

## SOME TASMANIAN FISHES.

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(Communicated by Alexander Morton, Esq.)

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Having occasion some time ago to compare certain Tasmanian fishes with their New South Wales representatives, I applied for assistance to Mr. Alexander Morton, Curator of the Tasmanian Museum, Hobart, who, with a commendable promptitude and liberality which, with advantage to Australian biology, might be well imitated, forwarded unreservedly a number of the required species, with the suggestion that I should embody the result of my researches in the form of a paper to the Royal Society.

The following remarks, the outcome of that suggestion, deal with a few of the more interesting fishes received from Mr. Morton, special attention having been given, as requested, to the *Mugilidae*.

The earliest record of the occurrence of this family in Tasmanian waters is to be found in Sir John Richardson's second notice of the fishes collected at Port Arthur, and sent to England by Commissary-General F. J. Lempriere. In this paper, which appeared in 1840, a gray mullet is mentioned under the name *Dajaus\* diemensis*, but without detailed description; in the following year, however, a very full and accurate diagnosis of the species appeared in the Transactions of the Zoological Society of London, and some years later both the Tasmanian and New Zealand species were figured by the same author in the Voyage of the Erebus and Terror as distinct fishes. Modern writers, with the exception of Castelnau and Macleay who follow him, are satisfied as to the identity of the two forms, and so we find Dr. Günther, in 1861, writing of them under the name of *Agonostoma forsteri*, he having quite unnecessarily changed the construction of Bennett's generic name, though, as remarked by Dr. Gill, he has retained this orthography in the fifth volume of his Catalogue of Fishes in the analogous names *Plecostomus*, *Chætostomus*, etc.

In 1842 the occurrence of the species on the Australian coast was noted for the first time by the Rev. Leonard Jenyns from a dried specimen collected at King George's Sound by Darwin during the Voyage of the Beagle, subsequent to which no record of it is to be met with, until in 1872 Count Castelnau records it as abundant on the coast of Victoria, reverting, as before mentioned, to Richardson's

\* *Dajaus*, Cuvier and Valenciennes, *Hist. Nat. Poiss.* xi. p. 164, 1836; type, *Mugil monticola*, Bancroft = *Agonostomus monticola*.

name, and stating that the Tasmanian fish is distinct from the New Zealand one, but giving no reason for this opinion ; not content with this, he further subdivides the Australian form by separating from *diemensis* the common mullet of the Gippsland Lakes under the name of *Agonostoma lacustris*.

In Sir William Macleay's paper on the "Mugilidæ of Australia,"† this is the only species of mullet recorded from Tasmania, from whence it is catalogued as *Agonostoma diemensis*, that author not only considering that its identity with the New Zealand fish had not been satisfactorily established, but also that Castelnau's *Agonostoma lacustris* from the Gippsland Lakes was worthy of specific recognition. With neither of these conclusions can I agree, for though the only New Zealand specimens which I have had an opportunity of examining were brought over in ice, scaled and cleaned for sale in Sydney, there is no doubt in my mind as to the correctness of Dr. Günther's judgment in referring Richardson's fish back to Forster's *albula*, while the two continental examples of *Agonostomus* which have passed through my hands, and which agree perfectly with Castelnau's *lacustris*, cannot be specifically separated from the Tasmanian fish.

Three years subsequent to the appearance of Sir William Macleay's catalogue, Mr. Robert M. Johnston published a "Catalogue of the Fishes of Tasmania,"‡ which included all the species of fishes at that time known to occur within the limits of the Tasmanian fauna. This list was chiefly based on Dr. Günther's well known British Museum Catalogue of Fishes and Macleay's recently published Australian Catalogue, largely supplemented by its author's close study of the fishes of the colony during a period of six years. Mr. Johnston had also the advantage of being in a position to consult Mr. Morton Allport's MS. list, but, like myself, he does not appear to have seen, or even known of, Dr. Bleeker's paper on the "Fishes of Van Diemen's Land."

In Mr. Johnston's catalogue we find the first published§ announcement of the occurrence of a second Mugilid, the two species being recorded (pp. 122, 123) as follows :—

83. *Mugil cephalotus*, Cuv. and Val. *Sand mullet*.

84. *Agonostoma forsteri*, Bl. *Sea mullet*.

A short account, under the above names, of the distribution, habits, mode of capture, etc., of both species will be found on pp. 86 and 87 of the same paper in the chapter devoted to the marine food fishes.

† Published May, 1880.

‡ Proc. Roy. Soc. Tas. 1882, pp. 53-144.

§ Allport had previously included the species, but I am unable to say under what name.

At p. 57, however, in the chapter headed "Market Fish and Fisheries," section ii., "Middle Ground" Fisheries, Mr. Johnston gives to what is certainly intended for the same fish its correct name of *Mugil dobula*, and as no explanation of the subsequent change of name to *cephalotus* is given, I am somewhat at a loss to know whether or not he considers Günther's *dobula* to be inseparable from Forskal's *oeur*¶, or whether the former name is merely due to a *lapsus calami*; the two species are quite distinct.

In 1891 a revised list\* by the same author appeared, in which these two species—*Mugil cephalotus* and *Agonostoma forsteri*—again figure as the sole representatives of the Tasmanian *Mugilidae*, but with the substitution in the latter of "Estuary Mullet" as a trivial name in place of "Sea Mullet; the amended name is much the more suitable, as the fish, on our coasts at any rate, is principally an inhabitant of brackish water.

Mr. R. Sherrin, however, in his "Handbook of New Zealand Fishes," p. 65, quoting Dr. Hector, writes in reference to the confusion in the popular mind between this fish and the herring. "It is easily recognised from the true herring by having two fins on the back, the first of which has only four rays. I particularly mention this, as in some years what is supposed to be this fish *visits the coasts in enormous shoals*,† like the herring of the British seas." I give this quotation because the habit here alluded to is totally opposed to all that we know of its life history in Tasmanian and Australian waters, and indeed of the habits of the other members of the genus, which are without exception denizens of fresh or brackish waters, and, if correct, must be taken into consideration as a factor of some importance as regarding the claims to specific separation put forward by some writers on behalf of the Tasmanian fish. It is probable, however, that this alleged difference in habit is traceable to the confusion between the mullets and herrings, the words "visits the coasts in enormous shoals" being as indisputably true of the latter as it is probably incorrect of the former fish. This solution of the difficulty appears to have commended itself to Dr. Hector as well as to myself, else he would hardly have penned the words "what is supposed to be this fish."

Continuing the same quotation, Mr. Sherrin writes:—"The Picton Herring, a dried fish commonly known through-

¶ *Mugillöur*, Forsk. Descr. Anim. p. 14, 1775 = *Mugil cephalotus*, Cuv. and Val. H. N. Poiss. xi. p. 110, 1836.

\* Proc. Roy. Soc. Tas. 1890, pp. 26-34.

† The italics are mine.

out the colony, is the 'aua,'<sup>‡</sup> preserved by smoking." On p. 72, however, Mr. Sherrin, alluding to the Australian Pilchard, writes:—"In the beginning of April they appear in Queen Charlotte's Sound, and are caught in large numbers, and converted by salting and smoking into the highly esteemed Picton Herring."

Taken together the two paragraphs quoted are directly contradictory of one another, or at the least so worded as to be liable to cause confusion in the minds of those who are not in a position to make a personal investigation; nevertheless I can affirm that both paragraphs are to some extent true, for having purchased in the Sydney market smoked "Picton Bloaters" and fresh "New Zealand Herrings," I found the former to be *Clupea sagax* and the latter *Agonostomus forsteri*.

The following epitome of the three<sup>¶</sup> mugiloid genera so far recorded from Tasmania should make the task of distinguishing them easy, since up to the present time only one species of each genus has been recognised, though doubtless a more thorough investigation of the estuary fauna, especially in the northern and eastern districts, will reveal the presence of others.

Adipose eyelid present; an elongate scale in the axil of the pectoral; snout scaly.

Both jaws toothless; anal fin with eight soft rays  
*Mugil*, p.

No adipose eyelid; no elongate scale in the axil of the pectoral; snout naked.

Teeth in the upper jaw only, in a single series; anal fin with nine soft rays. *Myxus*, p.

Teeth in both jaws, in several series; anal fin with twelve soft rays. *Agonostomus*, p.

In this and all subsequent papers the following rules for taking the comparative measurements will be strictly adhered to, unless special mention to the contrary shall be made:—The total length is the distance between the extremity of the jaws and the base of the caudal fin; the length of the head is the distance between the tip of the snout and the free margin of the bony opercle, or, if present, the tip of the opercular spine; the diameter of the eye is measured along its horizontal axis; the width of the interorbital region is the narrowest point of the cranium between the eyes; the base of a fin is the distance between its origin and the

<sup>‡</sup> Aua and Makawhiti are names by which *Agonostomus forsteri* are known to the Maoris.

<sup>¶</sup> Since this was written Mr. Morton has sent me a specimen of *Lisa peronii* from Tasmania; this genus may be distinguished from *Mugil* by the absence of an adipose eyelid, from *Myxus* and *Agonostomus* by the absence of teeth. It differs from all our other mullets in the great depth of the caudal peduncle.

insertion of the last ray ; the depth of the caudal peduncle is taken at its shallowest portion, and its length is the interspace between the dorsal and caudal fins. In giving the total length to which a fish attains the caudal fin is, as a matter of course, included.

Appended is a full generic and specific description of each of the Tasmanian Gray Mullets taken, in the case of *Myxus* and *Agonostomus*, entirely from specimens forwarded by Mr. Morton, while that of *Mugil dobula* was of necessity drawn up from Port Jackson examples, both the Tasmanian specimens received having been unfortunately destroyed, not, however, before they had been carefully examined and compared with our common New South Wales Sea Mullet. One of the Tasmanian examples was in the adult, the other in the half-grown or "hardgut" stage.

### MUGIL.

*Mugil*, Artedi, Gen. Pisc. p. 32, 1738.

Body oblong, somewhat compressed ; head moderate, the snout short and broad, not depressed ; mouth moderate and transverse, the lips thin ; premaxillaries narrow, protractile ; maxillary not bent downwards posteriorly, concealed except at the extreme tip beneath the preorbital, the lower border of which does not overlap it, without supplemental bone ; lower lip included, the dentary bones of the lower jaw obtusangular in front, separated at the symphysis by a shallow notch. Adipose eyelid present ; preorbital minutely denticulated, its lower border without notch ; opercular bones entire ; gill-rakers short, slender ; six branchiostegals ; pseudobranchiæ present ; jaws toothless, fringed with minute cilia ; vomer, palatines, and tongue without, pterygoids with a small group of minute teeth ; two dorsal fins with iv. 18 rays, the origin of the first about midway between the base of the caudal and the extremity of the snout ; anal fin originating slightly in advance of and not more developed than the soft dorsal, with iii 8 rays ; ventrals moderate, rounded, with a rather feeble spine ; pectorals rather small, pointed, with 16 rays, the upper ones the longest, the second undivided and not stronger than the third ; caudal emarginate, with the lobes acute. Scales moderate, cycloid ; snout and preorbital scaly ; an enlarged scale in the axil of the pectoral ; a scaly process between the ventral fins.

Deriv.—*Mugil*, the Latin name for a Mediterranean species, from *mulgeo*, to suck, in allusion to their method of procuring food.

Type.—*Mugil cephalus*, Linnæus.

## MUGIL DOBULA. -

*Mugil dobula*, Gnth. Catal. Fish, iii. p. 420, 1861 and Fisch. Sudsee, p. 214, pl. cxx. f. A. 1876; Casteln. Proc. Linn. Soc. N.S. Wales, 1878, iii. p. 387; Macl. Proc. Linn. Soc. N.S. Wales, 1880, iv. p. 415; Ogilby, Edi. Fish. N.S. Wales, p. 118, pl. xxxi. 1893. *Mugil waigiensis* (not Quoy Gaimard) Casteln. Proc. Zool. Soc. Vict. 1872, i. p. 140. *Mugil grandis*, Casteln. Proc. Linn. Soc. N.S. Wales, 1878, iii. p. 386; Macl. l.c. p. 412. *Mugil cephalotus* (not Cuv. Val.) Johnston, Proc. Roy. Soc. Tas. 1882, p. 122.

D. iv. i 8. A. iii 8. Sc. 40—42/14—15.

Length of head  $3\frac{9}{10}$  to  $4\frac{1}{5}$ , depth of body  $3\frac{3}{5}$  to  $3\frac{9}{10}$  in the total length; width of head  $1\frac{2}{5}$  to  $1\frac{3}{5}$ , of the interorbital region, which is almost flat 2 to  $2\frac{1}{5}$ , diameter of eye  $3\frac{2}{5}$  to  $4\frac{1}{5}$  in the length of the head; snout very broad and obtuse, as long as to one fourth of a diameter longer than the eye; maxillary longer than the diameter of the eye, reaching to or nearly to the vertical from its anterior margin; preorbital narrow, its distal end rounded and about half as wide as the pupil, entire or minutely serrated on the posterior portion of the lower and the hinder margins; 68 to 74 gill-rakers on the lower branch of the anterior arch; body rather stout, not much compressed, the dorsal profile but little convex, much less so than the ventral. The origin of the spinous dorsal is midway between the base of the caudal and the extremity of the snout; the spines are rather weak, the first slightly curved, as long as or a little longer than the second, its length  $1\frac{3}{5}$  to 2 in that of the head; the third spine is considerably shorter than the second, while the fourth is from 2 to  $2\frac{1}{2}$  in the length of the first; the space between the origins of the dorsal fins is as long as or a little longer than the head; the anterior soft rays are as long as or shorter than the first spine, and the outer border of the second dorsal is moderately emarginate, the last ray being considerably produced; the anal fin originates slightly in advance of and does not extend quite so far back as the second dorsal, its base being  $1\frac{2}{5}$  to  $1\frac{1}{2}$  in its distance from the caudal; the anterior soft rays are as long as those of the dorsal, and when laid back do not extend to the extremity of the last ray, which is more or less produced; the outer border of the fin is slightly emarginate; ventral inserted beneath the last third or fourth of the pectoral, its length  $1\frac{1}{2}$  to  $1\frac{3}{4}$  in that of the head, and  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in the distance between its origin and the anal; the outer ray a little longer than the second; third, or third and fourth pectoral rays the longest, not extending to beneath the origin of the spinous dorsal,  $1\frac{1}{3}$  to  $1\frac{2}{3}$  in

the length of the head ; caudal deeply emarginate ; caudal peduncle rather short and stout, its least depth  $2\frac{1}{4}$  to  $2\frac{4}{5}$  in the depth of the body, and  $1\frac{1}{4}$  to  $1\frac{2}{5}$  in its length. The axillary scales of the pectoral and ventral largely developed, and about as long as those of the first dorsal, which extend half way along the terminal membrane ; a series of small scales between the anterior dorsal and anal rays. Steel blue above, the sides and lower surfaces silvery ; a small black spot in the axil of the pectoral, and a golden spot on the upper angle of the opercle ; dorsal and pectoral fins dark blue-grey, the latter with a large silvery iridescent blotch covering the lower two thirds of its base ; caudal and anal fins yellowish-green.

This fine mullet has a much wider range than the majority of our Australian species, for, in addition to its Tasmanian distribution, which, according to Messrs. Johnston and Morton, comprehends the northern and eastern coasts, it is in all probability an inhabitant of the entire sea-board of the continent. Owing to the want of local catalogues of the fishes occurring along our southern, western, and northern shores, we have to be satisfied with such meagre records as are to be found in isolated papers, and in most cases, therefore, the exact limit of the range of a species cannot be definitely ascertained ; in the case of this mullet, however, we have precise records of its abundance along the whole of our eastern and south-eastern coasts ; westward of Victoria a hiatus occurs until Perth is reached, from whence Dr. Günther, the author of the species, found examples in the British Museum collection. As Macleay obtained specimens at Port Darwin, it is safe to conclude that it is found at all intermediate stations between that locality and Perth on the one hand and Cape York on the other, and it would even appear to extend north-westwards right through the Malaysian seas to the coasts of China, if Professor Kner is correct in attributing to this species two mullets collected at Hong-kong during the voyage of the "Novara." Both these examples were, however, very young, the largest being only five centimeters, and it scarcely seems advisable to me to claim so great an extension of distribution on so slender a foundation as the differences between this and any closely allied species (such as *oeur*, which is a common Chinese fish) at so early a stage of growth. To the north-east there is, however, more definite information as to its range, Dr. Günther having recorded it both from the New Hebrides and the Sandwich Islands.

This species is *par excellence* the mullet of our eastern and south-eastern coasts, and to it assuredly should be limited the name "Sea Mullet," as typifying its habit of gathering

in enormous shoals off our coasts during the latter end of the summer, preparatory to seeking its spawning beds in the shallower parts of our bays and estuaries. In its adult state this is the name applied to it by the residents of New South Wales and Queensland, the immature fish, prior to its first visit to the open sea, being known in the southern colony by the name of "Hardgut Mullet," in the northern by the appropriate one of "Mangrove Mullet"; in Victoria and Tasmania it has somehow contracted the name of "Sand Mullet," a title which is by no means suitable, as during the short time when it is engaged in spawning it shows a decided preference for mud banks at the mouths of rivers over the more open sandy beaches, and the remainder of its life is passed out at sea. This fine species attains to a length of 650 millimeters, and a weight of ten pounds or even more.

As this mullet has been confused by Mr. Johnston and others with *Mugil oeur*, the following differences between the two fishes may appropriately be mentioned here. In *dobula* the head is proportionately smaller, the body deeper, the eye larger, the jaws are without trace of teeth, and the scales are cycloid. The two last characters serve by themselves to distinguish the two species, as in *oeur* the teeth are "distinct in both jaws" (Day, Fishes of India), and the "scales of the trunk are more regularly ctenoid" (Kner, Voyage "Novara").

The mistake has no doubt been partly caused by Macleay's assertion that Prof. Kner "announces it," i.e., *cephalotus*, "as a Port Jackson fish." This is quite incorrect; that author records specimens obtained by the collectors of the "Novara" from Java, Manilla, and New Holland, the latter term being used throughout the whole work as synonymous with Australia.

The most southerly latitude to which I can with any certainty refer *oeur* is that of the Mary River, Queensland, where it was obtained by the naturalists of the "Challenger." From the ctenoid character of the lepidosis and the presence of teeth I should judge that *Mugil oeur* was more habitually a denizen of fresh and brackish waters than *Mugil dobula*.

### MYXUS.

*Myxus*, Günther, Catal. Fish. iii. p. 466, 1861.

Body oblong, compressed; head moderate, the snout pointed and somewhat depressed; mouth small and transverse, the lips thin; premaxillaries narrow, protractile; maxillary not bent downwards posteriorly, almost entirely hidden beneath the preorbital, which considerably overlaps it posteriorly, without supplemental bone; lower lip included, the dentary bones of the lower jaw obtusangular in front,

not separated by a notch at the symphysis. Adipose eyelid rudimentary; preorbital denticulated, its lower border without conspicuous notch; opercular bones entire; gill-rakers moderate, slender; six branchiostegals; pseudobranchiæ present; upper jaw with a single series of small club-shaped or crenulated teeth; lower jaw with fine cilia; vomer, palatines, pterygoids, and tongue with patches of minute teeth; two dorsal fins, with iv. i 8 rays, the origin of the first nearer to the base of the caudal than to the extremity of the snout; anal fin originating well in advance of and more developed than the second dorsal, with iii 9 rays; ventrals moderate and rounded, with a rather feeble spine; pectorals small, obtusely pointed, with 16 rays, the upper ones the longest, the second undivided and somewhat stronger than the third; caudal emarginate, with the lobes acute; scales moderate, mostly cycloid; snout naked: preorbital scaly; no enlarged scale in the axil of the pectoral; a scaly process between the ventral fins.

Deriv.— $\mu\nu\xi\omega\nu$  or  $\mu\nu\xi\sigma$ , a kind of fish, from  $\mu\nu\xi\alpha$ , slime.

Type.—*Myxus elongatus*, Günther.

#### MYXUS ELONGATUS.

*Myxus elongatus*, Gnth. Catal. Fish iii. p. 466, 1861; Kner, Voy. Novara, Fisch. p. 230, 1869; MacL. Proc. Linn. Soc. N.S. Wales, 1879, iv. p. 426; Ogilby, Rep. Lord Howe Isl. Fish. p. 63, 1889, and Edib. Fish N.S. Wales, p. 128, pl. xxxiii. 1893.

D. iv. i 8. A. iii 9. Sc. 42-46/14-15.

Length of head  $3\frac{5}{6}$  to  $4\frac{1}{10}$  depth of body  $3\frac{7}{10}$  to 4 in the total length; width of head  $1\frac{7}{10}$  to  $1\frac{9}{10}$ , of the slightly convex interorbital region  $2\frac{3}{4}$  to  $2\frac{7}{8}$ , diameter of eye 4 to  $4\frac{2}{3}$  in the length of the head; snout obtuse, from one fifth to two fifths of a diameter longer than the eye; maxillary about as long as the diameter of the eye and not reaching to the vertical from its anterior margin; distal end of the preorbital obliquely truncated, rarely rounded, as wide or nearly as wide as the pupil, the posterior half of the lower and the hinder borders strongly denticulated; 60 to 64 gill-rakers on the lower branch of the anterior arch; body moderately stout and deep, the dorsal profile slightly and evenly convex, less so than the ventral. The origin of the spinous dorsal is a little nearer to the base of the caudal than to the extremity of the snout; the spines are rather weak, the first straight or nearly straight, very little longer than the second, its length 2 to  $2\frac{1}{5}$  in that of the head;

the third spine is considerably shorter than the second and the fourth, which is curved and feeble, is 2 to  $2\frac{1}{3}$  in the length of the first; the space between the origins of the dorsal fins is as long as or a little shorter than the head; the anterior soft rays are as long as or a little longer than the first spine, and the outer border of the second dorsal is but little emarginate, the last ray not being appreciably produced; the anal fin originates well in advance of and does not extend quite so far back as the second dorsal, its base being  $1\frac{1}{3}$  to  $1\frac{2}{3}$  in its distance from the caudal; the anterior soft rays are longer than those of the dorsal, and when laid back extend to, or nearly to, the extremity of the last ray, which is but little produced; the outer border of the fin is moderately emarginate; ventral inserted beneath the last fourth of the pectoral, its length  $1\frac{1}{2}$  to  $1\frac{4}{5}$  in that of the head, and  $2\frac{1}{2}$  to  $2\frac{3}{4}$  in the distance between its origin and the anal; the outer ray not longer than the second; third pectoral ray the longest, not nearly extending to beneath the origin of the spinous dorsal,  $1\frac{4}{9}$  to  $1\frac{5}{9}$  in the length of the head; caudal deeply emarginate; caudal peduncle long and rather slender, its least depth  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in the depth of the body and much less than its length. Scales of the cheeks, preorbital, and ventral surface finely ciliated; the elongated scale in the axil of the ventral is much smaller than that at the base of the first dorsal, which reaches almost to the end of the membrane; a series of small scales between the soft dorsal and anal rays. Light reddish brown or dark green above, silver below, the sides pink; a small black spot in the axil of the pectoral; a golden spot on the opercle; soft dorsal generally with a median dusky band; extremity of the caudal fin blackish.

The aboriginal name of this fish in the Sydney district is Tallegalane, but it is more commonly sold by dealers as Sand Mullet, a name well in accordance with its habits. Its range extends from Southern Queensland to the coast of Victoria, whence Günther received one of his types. In that colony, however, it has either been overlooked or is a mere straggler, as it has not been recorded since; the fact that none of the Tasmanian authorities have ever noticed it, but that at the same time Mr. Morton was able to forward five examples, induces me to incline to the former theory. Its range on the coast of the island colony is not known, but probably concurs with that of *Mugil dobula*. The Tallegalane\* attains a size of 400 millimeters, though those which come to market more ordinarily average less than twelve inches.

\* Where the native name of an animal or plant is known it is, I think, always best to use it in preference to such names as "Sand Mullet," "Sea Mullet," etc., which are almost sure to be bandied about from one species to another in different localities.

## AGONOSTOMUS.

*Agonostomus*, Bennett, Proc. Zool. Soc. 1830, p. 166 ;  
*Agonostoma*, Günther, Catal. Fish, iii. p. 461, 1861, *et auctt.*

Body elongate-oblong, strongly compressed ; head moderate, the snout somewhat pointed and depressed ; mouth moderate and sublateral, the lips thin ; premaxillaries narrow, protractile ; maxillary straight, not bent downwards posteriorly, extending beyond the lower margin of the preorbital and entirely hidden beneath it and the anterior bones of the suborbital ring, without supplemental bone ; lower lip included ; dentary bones of the lower jaw rounded in front, with an indistinct notch at the symphysis ; adipose eyelid rudimentary ; preorbital denticulated, its lower border without conspicuous notch ; opercular bones entire ; gill-rakers moderate, rather stout ; six branchiostegals ; pseudobranchiæ present ; both jaws with a narrow band of small curved teeth, the lower with a series of fine cilia in addition to the teeth ; teeth on the vomer, palatines, pterygoids, and tongue. Two separate dorsal fins, with iv. i 9 rays, the origin of the first midway between the base of the caudal and the extremity of the snout ; anal fin originating well in advance of and much more developed than the second dorsal, with iii 12 rays ; ventrals small and rounded, with a feeble spine ; pectorals moderate, pointed with 17 rays, the upper ones the longest, the second undivided and but little stronger than the third ; caudal deeply emarginate, with the lobes acute. Scales small, feebly ciliated ; snout naked ; preorbital scaly ; no enlarged scale in the axil of the pectoral ; a scaly process between the ventral fins. Vertebræ 24 (11 + 13).

Deriv.—*α* priv., *γῶνος*, an angle, *στόμα*, mouth ; in allusion to the rounded shape of the lower jaw.

Type.—*Agonostomus telfairii*, Bennett.

## AGONOSTOMUS FORSTERI.

*Mugil albula forsteri*, Bloch and Schn. Syst. Ichth. p. 120, 1801. *Mugil forsteri*, Cuv. and Val. Hist. Nat. Poiss. xi. p. 141, 1836 ; Richards Voy. Erebus and Terror, Fish, p. 77, pl. xliv. ff. 20-26, 1846. *Dajaus diemensis*, Richards. Proc. Zool. Soc. Lond. 1840, p. 25 and Trans. Zool. Soc. Lond. iii. p. 123, 1841, and Voy. Erebus and Terror, Fish. p. 37, pl. xxvi. ff. 1-4, 1846 ; Jenyns, Zool. Beagle, Fish. p. 82, 1842. *Mugil albula*, Forster, Descr. Anim. ed. Licht. p. 145, 1844. *Agonostoma forsteri*, Gnth. Catal. Fish. iii. p. 465, 1861 ; Hutton, Fish. N. Zeal. p. 37, 1872 ; Hector, Edib. Fish. N. Zeal. p. 114, pl. vi. f. 58 ; Johnston, Proc. Roy. Soc. Tasmania, 1882, pp. 86, 123 ; Sherrin, Handb. N.Z. Fish. p. 65, 1886 ; *Agonostoma diemensis*,

Casteln. Proc. Zool. Soc. Vict. 1872, i. p. 141 and 1873, ii. p. 136; Macl. Proc. Linn. Soc. N.S. Wales, 1879, iv. p. 425. *Agonostoma lacustris*, Casteln. l.c. i. p. 142; Macl. l.c. *Agonostomus forsteri*, Gill, Mem. Acad. Washingt. vi. pp. , 1894.

D. iv, i 9. A. iii 12. Sc. 60-64/17-18.

Length of head 4 to  $4\frac{2}{7}$ ; depth of body 4 to  $4\frac{1}{2}$  in the total length; width of head  $1\frac{8}{9}$  to 2 of the convex interorbital region  $3\frac{2}{5}$  to  $3\frac{5}{9}$ ; diameter of eye  $3\frac{7}{10}$  to 4 in the length of the head; snout obtuse, as long as or a little longer than the eye; maxillary as long as or a little shorter than the diameter of the eye, reaching to or nearly to the vertical from its anterior margin; distal end of the preorbital rounded and oblique, not so wide as the pupil; posterior half of the lower and the hinder borders denticulated; 27 to 29 gill-rakers on the lower branch of the anterior arch; body rather elongated, the dorsal and ventral profiles equally and slightly convex. The origin of the spinous dorsal is midway, or a little in advance of midway, between the base of the caudal and the extremity of the snout; the spines are feeble, the first straight and but little longer than the second, its length  $1\frac{4}{5}$  to 2 in that of the head; the third spine is intermediate in length between the second and the fourth, which is 2 to  $2\frac{1}{3}$  in the length of the first; the space between the origins of the dorsal fins is as long as or a little longer than the head; the anterior rays are as long as the first spine, and the outer border of the soft dorsal is moderately emarginate, the last ray being slightly produced; the anal originates well in advance of and does not extend quite so far back as the second dorsal, its base being as long as or a little shorter than its distance from the caudal; the anterior rays are slightly longer than those of the dorsal, and when laid back extend to or a little beyond the base of the last ray, which is moderately produced, the outer border of the fin being deeply emarginate; ventral inserted beneath or a little behind the middle of the pectoral, its length  $1\frac{3}{4}$  to  $1\frac{9}{10}$  in that of the head, and  $2\frac{1}{5}$  to  $2\frac{3}{5}$  in the distance between its origin and the anal; the middle ray the longest; third and fourth pectoral rays the longest, not extending to beneath the origin of the spinous dorsal,  $1\frac{1}{6}$  to  $1\frac{1}{4}$  in the length of the head; caudal peduncle long and slender, its least depth  $2\frac{3}{5}$  to  $2\frac{3}{4}$  in the depth of the body, and  $1\frac{3}{4}$  to 2 in its length. The elongated scale in the axil of the ventral is small; no pointed scale at the base of the spinous dorsal; some small scales between the anterior rays of the anal fin.

Either "Estuary Mullet," as given by Mr. Johnston in his amended catalogue, or "Lake Mullet," as applied to his

*Agonostoma lacustris* by Count Castelnau, is a suitable name for this fish. At Perth, where, according to the latter authority, it is "very common," it is known as the "Pilchard," though the Count thinks that in this there "must be some mistake"; however, considering the remarkably herring-like appearance of the fish it is quite possible that among an ignorant population some such name would be applied to this or any similar species, as indeed is the case among the fishermen of New Zealand. The Estuary Mullet attains a length of 400 millimeters, but is usually much smaller.

Early in February I received from the same source a number of young examples of *Emmelichthys nitidus* with the following note on the subject of their capture:—"On Saturday, while one of our 'well' fishing boats was fishing for Barracouta, they got among a shoal chasing some small fish, the result being that the small fry made a rush for the boat, getting in at the holes and nearly filling the well." As the adult fish is seldom taken on the Tasmanian coast this sudden appearance of the fry in such numbers off the coast is very interesting, especially as nothing whatever was previously known about its breeding habits, though in a genus so closely allied to *Arripis* it was safe to conjecture that the method of propagation is somewhat similar in the two species. When their life history is better known it will probably be found that the members of both these genera shed their spawn near the surface, avoiding while so employed the proximity of the land.

As both Sir William Macleay and Mr. Johnston have followed Dr. Günther in using the generic name *Erythrichthys* for this fish I give here the synonymy of the genus, a glance at which will show that not only is that name inadmissible, having been previously made use of for a genus of Characinoid fishes, but that Richardson's name has priority of publication over Schlegel's, as also have Guichenot's and Bleeker's names.

#### EMMELICHTHYS.

*Emmelichthys*, Richardson, Voy. Erebus and Terror, Fish. p. 47, 1846.

*Boxaodon*, Guichenot, Rev. Zool. p. 333, 1847.

*Dipterygonotus*, Bleeker, Journ. Ind. Arch. iii. 1849†.

*Erythrichthys* (not Bonaparte, Saggio, 1831), Temminck and Schlegel, Faun. Japon. Poiss. p. 117, 1850.

Two fine examples of the fish commonly known to Australian scientists as *Holoxenus cutaneus* were included in the collection which was destroyed by an accident as previously

† Perhaps separable from *Emmelichthys*.

mentioned ; fortunately, however, I had embraced the opportunity of making a diagnosis of these specimens before the catastrophe took place, and am, therefore, enabled to give a more detailed description than that provided in the catalogues of Sir William Macleay and Mr. Johnston.

Owing to the loss of the specimens I am, however, debarred from giving a corrected generic diagnosis, from adding some characters to the specific description which would have made it more complete, and from noting the coloration. In the comparative measurements of the total length the caudal fin is included for the same reason.

Appended is the full synonymy, both generic and specific, so far as I know it.

#### GNATHANACANTHUS.

*Gnathanacanthus*, Bleeker, Fish. Van. Diemen's Land, p. 21, 1855†. *Holoxenus*, Günther, Ann. and Mag. Nat. Hist. (4) 1876, xvii. p. 393. *Beridia*, Castelnau, Proc. Linn. Soc. N.S. Wales, 1877, ii. p. 229.

#### GNATHANACANTHUS GOETZI.

*Gnathanacanthus goetzi*, Bleek. Fish. Van. Diem. Land, p. 21, pl. —, f. 1, 1855 ; Gill, Proc. U.S. Nat. Mus. xiv. p. 701, c. fig. *Holoxenus cutaneus*, Gnth. Ann. and Mag. Nat. Hist. (4) 1876, xvii. p. 393 ; Macleay, Proc. Linn. Soc. N.S. Wales, 1880, v. p. 438, and 1884, ix. p. 19 ; Johnston, Proc. Roy. Soc. Tas. 1882, p. 114 and 1890, p. 31. *Beridia flava*, Casteln. Proc. Linn. Soc. N.S. Wales, 1878, ii. p. 229, pl. ii ; Macleay, l.c. v. p. 592. *Holoxenus güntheri*, Johnston, ll. cc ; Macleay, l.c. ix. p. 19.

#### VELVET FISH.

D. xii-xiii 9-10. A. iii 8-9.

Length of head 3 to  $3\frac{1}{10}$ , depth of body  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in the total length ; depth of head below the first dorsal spine  $1\frac{1}{5}$  to  $1\frac{1}{4}$ , width of head  $2\frac{2}{3}$  to  $2\frac{3}{4}$  in its length ; eye rather small, situated entirely within the antero-superior fourth of the head, its diameter  $4\frac{3}{8}$  to  $4\frac{5}{6}$  in the length of the head ; snout obtuse, one tenth to one fifth of a diameter longer than the eye ; interorbital space strongly convex, its width  $1\frac{2}{5}$  to  $1\frac{3}{5}$  in the diameter of the eye ; profile of head in front of the dorsal fin slightly concave ; jaws subequal, the chin a little prominent ; cleft of mouth oblique, the maxilla extending to beneath the anterior margin of the eye ; opercle with two concealed spines ; the dorsal

† I have not seen this paper.

fin commences above the eye ; the spines are rather weak, the third the longest,  $1\frac{5}{9}$  to  $1\frac{7}{10}$  in the length of the head ; the eighth and ninth are short and sometimes quite concealed beneath the loose skin§ ; the length of the last spine is  $1\frac{2}{9}$  to  $1\frac{3}{10}$  in that of the third and  $1\frac{1}{3}$  to  $1\frac{4}{9}$  in the first ray ; all the fin rays have free tips, and the third and fourth are the longest,  $1\frac{1}{4}$  to  $1\frac{1}{3}$  in the length of the head ; the anal spines are rather stronger than those of the dorsal, the last the longest,  $2\frac{1}{4}$  to  $2\frac{3}{8}$  in the length of the head and  $1\frac{1}{2}$  to  $2\frac{2}{3}$  in the longest rays ; ventral spine strong and acute,  $1\frac{2}{3}$  to 2 in the length of the longest ray ; the margin of the fin is either rounded or subacuminate owing to the prolongation of the two outer rays, and extends almost to the vent or beyond the origin of the anal ; pectoral rounded, reaching to or beyond the vertical from the first anal ray,  $1\frac{1}{10}$  to  $1\frac{1}{5}$  in the length of the head ; caudal rounded, subequal in length to the pectoral, its length  $3\frac{5}{9}$  to  $3\frac{2}{3}$  in the total length ; the least depth of the caudal peduncle is about as long as the diameter of the eye.

The specimens were in fair condition and measured respectively 270 and 280 millimeters.

Among the other fishes forwarded by Mr. Morton was a Macrurid from the estuary of the Derwent ; though closely allied to *Cælorhynchus australis* (*Ledidoleprus australis*, Richardson, Proc. Zool. Soc. Lond. 1839 ; *Macrurus australis*, Günther, Catal. Fish. iv. p. 391, and Voy. Challenger, Zool. xxii. p. 127), this example differed to such an extent that I think it better to describe it at length, naming it provisionally as below¶.

#### CÆLORHYNCHUS MORTONI, sp. nov.

D. 13, 68. A. 71. V. 7. P. 15. C. 6. Sc. 88 $\frac{4}{14}$ .

Length of head  $4\frac{1}{3}$ , depth of body  $5\frac{1}{2}$  in the total length ; eye very large, its diameter  $3\frac{1}{4}$  in the length of the head ; snout obtusely angulated, extending considerably beyond the mouth, a little longer than the eye ; interorbital region flat, its width six sevenths of the diameter of the eye ; upper surface of the snout with a median and two lateral ridges ; infraorbital ridge prominent, not reaching back as far as the angle of the preopercle, in front of which it terminates in an elongated, acute point, formed by its coalescence with an arcuate ridge which traverses the anterior border of the preopercle ; barbel subequal in length to the

§ In one specimen these two spines are not visible, but can be plainly felt.

¶ I submitted the above description to Dr. Boulenger, who, however, merely writes in answer :—“From your description I think the *Cælorhynchus* must be very closely allied to *Macrurus australis*.” Through an unfortunate accident the specimen has been lost to science.

vertical diameter of the eye ; the maxillary reaches to a little beyond the vertical from the middle of the orbit ; the band of teeth in the lower jaw is composed of three irregular series and is but a little broader in front than behind ; second ray of the first dorsal fin smooth, not extending when laid back to the origin of the second dorsal, its length equal to half of the head ; it is inserted immediately behind the base of the pectoral ; second dorsal rays very low ; anal well developed, originating a little in advance of the second dorsal, the longest rays anterior to the middle of the fin and one third of the length of the head ; ventral inserted entirely behind the base of the pectoral, its outer ray slightly produced, extending to the vent, which is situated beneath the dorsal interspace ; pectoral pointed, reaching as far back as the ventral, rather longer than the postorbital portion of the head. Scales of the body with from 18 to 23 parallel keels, each of which is composed of a series of strong, acute, compressed, overlapping spines, the last one passing beyond the free border of the scale ; scales of the head smaller and very rough, covered with radiating striæ, each of which is armed with short branched spines ; scales on the opercles, the series above the infraorbital ridge, and two rows on each side of the occiput more regularly striated. Dark brown above, light brown below ; all the darker scales with a whitish oblong spot at their base.

The example measures 520 millimeters.

Among the more pronounced points of difference between the species under consideration and *Cælorhynchus australis*\* the following characters may be specially noticed ; the figures within brackets pertain to the latter species :—The much greater size of the head, the comparative measurements being  $4\frac{1}{3}$  and (nearly 5) in the total length ; the much smaller number of rays in the second dorsal, 68 (88), and anal 71 (87-96) fins ; the much larger scales, 88 and (ca. 130) ; and the different pattern and strength of the scale armature, for while the number of keels present on each body scale in *C. mortoni* is from 18 to 23, and these are arranged in parallel series and terminate each in a strong, free spine, which conjointly form the posterior border of the scale, in *C. australis* there are only 12 to 18 rows of keels and the border of the scale is more or less scalloped in appearance.

As *Cælorhynchus australis* is more abundant on the New Zealand coast than elsewhere I must leave to the scientists of that colony the task of determining whether the differences pointed out above represent only such as are likely to be

\* *C. australis* was originally described by Sir John Richardson from an example taken at Port Arthur, Tasmania ; it is also a native of the New Zealand seas.

found in what may be termed the polar forms of a variable species (in which case intermediate forms should be easily obtainable), or whether two distinct but closely allied species have hitherto been confounded under the name *australis*.

A specimen of eel forwarded for identification belongs to the restricted genus *Ophisurus*, but is in such bad condition that the species cannot be determined. It may, however, be included provisionally in the Tasmanian catalogue as *O. serpens*.