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STUDIES IN AUSTRALIAN FISHES.

No. 5. *

BY

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(Plates xxv.-xxvi.)

Family TORPEDINIDAE.

Genus TORPEDO, *Houttuyn*.

Torpedo (*Houttuyn*), Jordan, *Genera of Fishes*, 1917, p. 22.

TORPEDO FAIRCHILD, *Hutton*.

(Plate xxv.)

Torpedo fairchildi, Hutton, *Cat. Fish. N.Z.*, 1872, p. 83, pl. xii., fig. 134.
Id., Robson, *N.Z. Journ. Sci.*, ii., 1886, pp. 27, 123 (breeding).

Torpedo fusca, Parker, *Trans. N.Z. Inst.*, xvi., 1884, p. 281, pl. xxii. *Id.*,
Gascoyne, *Trans. N.Z. Inst.*, xxvii., 1895, p. 672.

Narcacion fairchildi, Waite, *Rec. Cantb. Mus.*, i. 1, 1907, p. 8, and *Loc. cit.*, i. 2, 1909, p. 144, pl. xvii.

Narcacion fusca, Waite, *Loc. cit.*, i. 1, 1907, p. 8.

Narcobatus fairchildi, Waite, *Loc. cit.*, i. 4, 1912, p. 316.

Length of the disc, from the snout to the level of the end of the ventrals, 1.17 in its width; tail from the vent 1.4 in the length of the disc. Narrowest interspiracle width 1.3 in the space between the eyes; width of the spiracle equal to the longitudinal bulge of the eye, and 2.2 in the space between the eyes. Mouth as wide as its distance from the end of the snout; internasal width equal to half the preoral length.

Disc subcircular, somewhat flattened in front, with the snout scarcely distinguished; the posterior angles broadly rounded. Eyes small, their length greater than their distance from the spiracle; they are a little nearer to each other than to the anterior margin of the disc. Spiracles without fringes, subovate and oblique; the interspiracle width much less than the space between the eyes. Each nostril with a free upstanding lobe posteriorly, and a second pointed one overhanging the upper lip; internasal valve subquadrangular, the angles rounded; the posterior margin incised on the median line, where there is a small fleshy tubercle. Teeth in a band in each jaw, with broad bases and sharp upstanding points. Skin everywhere smooth, the lateral line well defined on each side of the back.

The first dorsal fin rounded, the middle of its base above the junction of the ventral fin with the tail; its height, measured from its origin to its

* For No. 4, see "Records," xi., 1917, p. 163.

tip is about one half greater than that of the second dorsal, and is equal to the distance between the outer angles of the spiracles; its hinder edge is a little behind the posterior angles of the ventrals. Second dorsal of similar form to the first, and much nearer it than the tail. Ventrals rounded, a small angular lobe projecting from the claspers. Caudal large, subtruncate, its depth much greater than its length; the peduncle is distinctly keeled laterally, and the vertebral portion does not nearly reach the margin of the fin.

Colour.—Chocolate brown above, white below.

Described and figured from an adult male specimen 470 mm. wide.

Identity.—In identifying this specimen as *T. fairchildi*, I rely upon Waite's description and figure rather than upon the original definition and illustration of the species, which were evidently very faulty. I have also accepted the synonymy as determined by him.

Loc.—This specimen was obtained by the State Trawlers nine miles N. 170° E. of Green Cape, New South Wales, in forty-nine fathoms, from a bottom of sand and stones. It was presented to the Trustees of the Australian Museum by Mr. David G. Stead, General Manager of the State Trawling Industry, to whom I am indebted for the privilege of recording the first species of the genus *Torpedo* recognised from Australian waters.

Family ALBULIDÆ.

Genus ALBULA (*Gronow*), *Scopoli*.

ALBULA VULPES, *Linné*.

Albula conorhynchus, Saville Kent, "Great Barrier Reef," 1893, p. 302.

Albula vulpes, Ogilby, Proc. Roy. Soc. Qld., xxi., 1908, p. 1. *Id.*, Weber and Beaufort, Fish. Indo-Austr. Arch., ii., 1913, p. 7, fig. 5.

Albula glossodonta, Ogilby, Mem. Qld. Mus., v., 1916, p. 96.

A large specimen, 603 mm. long from the snout to the end of the middle caudal rays, was forwarded by the Fisheries Department early in June, 1918, from Woy Woy, near Sydney. Its prevailing colour was a rich pink. It does not differ from two smaller examples from Malekula, New Hebrides, and Hood Bay, Papua. Though recorded from Queensland, this species has not been previously recognised south of Moreton Bay.

Family CLUPEIDÆ.

Genus SARDINIA, *Poey*.

SARDINIA NEOPILCHARDUS, *Steindachner*.

Australian Pilchard.

(Plate xxvi., fig. 1.)

Clupea melanosticta, McCoy, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 188 (not of Schlegel).

- Clupea sajar*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 187, and Proc. Linn. Soc. N.S.Wales, iii., 1879, p. 355. *Id.*, Hutton, Cat. Fish. N. Zeal., 1872, p. 63, and Hector, *Ibid.*, p. 119, pl. xi., fig. 110. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, iv., 1879, p. 371, and *Ibid.*, vi., 1882, p. 258. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 133 and *Ibid.*, 1890 (1891), p. 37. *Id.*, Arthur, Trans. N.Z. Inst., xv., 1883, p. 208, pl. xxxiv., fig. 2. *Id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 56, and Ed. Fish. N.S.Wales, 1893, p. 180, pl. xlv. *Id.*, Lucas, Proc. Roy. Soc. Vict. (2), ii., 1890, p. 37. *Id.*, Hutton, Trans. N.Z. Inst., xxii., 1890, p. 284, and Index Faun. N.Zeal., 1904, p. 51. *Id.*, Waite, Rec. Cantb. Mus., i., 1907, p. 10. *Id.*, Zietz, Trans. Roy. Soc. S.Austr., xxxii., 1908, p. 294 (not *C. sajar*, Jenyns).
- Clupea neopilchardus*, Steindachner, Denk. Akad. Wiss. Wien., xli. i., 1879, p. 12. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 416. *Id.*, Waite, Rec. Cantb. Mus., i. 3, 1911, p. 158, and *Ibid.*, i. 4, p. 317.
- Clupanodon neopilchardus*, Waite, Mem. Austr. Mus., iv. 1, 1899, p. 53, and Mem. N.S.Wales Nat. Club, No. 2, 1904, p. 13, and Rec. Austr. Mus., vi. 1, 1905, p. 58. *Id.*, Stead, Ed. Fish N.S.Wales, 1908, p. 25, pl. iv. *Id.*, McCulloch, Zool. Res. "Endeavour," i. 1, 1911, p. 17.
- Amblygaster neopilchardus*, Cockerell, Mem. Qld. Mus., iii., 1915, p. 36 (scales). *Id.*, Ogilby, Mem. Qld. Mus., v., 1916, p. 98. *Id.*, Waite, Austr. Antarctic Expd., iii. 1, 1916, pp. 56, 81.
- Sardina neopilchardus*, Regan, Brit. Antarctic Expd., Zool., i. 4, 1916, p. 136, pl. v., figs. 3-4 (larvae), and Ann. Mag. Nat. Hist. (8), xviii., 1916, p. 14, pl. i., fig. 2.
- Br. 7. D. 4 + 14-15; A. 3 + 13-14 + 2; P. 17-18; V. 7-8; C. 19. Forty-nine rows of scales between the operculum and the hypural joint, seventeen on the back before the dorsal fin, and twelve between the dorsal and ventral fins. Vertebrae forty-nine.
- Depth 4·9 in the length to the hypural joint; head 3·9 in the same. Breadth behind the head 1·7 in the depth. Eye 4·05 in the head, and 1·3 in the snout, which is 3·1 in the head.
- Body moderately elongate, compressed, the ventral profile, more curved than the back. Maxillary broad, rounded posteriorly, reaching to below the anterior third or fourth of the eye, and scarcely attaining the vertical of the anterior border of the pupil; its surface bears two strong ridges, and the upper portion is covered by a broad supplemental bone which is expanded posteriorly. Cheek, between the eye and the anterior end of the preoperculum, as deep as the eye. Cheek, preopercular border, and upper portion of operculum with arborescent mucous canals. Operculum with five or six striæ descending towards the suboperculum. Nostrils supero-lateral, juxtaposed, and nearer the end of the snout than the eye. Upper surface of head flat, with bony ridges, the occiput with two triangular, striate patches. Jaws and palate without teeth. Gill-rakers fine and closely set, the longest equal to the length of the eye; seventy-three on the lower limb of the first arch.

Scales¹ deciduous, largest on the sides, becoming smaller backwards. Ventral scutes keeled, but not prominent; about nineteen before the ventral fins, and about fifteen more to the vent. Elongate scales cover the bases of the dorsal, anal, pectoral and ventral fins; two enlarged, leaf-like scales on each side of the caudal.

Origin of the dorsal fin a little nearer the snout than the last ray is to the hypural joint. Fourth and fifth dorsal rays longest, slightly longer than the base of the fin; the others decrease rapidly backwards, and the margin of the fin is slightly concave. Ventrals inserted below or a little behind the middle of the dorsal. Pectoral inserted below the angle of the suboperculum, its upper rays longest, reaching about three-fourths of its distance from the vertical of the first dorsal ray. Third and fourth anal rays longest, the others decreasing backwards to the penultimate which, with the last, is enlarged. Caudal deeply forked.

Colour.—Dark blue above, changing abruptly into the silver of the sides. Each scale of the back with a small blackish basal spot, and a row of round blackish spots along the junction of the blue with the silver. Tips of jaws blackish. Eye silvery. Dorsal and caudal fins tipped with blackish dots.

Described from six specimens taken from a large shoal which entered Botany Bay in the middle of July, 1917. They were secured at Sandringham by Mr. J. H. Wright, and are of about equal size. The specimen figured is 190 mm. long.

Occurrence.—Pilchards occur in vast shoals on the coast of New South Wales in the colder months, but very little definite information relative to their habits and migrations is available. The following remarks are collected from various papers published in Victoria, New South Wales and New Zealand.

McCoy² recorded the occurrence of Pilchards in Hobsons Bay, Victoria, in August, 1864-1866. They arrived in such countless numbers in the latter year, that carts were filled with them by simply dipping them out of the sea with large baskets. Hundreds of tons of the fish were sent to the inland Victorian markets, and they were sold in Melbourne for several weeks by the bucket-full for a few pence. Captains of ships entering Hobson's Bay, reported having passed through shoals of Pilchards for miles. Ogilby (1893) noted that Pilchards annually pass along the New South Wales coast in incredible multitudes. Macleay (1879) ascertained from the fishermen that their annual visit to the New South Wales coast was about June and July, when enormous shoals were generally observed one to three miles from the land, and migrating northwards. According to Stead (1908) shoals of mature Pilchards, nine to ten inches long, are usually making northward along the New South Wales coast in September, and small bodies of them are often found among Mackerel of equal size and *vice versa*.

The Pilchard is equally abundant in New Zealand waters. Arthur (1883) records that they occur all the year round at Queen Charlotte Sound, but only enter the shallower bays during winter. They prefer

¹ Scales described by Cockerell—Mem. Qld. Mus., iii., 1915, p. 36.

² McCoy—Intercolonial Exhibition Essays, 1866-1867, p. 319.

colder water, and so leave the shallows when the spring sets in. In winter, they occur in large shoals, when they are systematically fished for, but they keep apart during the summer. Four smoke-houses were employed in curing the fish in 1882, and the average haul of the nets was one-and-a-half to two tons, but at times, hauls of ten tons were secured. Henry³ obtained half a baker's basket full of Pilchards at Queenscliff, New Zealand, in 1902, by simply dipping it in the water. The air was alive with birds, and the water with porpoises and various fishes preying upon the pilchards. Hector (1872) recorded a shoal migrating southwards east of Otago, New Zealand, which extended as far as the eye could reach. It was followed by a multitude of Gulls, Mutton-birds, Barracouta and Porpoises, and the fish were so densely packed that a pitcher might be half-filled with them by simply dipping it in the sea.

Notwithstanding their great abundance, and value as food, Pilchards are rarely seen in the markets in Australia. Ogilby (1893) noted that the number observed in the markets over a space of eight years could be counted on the fingers of one hand. Stead⁴, also speaking with experience of our markets, remarked that with the exception of an occasional basket or two of Pilchards, offered as bait rather than for human consumption, this fish does not usually pay toll. On one occasion, however, in 1908, about forty baskets-full were netted, and after being salted and smoked, were readily sold.

As food.—According to Arthur (1883) the New Zealand Pilchard is exceedingly good when fried, and is sold when smoked as the "Picton Herring." Stead (1908) states that they smoke well, and a small quantity is so treated annually in New South Wales. Some which were captured with those described above, were found to be quite good eating, but with a tendency to quickly become rather soft.

Breeding.—Nothing definite appears to have been recorded relative to the reproduction of the Pilchard in Australian waters. According to Arthur (1883), they spawn during the summer in New Zealand, and are always very full of roe about Christmas time, when they are found in small shoals. Larval specimens, 12-18 mm. long, have been described and figured by Regan (1916). These were collected near North Cape, New Zealand at a depth of three metres, on 1st September, 1911.

Common Names.—This fish is generally recognised as the Pilchard or Sardine. Macleay noted that the fishermen near Sydney called it "Maray," a name also applied to other species of Herrings, while it is sold in New Zealand in the smoked state as "Picton Herring."

Range.—On the eastern coast of Australia, the Pilchard ranges from Tasmania (Johnston, 1882) northwards to Moreton Bay and Hervey Bay, Queensland (Ogilby, 1916). Zietz (1908) included it in a list of South Australian fishes, and Waite (1905) recorded Western Australian specimens. It ranges from north to south in New Zealand, being observed at Auckland (Sherrin, 1886), and recorded from the Auckland Islands by Waite (1916).

³ Henry—Trans. N. Zeal. Inst., xxxiv., 1902, p. 570.

⁴ Stead—Future of Commercial Marine Fishing in N.S. Wales (p. 17). N.S. Wales Fisheries Department, Pamphlet, 1911.

Family STROMATEIDAE.

Genus CENTROLOPHUS, *Lacépède*.CENTROLOPHUS MAORICUS, *Ogilby*.

(Plate xxvi., fig. 2.)

Centrolophus maoricus, Ogilby, Rec. Austr. Mus., ii. 5, 1893, p. 64. *Id.*, Regan, Ann. Mag. Nat. Hist. (7), x., 1902, p. 195, and Brit. Antarctic Exped., Zool. i. 1, 1914, p. 19, and i. 4, 1916, p. 144, pl. x., fig. 7 (post larva).

D. 39; A. 25; P. 20; V. $i/5$; C. 17. One hundred and sixty or more rows of scales below the lateral line between the operculum and the base of the tail.

Depth below the highest dorsal rays 4.08 in the length from the snout to the base of the tail; head 4.5 in the same. Eye slightly shorter than the snout, 4.2 in the head. Interorbital width a little greater than the length of the snout, which is 4 in the head. Longest dorsal and anal rays about 2.5, pectoral 1.7, and ventral 3 in the head.

Body compressed, the upper profile less arched than the lower. Snout obtusely rounded, the upper profile of the head a little oblique, its junction with the neck defined by a slight prominence. Nostrils approximate, in the anterior third of the snout; the anterior rounded and slightly larger than the posterior, which is oval. Eye large, vertically elliptical, and surrounded by a prominent naked lid. Mouth oblique, the maxilla reaching to below the anterior portion of the eye. Teeth cardiform, in a single row in each jaw, but irregular and almost biserial in the anterior portion of the premaxillaries; palate and tongue toothless. Gill-rakers massive, flat, with setiform spines on their hinder margins; thirteen on the lower limb of the first arch, the length of the posterior almost equal to half the width of the eye. Margins of the preoperculum, suboperculum and interoperculum membranaceous and finely lobulate.

Scales cover the greater part of the operculum, interoperculum and suboperculum; the rest of the head is naked and closely pitted with minute pores. The scales commence abruptly on the nape, and extend over the greater part of the vertical fins and onto the base of the pectorals. They are cycloid and concentrically striated; where they are removed, their pits often show a median pore. Lateral line extending backward horizontally for a short distance, thence dipping towards the middle of the body, which is reached above the origin of the anal fin.

Dorsal fin originating above the end of the pectoral fin, its anterior rays deeply imbedded in the skin and difficult to distinguish; they increase gradually in length to the eleventh, which, with a few following it, form a slightly elevated lobe to the fin; the rays then decrease gradually in length backwards so that the margin of the fin is almost straight. Anal of similar form to the dorsal, the length of its base about once and two-thirds in that of the dorsal; the last ray is well behind that of the dorsal. Caudal deeply emarginate, its lobes pointed. Ventrals small, inserted before the vertical of the pectoral base; the spine is weak, and the last ray is united to the abdomen by membrane.

Colour.—Dark slaty-brown above, gradually changing to leaden-silver below. Head brown above, leaden-silver on the sides. Vertical fins similar to the body; outer sides of the ventrals and pectorals lighter.

Described and figured from a specimen 740 mm. long from the snout to the end of the middle caudal rays. It differs from Ogilby's description in several characters, but a comparison of it with the holotype of the species, which is stuffed in the Australian Museum collection, shows it to be similar in all details.

Loc.—This specimen was found washed up on a beach at the entrance to Crookhaven, New South Wales. It was slightly damaged, parts of the eye and caudal peduncle having been eaten away, but was otherwise in splendid condition. The specimen was presented to the Trustees of the Australian Museum by the Fisheries Department of New South Wales.

No species of the genus *Centrolophus* has hitherto been recognised from Australian waters.

Family SYNANCEJIDÆ.

Genus EROSA, Swainson.

EROSA EROSA, Langsdorf.

Erosa erosa (Langsdorf), Jordan and Starks, Proc. U.S. Nat. Mus., xxvii. 1904, p. 156, fig. 16.

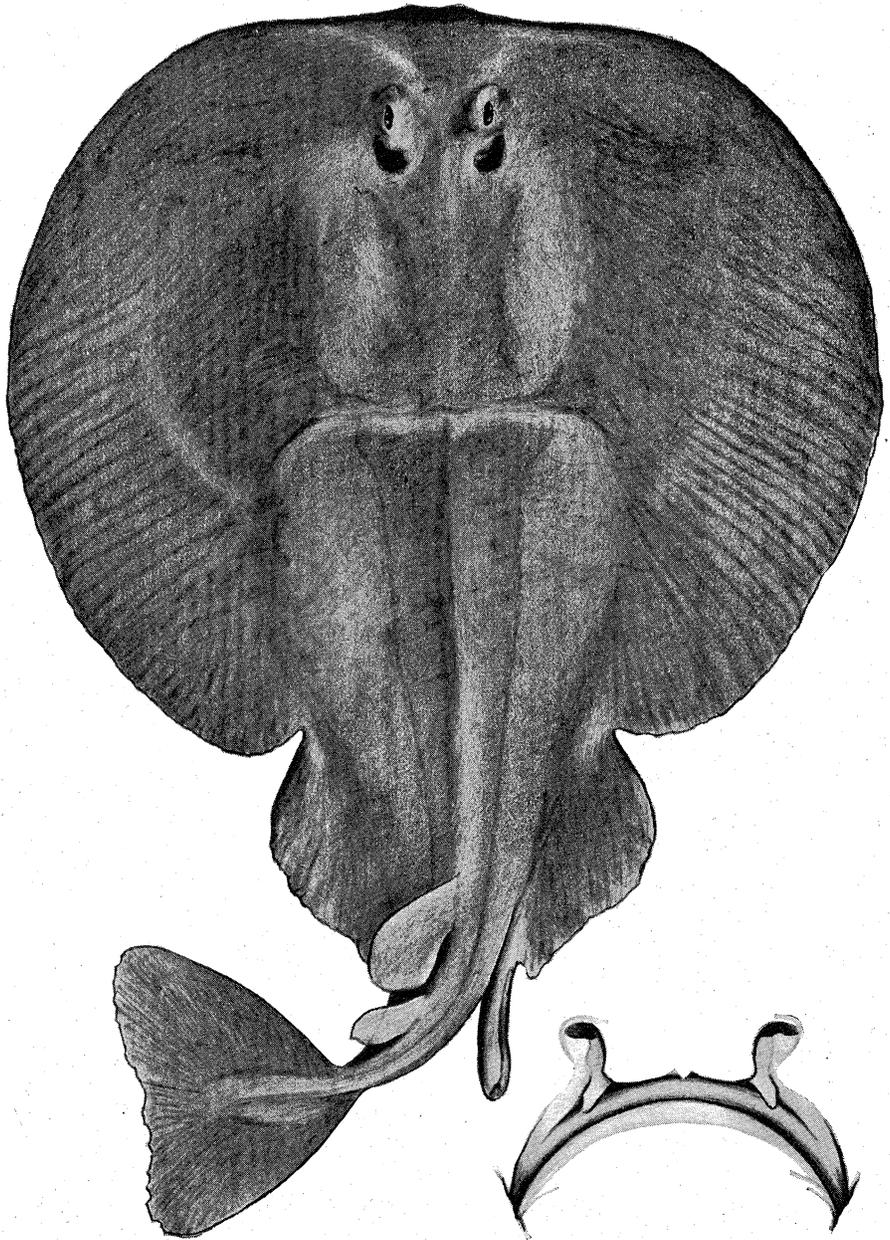
Erosa iridea, Ogilby, New Fish. Qld. Coast, 1910, p. 113.

Having compared the type of *E. iridea*, which is 80 mm. long, with a small Japanese example of *E. erosa*, 46 mm. long, I find no differences other than small details of the cephalic structure, which are evidently due to the very different sizes of the specimens.

Loc.—Nineteen miles N. 30° W. from Double Island Point, Queensland; 33 fathoms.

EXPLANATION OF PLATE XXV.

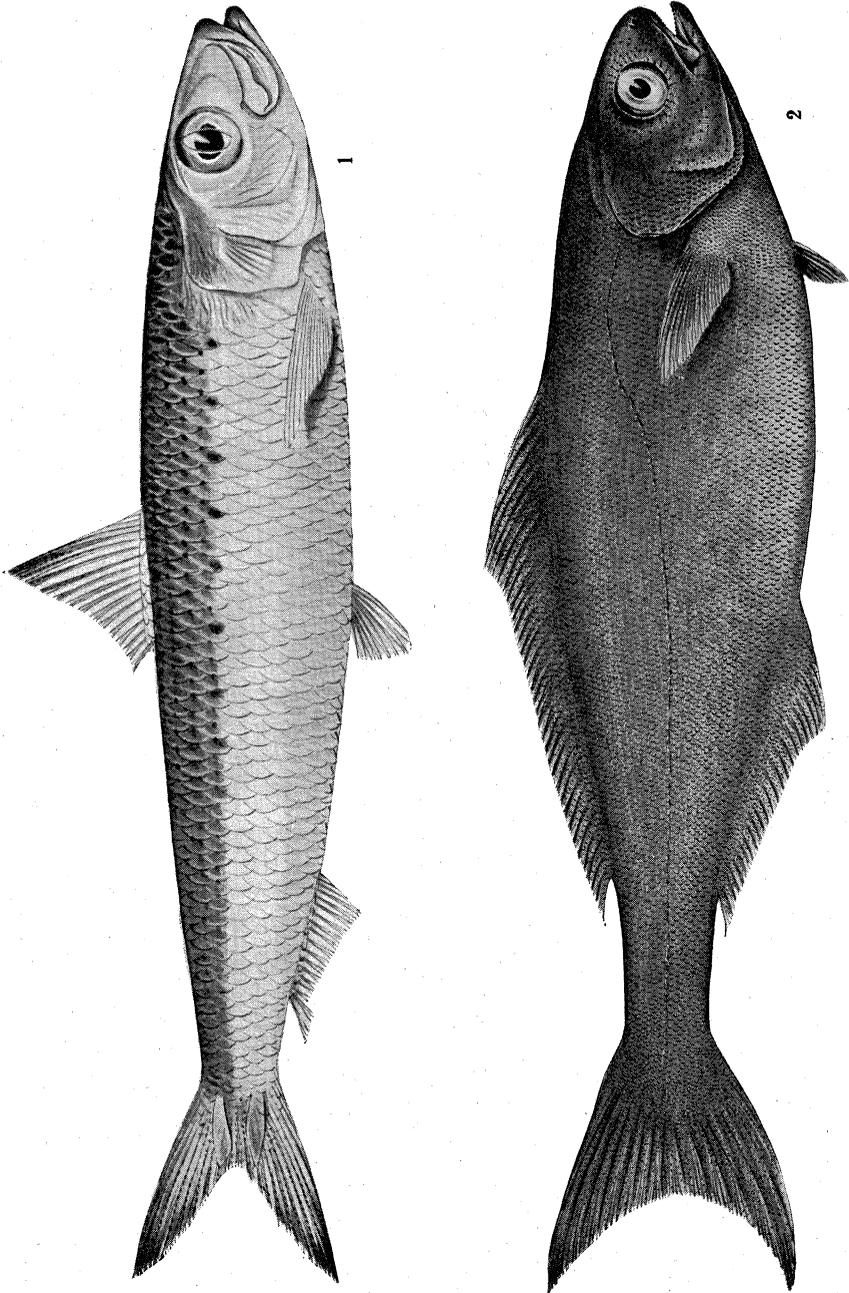
Torpedo fairchildi, Hutton. A specimen 470 mm. wide, from off Green
Cape, New South Wales.



F. A. McNEILL, del., Austr. Mus.

EXPLANATION OF PLATE XXVI.

- Fig. 1. *Sardinia neopilchardus*, Steindachner. A specimen 190 mm. long, from Botany Bay, New South Wales.
- Fig. 2. *Centrolophus maoricus*, Ogilby. A specimen 740 mm. long, from Crookhaven, New South Wales.



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