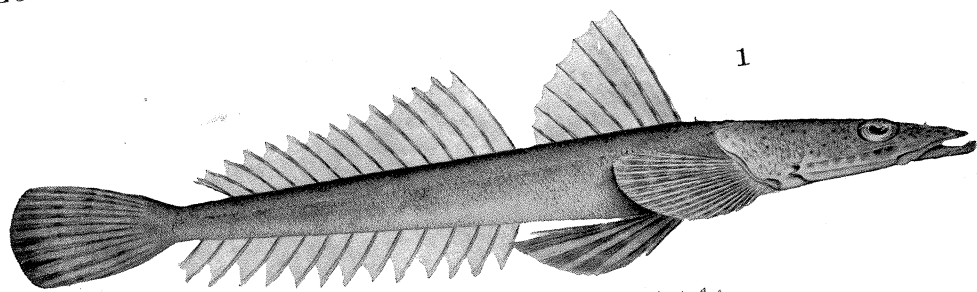
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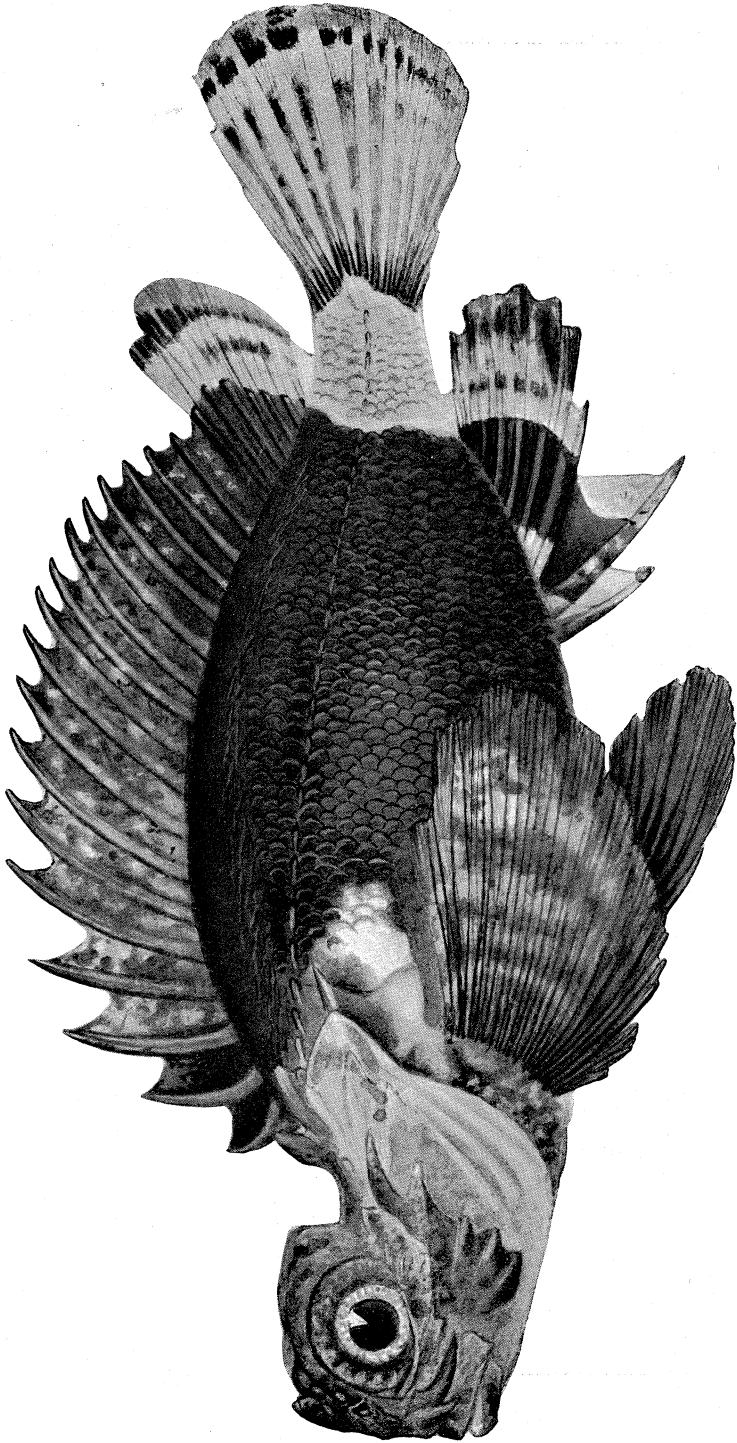
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3



PHYLLIS F. CLARKE (1) and JOYCE K. ALLAN (2, 3, 4 and 5), del.

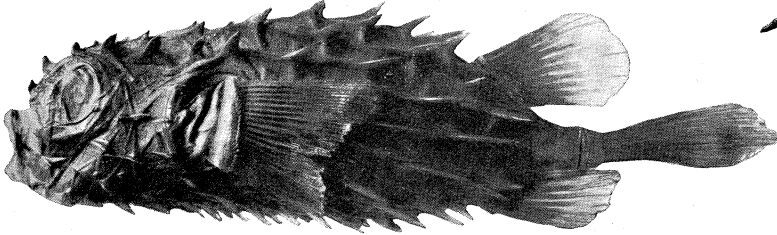


ETHEL A. KING, del.

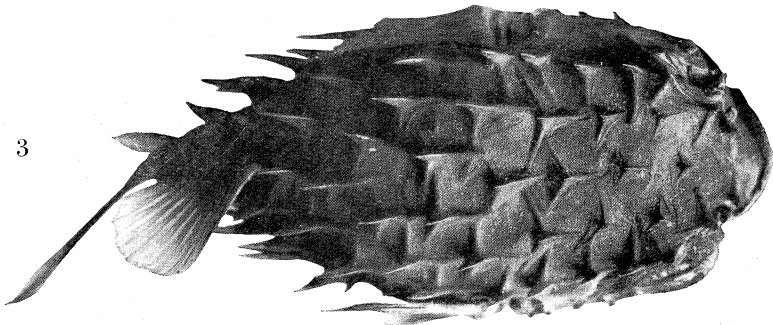
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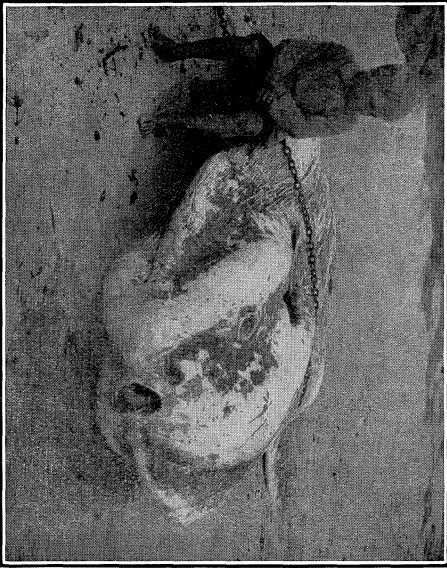


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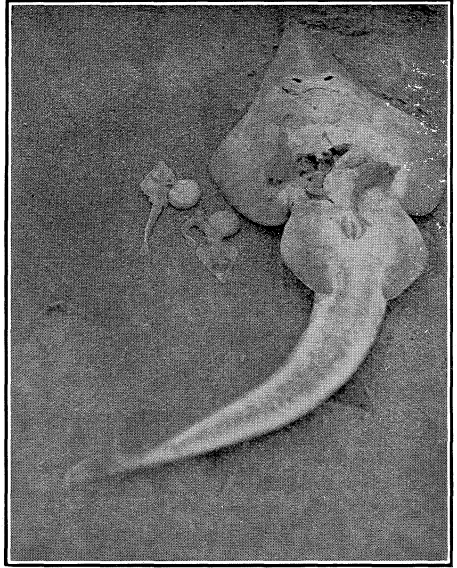


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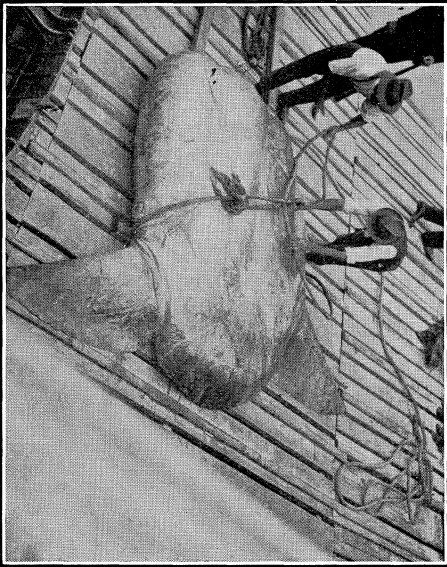




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4

G. C. CLUTTON (1, 3 and 4) and A. MUSGRAVE (2), photo.