STUDIES IN THE ICHTHYOLOGY OF QUEENSLAND.

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i.

SCORPÆNIDÆ (1).

Among the various products of our bays and estuaries, which are apt to make their presence known to the unwary in an unequivocal manner, few are more widely and invidiously known than the small fishes to which the names "Bullrout" and "Fortescue" have been given, and which have been grouped together under the common name *Centropogon* by Dr. Günther and other authors. The genus belongs to the scorpænoid division of the sub-order *Loricati*, or "mail-cheeked fishes," the name being derived from the exceptional development of the third bone of the infraorbital ring, which is in most of the genera produced backwards to the preopercular bone, and so forms an admirable protective covering to the sides of the head.

The family *Scorpænidæ* (Scorpion-Fishes) is abundantly represented throughout all temperate and tropical seas. It is provisionally divisible into three groups—*Sebastinæ*, *Apistinæ*, and *Scorpæninæ*.*

Among other peculiarities the second group is characterised by a strong spinous prolongation of the preorbital bone; this is more or less erectile at will, and can be, and indeed is

*This is not to be considered a natural division, as the whole series, outside of the obviously sebastine and scorpænine forms, requires careful revision, some of those which would here be placed among the *Apistinæ* being, like *Notesthes*, closely related to the *Sebastinæ*, others, like *Liocranium* as closely to the *Scorpæninæ*, while some may have trigloid affinities.

very readily employed as a weapon of offence. Some of the species are also credited with the possession of toxic qualities, and there can be no question as to the acuteness of the pain caused by a stab from either the Bullrout or the Fortescue, which belong to this group.

In 1860 four species were referred to his genus *Centropogon* by Günther. These four species may for convenience be tabulated as follows :—

Second anal spine longer than the third—Species, *australis*.
Second and third anal spines subequal—Species, *robustus*.
Second anal spine appreciably shorter than the third—
Species, *fuscovirens*, *leucoprosopon*.

To the first of these three sections the generic name *Centropogon* rightfully belongs, the type being *Cottus australis*, White. *Centropogon robustus*, Günther, the sole representative of the second section, is generically separable, and it is here proposed to establish a genus, *Notesthes*, for its accommodation. The third section will be dealt with further on in connection with an undescribed Queensland fish, which is perhaps allied to its representatives though widely separated from the typical *Centropogon*.

Subsequent to the publication of the second volume of the British Museum Catalogue of Fishes, four more species were added to *Centropogon*, namely :—

C. marmoratus, Günther, Ann. & Mag. Nat. Hist., (3) xi. 1863, p. 136, Moreton Bay.

C. indicus, Day, Fish. India, p. 155, pl. xxxviii. fig. 2, 1875, Madras.

C. echinatus, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1881, p. 436, Endeavour River.

C. nitens, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 459, Coast of Queensland.

According to my views only the first of these is a true *Centropogon*, while of the three remaining species no two are congeneric. To add to these complications Castelnau in 1872 confused *Centropogon australis*, White, with the fish described by Guichenot (Mem. Soc. Imp. Sc. Nat. Cherbourg, xiii. 1868, p. 89) as *Neosebastes scorpænoides*, and in the following year, when seeking to correct his mistake, made matters worse by rejecting the genus *Neosebastes* and relegating Guichenot's fish to the genus *Centropogon*, with which it has not the slightest affinity. (*v.* Proc. Zoöl. & Accl. Soc. Vict., ii.

1873, p. 40). In this he was unfortunately followed by Macleay, who, however, it is but just to say, expressed his doubt as to the propriety of the course followed by Castelnau. Here, so far as this fish is concerned, the matter might have been left for the present, but that Jordan and Evermann (Fish. N. & Mid. Amer., p. 1839) place *Neosebastes* among the synonyms of *Scorpæna*. The type of *Neosebastes* is the South Australian *Scorpæna panda*, a species which, like *N. scorpænoides*, I have never seen. Judging, however, from McCoy's fine figure and description of the latter species (Prodr. Zoöl. Vict., dec. xx, pl. 193) I am inclined to recognise Guichenot's genus, the complete lepidosis of the upper surface of the head and the absence of simple pectoral rays being inimical to its inclusion in *Scorpæna*.

Reverting to the list given above it will readily be seen that the fish described by Day as *Centropogon indicus* differs greatly from that genus as here restricted. Among the characters which separate it may be noted—the difference in the contour of the head and nape, the longer lower jaw, the absence of an enlarged outer series of teeth in the premaxillaries, the decreased number of dorsal spines, the elongation of the third anal spine beyond the second, the pauciradiate pectorals, and the obsolescence of one of the ventral rays.

As I cannot find any other genus in which this combination of characters exists I propose to separate the Indian fish from *Centropogon* under the name *Daia*, in honor of Surgeon-General Francis Day, author of the Fishes of India and other works.*

As to the species to which Macleay gave the name *Centropogon echinatus*, the author's description is of little value in assisting us to determine its affinities. We learn, however, that the lateral line is provided with filaments, and that the second anal spine is greatly enlarged, while the neglect to mention a preorbital spine suggests the absence of that character. Taken together these point to a scorpænine rather than an apistine fish, and I am inclined to believe that Macleay's species will eventually prove to belong to that group.

Finally, with regard to the remaining species, *Centropogon nitens*, the generic identification is greatly hampered by the omission on the author's part of any reference as to the extent of the dorsal lepidosis, and to the comparative length of the

Tetraroge rubripinnis (Schlegel, Faun. Japon., Poiss, p. 49, pl. xxii. fig. 2) may be a *Daia*.

anal spines. Insufficient though the description of this fine species is, two characters nevertheless are noteworthy as serving to separate it from the genus to which it has been referred, namely, the remarkable sculpture of the scales, each of which is said to be traversed by three striæ, which converge from the base towards the margin, thus directly reversing the ordinary procedure; and, secondly, the small size of the eye, which is at variance with the normal character of these fishes.

In addition to the eight species enumerated above as having been referred by various authors to *Centropogon*, Günther includes as doubtful (Catal. Fish., ii. p. 128, note) *Apistus hypselopterus*, Bleeker (Banda, i. 1851, p. 238). No species is figured under this specific name in the Atlas Ichthyologique.

With these general remarks I will now proceed to give detailed generic and specific descriptions of three of our Queensland dagger-cheeked scorpænids, together with such data as to their habits, food, etc., as I have been able to gather. I have failed to obtain any information respecting their breeding habits.

Centropogon.

Centropogon, Günther, Catal. Fish, ii. p. 128, 1860 (*australis*).

Body elliptical, compressed. Scales small, adherent, ctenoid, smooth, arranged in regular series. Lateral line complete, not extending on the caudal fin; the tubes simple, slightly bent upwards posteriorly, separated from one another by a single scale; each tube corresponding in length to about two body scales and raised conspicuously above them. Head rather large, entirely naked, without dermal appendages, its upper profile parabolic; snout short and broad, with slightly convex profile; preorbital pore inconspicuous; a series of large open pores along each side of the lower jaw inside the dentary bone, thence bending upwards along the border of the preopercle. Nape not continuous with the upper profile of the head, rising abruptly above the posterior border of the orbit, naked, as also is a cuneiform band, widest anteriorly, on each side of the spinous dorsal fin, a narrow band behind the head, and the pectoral, thoracic, and ventral areas. Mouth with rather small, slightly oblique cleft; jaws equal; premaxillaries protractile, produced in a skinny lobe which conceals the lower border of the maxillary, the upper and hinder borders of which are exposed. Upper jaw with a continuous band of villiform teeth and an

outer row of strong, well separated, curved, conical teeth; villiform teeth on the vomer and palatines; mandibular teeth similar to those of the premaxillaries, but with the enlarged series reduced to two or three on each side of the symphysis. Nostrils large, patent, well separated, tubular, the anterior with a tentacle. Eye large, anteromedian, sublateral, high; interorbital region deeply concave without tentacles. Cranial ridges moderately developed, mostly terminating in a spine; coracoid process with a short stout spine; no suprascapular spine. Preorbital with two exposed spines, the first short, stout, triangular, directed downwards; the second long, strong, acute, and dagger-shaped, reaching far beyond the maxillary, and capable of a wide lateral extension, the membranous attachment to the cheek being narrow. Preopercle with five spines, the upper much the longest and exposed; interopercles widely separated; opercle smooth, with a well developed lobe and two divergent ridges, each of which ends in a small spine; the surface smooth. Gills four, a small cleft behind the fourth; even branchiostegals; gill-rakers reduced to a few spinulose tubercles. Upper pharyngeal bones circular and separate; lower, subpyriform and contiguous; both armed with strong conical teeth. Soft dorsal and anal fins without basal scaly sheath; last ray in each divided to the base. Dorsal fin originating but little behind the eye, elevated in front, emarginate behind, with xvi (xv) 8 or 9 (10) rays, the spines of moderate strength and pungent; spinous portion of fin about thrice as long as the soft portion; interspinous membrane deeply cleft anteriorly; last ray broadly attached to the peduncle. Anal fin with iii 5 or 6 rays; spines strong, the second longer and stronger than the third; last ray nearly free. Caudal fin rounded. Pectoral fins well developed, rounded, symmetrical, undivided; each with 14 rays, the middle the longest; none of the lower rays simple. Ventral fins moderate, approximate, inserted behind the base of the pectorals, each with i 5 rays; the spine strong and rather long; second soft ray longest, the last widely attached to the wall of the abdomen. Posterior processes of premaxillaries in contact with the frontal bone; frontal bone with a pair of conspicuous ridges which are approximate mesially but are divergent in front and behind, and are separated from the tympanic ridges by a shallow transverse preoccipital groove, the anterior border of which is formed by the nearly transverse coronal ridges; no supraoccipita crest for the support of the anterior dorsal spine; suborbital

stay with a single smooth ridge. Vertebræ 11+16 = 27. (κέντρον, a spine ; πώγων, beard.)

East Coast of Australia. Two species.

As will be seen by a comparison of the generic diagnosis given by Macleay (copied for the most part from Günther) and the above definition, the former is far from satisfactory, sins of commission and omission being both plentiful and palpable. For instance, we find that according to it both the head and the body are scaly, whereas the former is wholly, the latter partly naked ; the genus, as regards this character, being intermediate between *Notesthes* and *Pentaroge*. We are also told that there is no preoccipital groove and no cleft behind the fourth gill. A very superficial examination reveals the presence of both groove and cleft, and both these characters, as also the nakedness of the head, were fully recognised by Günther in his description of *Centropogon marmoratus*, and the necessary corrections made. Günther, however, has failed to notice the conspicuously enlarged outer series of premaxillary teeth, which at a glance differentiates this genus from *Notesthes*.

That no reference whatever is made to the extensive naked area on the back and nape, although it forms an important generic character, is the more remarkable because Cuvier and Valenciennes commence their notice of the species with the following paragraph, which plainly shows the importance which they attach to the character:—"A la suite de ces apistes à longues pectorales et à rayons libres, viendra un poisson du Port Jackson, qui a pour caractère particulier la nudité de la partie antérieure et supérieure de son dos, où les écailles manquent, comme à sa tête, tandis que le reste de son corps en a de petites, âpres, sembables à peu près à celles de notre *Scorpæna porcus*." Again, in the description of the fish the following passage occurs:—"L'espace nu de son dos est circonscrit de chaque côté par une ligne qui part du haut de l'orifice branchial, et monte obliquement en se rapprochant de la dorsale jusqu' à son dernier rayon épineux." These authors also give the formula of the dorsal fin in the typical species correctly, a fact to which it is necessary to draw special attention, because Günther has given as normal a formula founded on accidental variation, and this has been copied without comment or verification by Macleay.

Centropogon australis.

Cottus australis, White, Voy. N. S. Wales, p. 266, c. fig., 1790, Port Jackson.

Apistus australis, Cuvier & Valenciennes, Hist. Nat. Poiss., iv. p. 398, 1829.

Centropogon australis, Günther, Catal. Fish., ii. p. 128, 1860, *and* Zoöl. Challenger, i, Shore Fishes p. 28, 1880; Macleay, Proc. Linn. Soc. N. S. Wales, v. 1881, p. 436; Ogilby, Catal. Fish. N. S. Wales, p. 22, 1886.

The Fortescue,* Woods, Fish. and Fisher. N. S. Wales, p. 49, 1882.

Neosebastes australis, Waite, Thetis, p. 103, pl. xxi, 1899.

Fortescue.

D. xvi 9. A. iii 5. Sc. 7/80/41. L. l 28.

Depth of body greatest below the fifth dorsal spine, where it is $2\frac{3}{4}$ to 3 in the total length; length of head $2\frac{4}{5}$ to $3\frac{1}{5}$ in the same. Snout as long as or a little shorter than the diameter of the eye, which is $2\frac{4}{5}$ to 3 in the length of the head. Nasal tentacle fan-shaped and fimbriated. Width of interorbital region $5\frac{1}{2}$ to $5\frac{3}{4}$ in the head. Maxillary extending to or a little beyond the vertical from the anterior border of the pupil, its length 3 in the head, the width of its distal extremity about one third of the diameter of the eye. Preocular, supraocular, postocular, tympanic, parietal, and nuchal spines well developed. Interorbital ridgeswell developed, smooth; temporal region with three short spinose ridges. Posterior preorbital spine extending backwards to or slightly beyond the vertical from the hinder margin of the eye, its length from the base of the anterior spine 2 to $2\frac{1}{2}$ in

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* Both Tenison Woods and Macleay have erroneously applied this name to *Pentaroge marmorata*. This is obviously wrong, that species being so rare in Port Jackson that during a residence there of fifteen years I have not seen a single local example. *Apistus marmoratus*, Cuv. & Val. (Hist. Nat. Poiss., iv. p. 416) was founded on a fish said to have been obtained by Péron at Timor. Since that time it has not been found there, nor was it known to Bleeker from any of the isiands of the Indo-Malayan Archipelago; but it, or an allied species, is commonly found on the Tasmanian and Victorian coasts. If the fact be taken into consideration that the members of the Cuvierian genus *Apistus* are, as a rule, greatly restricted in their distribution, it will at once appear to be unlikely that the same species should inhabit the warm waters of tropical Timor and the cold seas of temperate Tasmania. Perhaps two distinct species are confonnded under the one name. Péron was fortunate in his Timor collections; he got *Cnidoglanis macrocephalus* (= *megastoma*) there, but no one has found it since!

that of the head. Upper preopercular spine not so long as the second preorbital spine. Gill-rakers 4 + 9, all tubercular. Third dorsal spine the highest, conspicuously higher than the second or fourth, $1\frac{1}{5}$ to $1\frac{1}{3}$ in the length of the head, and thrice the height of the first spine: last spine higher than the penultimate; outer border of soft dorsal rounded, the highest ray about equaling the fifth spine. Anal fin originating below the fourteenth or fifteenth dorsal spine, its second spine as high as the seventh or eighth dorsal spine, half or a little more than half the length of the head, and as high as or a little lower than the soft portion of the fin, the outer border of which is subtruncate. Caudal fin with 10 branched rays, the middle pair the longest, $3\frac{3}{5}$ to $3\frac{4}{5}$ in the total length. Pectoral fin not reaching beyond the ventral,* its length thrice the width of its base and equal to the length of the head. Ventral fin rounded, $1\frac{1}{5}$ to $1\frac{1}{4}$ in the head, extending to or slightly beyond the vent, its spine as long as the second anal spine. Pale yellowish or ochraceous brown, with six irregular tranverse dark chestnut-brown or black bands; the first through the eyes; the second below the anterior dorsal spines and often reduced to an oblong blotch; the third below the sixth to ninth spines and ceasing beneath the appressed pectoral fin; the fourth below the anterior soft rays, sometimes ceasing at or near the lateral line, sometimes extending to or even upon the anal fin; both this and the preceding band may extend well on the dorsal fin, and both have a tendency to lateral expansion about the middle of the side; the fifth across the base, the sixth across the middle of the caudal fin; a dusky spot is also usually present below the eleventh to thirteenth dorsal spines; outer border of spinous dorsal usually more or less dusky; soft portion with an oblique dark median bar, which is often reduced to a spot near its anterior border; pectoral fins with or without a dark median transverse band and sometimes with narrow parallel bars also; a dark blotch absent or present at the base of the ventral fins. Examples obtained from muddy ground have the body more or less clouded so that the ground color scarcely appears, and in these the basal half of the pectorals and the ventrals are dark. (Lat. *australis*†, southern.)

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* In no case, out of scores of examples which have passed through my hands, have I found the pectoral fins to reach back to the "origin of the anal," as stated by Günther and Macleay.

†The specific name "*australis*" is frequently but erroneously used to signify "Australian"; it is almost needless to say that it does nothing of the kind, its sole meaning being neither more nor less than "southern":

Occasionally, but very rarely, one of the dorsal spines is absent, in which case an additional soft ray will almost invariably be found; while it also happens that not unfrequently the short first spine appears to be wanting, having been accidentally broken off and the scar healed over. A specimen in the collection of the Australian Museum, Sydney, has a pungent spine growing outwards and rather downwards from the base of the eighth dorsal spine, of which it is fully half the length; it protrudes well beyond the skin, and was probably caused by an injury when the fish was young.

Length to 135 millimeters. (Head and body 106, caudal fin 29.)

East coast of Australia. I have taken specimens at various points of the coast between Port Hacking to the south and Moreton Bay to the north; it frequents sandy bays in preference to muddy estuaries, and, unlike its relative, the "Bullrout," never ascends rivers into fresh water. It is very common in Port Jackson, every haul of the trawl net bringing up several; it is, therefore, not out of place to warn the inexperienced against rashly plunging the hand into the gatherings of the net from that port, since, between stingarees (*Urolophus*), numbfishes (*Hypnos*), and fortescues, he would probably receive an unpleasant reminder of the evils of curiosity. In the autumn of 1886, I had the pleasure of accompanying Mr. Tryon and the late Captain Fison, on a three days' trip down Moreton Bay, during which we did some dredging and caught several specimens, which differed in no particular from the common Port Jackson species. It appears, therefore, to be tolerably plentiful in suitable localities along our foreshore, and possibly extends its range considerably further northwards. The same may be confidently asserted as to the extension of its range in a south-easterly direction; but it has not as yet been recognised by the naturalists of Tasmania or Victoria.

"*australis*" can only, therefore, be correctly employed when the species so designated is an inhabitant of a more southerly district than any of its congeners at that time known. By this rule White was correct in so naming his fish, no *Cottus* from further south being known. (The *Cottidæ* proper, as now limited, are inhabitants of periarctic regions only). If an author intends to convey the meaning that the product which he is describing is an autochthon of the Australian Region he should employ such a word as "*australiæ*" or "*australianus*" and the like; but the vagueness, of even these terms, owing to the size of the territory comprehended, suggests the advisability of omitting their employment altogether.

Type apparently non-existent.

White's description and figure are so bad that it is impossible to state with absoute certainty that the subject of this article is the actual species of which he obtained specimens; their identity, therefore, rests solely on the negative evidence that there is no other Port Jackson fish at all resembling his species in pattern of coloration. But this is of less importance owing to the accurate description given in the "Histoire Naturelle des Poissons," the authors of which retain White's specific name for specimens collected by Quoy and Gaimard in Port Jackson, during Freycinet's voyage in the "Uranie," associating our species, however, with the Indian genus, *Apistus*, from which it may be distinguished by the absence of a free pectoral ray, etc.

The Fortescue feeds on small crustaceans, mollusks, and the like, and is useless even as food for other fishes, the painful character of the wounds inflicted by the preorbital and preopercular spines acting as a sufficient deterrent to its would-be consumer. Its small size renders it valueless as human food.

The above description is drawn up from an examination of numerous specimens collected in the Sydney district.

If a comparison be instituted between the above description of *Centropogon australis* and Günther's detailed description of *C. marmoratus*, the differences will be found to be very slight. Putting aside the rather unreliable character of coloration, they amount to the (1) lowness of the anterior dorsal spines, the third to sixth being subequal and longest, only half the length of the head and lower than the soft portion of the fin; and (2) the larger scales, which are arranged in 68 transverse series above the lateral line. Though a native of Moreton Bay this species is equally unknown to Mr. De Vis as to myself.*

I cannot close my account of this genus without a few remarks on the figure of *Neosebastes australis*, published in "Memoir iv." of the Australian Museum publications.† Waite's figures of fishes are ordinarily so accurate in every

*Since writing the above I have received through the kindness of Mr. J. R. Tosh two examples of *Centropogon* from Southport, which belong to the low-finned form. They differ, however, so much *inter se* that I think it advisable to withhold the description until such time as I can obtain a fuller series of specimens.

† "Scientific Results of the Trawling Expedition of H.M.C.S. 'Thetis', off the coast of New South Wales." Sydney, 1899.

detail, that I cannot help suspecting that the fish there figured differs specifically from the common "fortescue" of our litoral fauna. This would account for its capture in what Waite rightly regards as the "unusual depth of 16-19 fathoms."

The following are the more prominent variant characters between the specimen (from Port Jackson) now before me, and Waite's figure :—

In the typical *Centropogon australis* (White) † the body is less robust, the greatest depth in numerous examples being $2\frac{3}{4}$ in length against $2\frac{3}{5}$ in the figure ; the jaws are equal ; the nasal tentacle is larger, and fimbriated, the opercular ridges are more conspicuous and widely divergent ; the third dorsal spine is much higher, never less than $\frac{3}{4}$ of the head and thrice the height of the first spine ; the soft part of the dorsal fin has nine rays, and the last is almost wholly united by membrane to the back ; the second anal spine is much longer and stronger than the third, as high as the 7th or 8th dorsal spine, and half the length of the head ; the pectorals are rounded and symmetrical, the middle (7th and 8th) rays the longest, *not* reaching beyond the ventral and *not* surpassing the head in length ; the ventral is much larger, rounded, reaching beyond the vent, $\frac{4}{5}$ of the length of the head, its spine as long as the second anal spine.

NOTESTHES, gen. nov.

Body elliptical, compressed. Scales small, adherent, ctenoid, concentrically striated, arranged in regular series. Lateral line complete, not extending on the caudal fin ; the tubes simple and straight, forming together a continuous band, each tube corresponding in length to from two to three body scales, and raised conspicuously above them. Head large, entirely naked, without dermal appendages, its upper profile obliquely linear ; snout short and broad, with somewhat declivous profile ; preorbital pore large ; a series of similar pores along each half of the lower jaw inside the dentary bone ; a pore at the root of each preopercular spine. Nape slightly rounded, nearly continuous with the head, naked, as also is the thorax. Mouth with rather large oblique cleft ; lower jaw the longer ; premaxillaries protractile, produced in a skinny lobe, which

† White's specimens would certainly belong to the form "better known in shallow water cruising around the piles of piers and jetties" (Waite), rather than to a deeper sea form which he had no means of capturing in its natural haunts.

conceals the lower border of the rather large maxillary, the upper and hinder borders of which are exposed. Jaws with interrupted bands of villiform teeth; no outer series of enlarged teeth; villiform teeth on the vomer and palatines. Nostrils large, patent, well separated, tubular, without tentacles. Eye rather large, anterior, sublateral, high; interorbital region concave, without tentacles. Cranial ridges rather feeble, with or without a small terminal spine; coracoid process with a strong spine; no suprascapular spine. Preorbital with three spines, the tips of which are exposed; the anterior short, stout, somewhat curved, directed downwards and backwards; the posterior longer, strong, acute, and thorn-like, not nearly reaching to the end of the maxillary, and but moderately erectile, the membranous attachment to the base of the suborbital stay being wide; the median spine when present rises above the base of the last and is directed upwards. Preopercle with five spines, the upper the longest, with exposed tip; interopercles in contact; subopercle with a small spine; opercles with a well developed lobe and two divergent ridges, each of which terminates in a strong spine, the surface conspicuously carinated above the lower ridge. Gills four, a cleft behind the fourth; seven branchiostegals; gill-rakers short and stout, mostly tubercular. Upper pharyngeal bones elongate-pyriform, separate, forming a continuous patch; lower approximate, each patch split up into four distinct sections, which are as distant from one another as they are from those of the opposite side; all are armed with short stout conical teeth. Soft dorsal and anal fins with a partially scaly base, the last ray in each divided to the base. Dorsal fin originating above the upper preopercular spine, evenly rounded in front, emarginate behind, with xv 9 or 10 rays, the spines of moderate strength and pungent; spinous portion of fin more than thrice as long as the soft; interspinous membrane moderately cleft anteriorly; last ray partially attached to the peduncle. Anal fin with iii 5 rays; spines strong, the third as long as or a little longer than the second; last ray nearly free. Caudal fin rounded. Pectoral fins well developed, rounded, symmetrical, undivided; each with 12 rays, the middle the longest; none of the lower rays simple. Ventral fins moderate, approximate, inserted behind the base of the pectorals; each with i 5 rays, the spine strong and rather long; second soft ray longest, the last narrowly attached to the wall of the abdomen. Air bladder large and simple, with thick walls. Pyloric cæca in

small numbers. Stomach simple, its entire length interiorly with coarse longitudinal ridges. Intestines folded. Posterior processes of premaxillaries extending to the frontal bone; frontal bone with a pair of conspicuous ridges, which are approximate mesially but divergent in front and behind and are separated from the tympanic ridges by a wide interspace; no preoccipital groove; coronal ridges vestigial, slightly convergent forwards; no supraoccipital nor nuchal crest for the support of the anterior dorsal spine, which is deeply grooved in front; suborbital stay with several smooth, branched carinæ Vertebræ 10 + 17 = 27. (νῶτον, back; ἐσθής, clothing: in allusion to the complete lepidosis of the dorsal region).

Rivers and estuaries of Eastern Australia. Monotypic.

The genus *Notesthes* outwardly resembles *Neosebastes*, but the latter differs from it in having the entire head covered with scales, in the absence of an elongate defensive preorbital spine, in the reduced number of dorsal spines, in the large twenty-two-rayed pectoral, etc. It is, however, probable that while *Notesthes* has distinct sebastine affinities those of the *Neosebastes* incline to the scorpænine.

Notesthes robusta.

Centropogon robustus, Günther, Catal. Fish., ii. p. 128, 1860, Australian Seas; Krefft, Proc. Zoöl. Soc., 1864, p. 182; Günther, Ann. & Mag. Nat. Hist., (3) xx. 1867, p. 60 *and* Zoöl. Challenger, i, Shore Fishes p. 33, 1880; Macleay, Proc. Linn. Soc. N. S. Wales, v. 1881, p. 436 *and* viii. 1883, p. 203; Ogilby, Catal. Fish. N. S. Wales, p. 22, 1886 *and* Edib. Fish. & Crust. N. S. Wales, p. 67, 1893.

Centropogon troschelii, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 440, pl. iv. fig. 1, Port Jackson.

The Bullrout, Woods, Fish. & Fisher. N. S. Wales, pp. 48, 108, 1882.

Neosebastes robustus, Waite, Thetis, p. 102, 1899.

Bullrout.

Depth of body greatest below the third dorsal spine, where it is $2\frac{3}{5}$ to $2\frac{4}{5}$ in the total length; length of head $2\frac{1}{2}$ to $2\frac{2}{3}$ in the same. Snout as long as or a little longer than the diameter of the eye, which is $3\frac{4}{5}$ to $4\frac{1}{3}$ in the length of the head. Width of interorbital region $5\frac{4}{5}$ to 6 in the head. Maxillary extending to or not quite to the vertical from the posterior border of the pupil, its length $2\frac{1}{5}$ to $2\frac{1}{3}$ in the head, the width of its distal extremity

$1\frac{1}{3}$ to $1\frac{4}{5}$ in the diameter of the eye. Nasal, preocular, supraocular, postocular, parietal, and nuchal ridges each terminating in a spine; an exoccipital spine; interorbital ridges moderately developed, smooth; temporal region with three short spinose ridges. Posterior preorbital spine not extending beyond the vertical from the front margin of the pupil, its length from the base of the anterior spine $6\frac{1}{3}$ to $6\frac{3}{4}$ in that of the head. Upper preopercular spine as long as or longer than the last preorbital spine. Gill-rakers 4 + 12, a few near the hinge claviform, the rest tubercular. Length of soft portion of dorsal fin $3\frac{1}{5}$ to $3\frac{1}{3}$ in that of the spinous; fourth spine the highest, not much higher than the third or fifth, 2 to $2\frac{1}{3}$ in the length of the head, and $2\frac{2}{5}$ to $2\frac{2}{3}$ times the height of the first spine; last spine as high as or a little higher than the penultimate; outer border of soft dorsal rounded, the highest rays equal to or rather less than the fourth spine. Anal fin originating below the thirteenth or fourteenth dorsal spine, its third spine as high as the seventh or eighth dorsal spine, $2\frac{1}{4}$ to 3 in the length of the head, and considerably lower than the soft portion of the fin, the outer border of which is angularly rounded. Caudal fin with 10 branched rays, the middle pair the longest, $3\frac{2}{3}$ to 4 in the total length. Pectoral fin not reaching to the vent, its length thrice or a little more than thrice the width of its base, and $1\frac{1}{5}$ to $1\frac{1}{4}$ in the length of the head. Ventral fin pointed, a little shorter than the pectoral, extending to or nearly to the anal, its spine as long as the third anal spine. Pyloric cœca 4. Brown, irregularly marbled with black, which sometimes takes the form of broad transverse bands, and frequently with bright yellow spots and blotches; a chestnut spot often present on the occiput; fins mottled with blue-gray or yellow and black; a large black blotch usually present in front of the middle of the spinous dorsal. (*robusta*, stout.)

Length to 280 millimeters. (Head and body 222, caudal fin 58.)

East coast of Australia. Its presence has been recorded throughout the district lying between Shoalhaven to the south and the Mary River to the north, but as it is everywhere common within those limits a more perfect acquaintance with our estuarine fauna will probably extend its range considerably. It has not, however, been included in either the Victorian or the Tasmanian lists.

Type in the South Kensington Museum.

The Bullrout is essentially a brack- and fresh-water fish, never voluntarily visiting the open sea, though occasional examples may be caught near the mouths of the larger rivers, having been carried out by floods, as in the case of the specimen trawled in Shoalhaven Bight by the "Thetis." It is common in brackish creeks and lagunes, living at the bottom among weeds and mud, and readily taking any bait of a suitable size, such as a shrimp or small worm. It is also plentiful in most if not all of our eastern rivers, far up towards their sources having successfully ascended rapids and surmounted other obstacles in their passage. I have not, however, succeeded in obtaining any proof of its breeding under such conditions. The young, of less than an inch long, are frequently swept ashore among the debris of a seine, and are beautiful little objects; indeed I do not agree with Woods in his remark that "like all the scorpion fish it is very ugly"; many species of *Sebastes*, *Scorpæna*, etc., are strikingly handsome fishes with beautifully blended colors, while a freshly caught Bullrout, from fairly clean ground and clear water, with its black and gold marmoration contrasting strongly with the deep rich brown of the ground color, is as pretty a fish as one is likely to get in a day's angling. The flesh is excellent.

With regard to the pain caused by a stab from the cephalic spines of this and the preceding fish, I see no reason to change my previously expressed opinion on the subject.* The account given by Woods, and which has unfortunately been reprinted in a recent number of a Brisbane newspaper,† is very highly colored.

Nor do Waite's remarks help matters much. The canaliculation of the spines is no proof of poisonous properties in their possessor, and is common to many fishes which are above reproach; so also as to the mucosity. Therefore, I submit that "the truth" of their "possessing poisonous properties" is not "apparent," whatever appearance of truth there may be in Mr. Waite's assertion. Only a few days ago I received a brace of cuts, right and left, from the mandibular teeth of a wretched little sabre-toothed blenny (*Aspidontus*, sp.), which caused me more pain and subsequent annoyance than any wound from a *Centropogon* or a *Trachinus* ever did; and yet I do not remember having read or heard that these fishes were toxophorous; and far be it from me to make the accusation.

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* Edib. Fish. N. S. Wales, p. 68.

† "Queensland Sportsman," January 30, 1903.

The origin of the name, "Bullrout," is unknown, but I do not think it likely to be a corruption of a native word (as suggested by Mr. Woods); more probably it is connected with the noise it makes when hooked, and which might have been bestowed upon it by the early settlers from a fancied resemblance to the distant bellowing of a bull.

If we turn back now to the primary divisions (see p. 8) into which I separated the species referred to *Centropogon* in Günther's Catalogue, we shall find that two species—*C. fuscovirens* and *C. leucoprosopon*—were associated together in my third section. The former species is known to me from the descriptions given by Cuvier and Valencienes and by Günther, the latter only by Günther's description; both species are, however, figured in the Atlas Ichthyologique.* Both are natives of Amboina from whence they were originally described, the one by Cuvier, the other by Bleeker, who placed them in the heterogeneous assemblage of species which were associated under the name *Apistus*. But in a revision of the family published in 1876, the latter author founded for them the genus *Paracentropogon* (Versl. Ak. Amst., (2) ix: p. 297), † taking for his type *Apistus longispinis*, Cuv. and Val., with which he had meanwhile identified *A. fuscovirens*.‡ The synonymy of the species, in the absence of necessary works of reference is somewhat puzzling, but is probably not very different from the following:

PARACENTROPOGON LONGISPINIS.

? *Scorpæna spinosa*, Gmelin.

Apistus longispinis, Cuvier & Valenciennes, Hist. Nat. Poiss., iv. p. 408, 1829, Amboina; Quoy & Gaimard, Voy. Astrolabe, p. 694, Poiss. pl. xi. fig. 4, 1833.

Apistus fuscovirens, Cuvier & Valenciennes, l.c., p. 409, Amboina; Quoy & Gaimard, l.c., p. 695, pl. xi. fig. 5; Bleeker, Amboina & Ceram, p. 269, 1852.

Apistes multicolor, Richardson, Voy. Samarang, Fish. p. 3, pl. iv. figs. 3 & 4, 1848.

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* No letterpress was issued with the plates of the *Scorpænidæ*, and it is quite possible, therefore, that I may not be correct in some of the deductions which I have drawn.

† No copy of this work exists in Australia.

‡ My only grounds for this belief are that *Apistus fuscovirens* is not figured in the Atlas, and that both it and *A. longispinis* have a similar dorsal ornamentation, and that the latter and *A. leucoprosopos* have been united in the one genus.

Centropogon fuscovirens, Günther, Catal. Fish., ii. p. 130, 1860.
Tetraroge longispinis, Günther, l.c., p. 134.
Paracentropogon longispinis, Bleeker, Atl. Ichth., ix, pl. ccccxii. fig. 4, 1877.

PARACENTROPOGON LEUCOPROSOPON.

Apistus leucoprosopos, Bleeker, Act. Soc. Sc. Ind. Neerl., i.p. 35, Amboina.
Centropogon leucoprosopon, Günther, Catal. Fish., ii. p. 130, 1860.
Paracentropogon leucoprosopon, Bleeker, Atlas Ichth., ix, pl. ccccxiii. fig. 2, 1877.

A third species of *Paracentropogon* was described by Dr. Gunther and will stand as follows :—

PARACENTROPOGON NUDUS.

Tetraroge longispinis, var. *nuda*, Gunther, Zoöl. Challenger, i, Shore Fishes p. 66, 1880.

It was necessary for me to refer at some length to my knowledge of these species, because the Queensland fish of which I give a detailed description below has some outward resemblance to Bleeker's figure, but as neither Cuvier and Valenciennes, Bleeker, nor Gunther refer to the presence of simple pectoral rays and the reduced number of ventral rays they cannot be congeneric with our Queensland fish.

LIOCRANIUM, gen. nov.

Body ovate, strongly compressed, the back elevated in front. Scales minute, adherent, cycloid, smooth, arranged in regular series. Lateral line complete, not extending on the caudal fin ; the tubes simple, bent upwards posteriorly, forming together a continuous band, each tube corresponding in length to from three to five body scales and raised but slightly above them. Head large, entirely naked, without dermal appendages, its profile declivous and concave in front, parabolic above ; snout short and broad, with convex profile ; preorbital pore inconspicuous ; a large open pore below the chin, behind which a series of similar but smaller pores extends backwards along each half of the lower jaw inside the dentary bone, thence bending upwards along the border of the preopercle. Nape arched, continuous with the upper profile of the head, naked, as also is the dorsal area above the opercles, a narrow band along

the base of the dorsal fin, another behind the head, and the pectoral and pelvic areas; thoracic region entirely covered with scales, which are rather smaller than those of the body. Mouth with rather large, oblique cleft; lower jaw a little the longer; premaxillaries protractile, produced in a skinny lobe, which conceals the lower border of the maxillaries, the upper and hinder borders of which are exposed. Jaws with interrupted bands of minute, conical teeth; similar teeth on the vomer; palatine bones edentulous. Nostrils large, patent, well separated, feebly tubular, without tentacles. Eye very large, anterior, sublateral; interorbital region without tentacles. Cranial ridges feeble, smooth; coracoid process and suprascapular bone without spines. Preorbital with two spines, which are concealed in life beneath a thick loose skin; the anterior of moderate length, strong, directed downwards and backwards; the posterior longer, strong, acute, and thorn-like, not reaching to the end of the maxillary, and but moderately erectile, having a wide membranous attachment to the suborbital stay. Preopercle with three to five points, the upper of which is produced to form a stout sharp spine, the others being reduced to blunt tubercles; interopercles in contact; subopercle with a spinate point; opercle with a large triangular lobe, and two smooth, feeble, divergent ridges, which do not end in spines; the surface smooth. Gills four; no cleft behind the fourth; six branchiostegals; gill-rakers short and stout, with densely spinulose tips. Upper pharyngeal bones oval and remote; lower subpyriform and contiguous; both armed with short, stout, crowded, conical teeth. Soft dorsal and anal fins without basal scaly sheath; last ray in each divided to the base. Dorsal fin originating above anterior border of eye, evenly rounded in front, slightly emarginate behind, with xiii 7 rays, the spines flexible but acute; spinous portion of fin more than thrice as long as the soft portion; interspinous membrane moderately cleft throughout; last ray partially attached to the peduncle. Anal fin with iii 5 rays; spines moderate, the third much longer than the second; last ray almost wholly attached to the peduncle. Caudal fin large, slightly rounded. Pectoral fins large, cuneate, symmetrical, undivided; each with 14 rays, the middle the longest; some of the lower rays simple. Ventral fins small, approximate, inserted behind the base of the pectorals, each with i 4 rays; the spine moderately strong and elongate; first soft ray longest, last widely attached to the wall of the abdomen. Air-bladder large, strong, and simple. Intestines

folded. Stomach simple, its posterior half with coarse, gizzard-like longitudinal ridges within. Posterior processes of premaxillaries not extending to the frontal bone; frontal bone with a pair of conspicuous ridges which are divergent in front, mesially united by a bony bridge, and abruptly bent outwards so as to form a deep loop with the tympanic ridge; coronal ridges well developed, continuous with the interfrontal bridge, and united posteriorly to form a strong median crest for the first dorsal spine, which is deeply grooved anteriorly; suborbital stay with two smooth parallel ridges, which are branched posteriorly. Vertebræ 8 + 16 = 24. (λεῖος, smooth; κρανίον, skull).

Coast of Queensland. Monotypic.

In the obsolescence of the first soft ray of the ventral fins this genus agrees with *Daia*.

LIOCRANIUM PRÆPOSITUM, sp. nov.

D. xiii 7. A. iii 5.

Depth of body greatest below the fourth dorsal spine, where it is $2\frac{1}{3}$ to $2\frac{1}{2}$ in the total length; length of head $2\frac{1}{2}$ to $2\frac{3}{5}$ in the same. Length of snout $1\frac{1}{3}$ to $1\frac{2}{5}$ in the diameter of the eye, which is $2\frac{3}{4}$ to $2\frac{7}{8}$ in the length of the head. Width of interorbital region $5\frac{4}{5}$ to 6 in the head. Maxillary extending to the vertical from the posterior border of the orbit, its length about 2 in the head, the width of its distal extremity about half the diameter of the eye. Posterior preopercular spine extending backwards to or a little beyond the vertical from the hinder margin of the pupil, its length from the base of the anterior spine $4\frac{3}{5}$ to 5 in that of the head. Upper preopercular spine not quite so long as the second preorbital spine. Gill-rakers 3 + 9, a few near the hinge claviform, the rest tubercular. Length of soft portion of dorsal fin $3\frac{1}{3}$ to $3\frac{1}{2}$ in that of the spinous, the outer border of which is sinuous; third spine the highest, twice as high as the first and conspicuously higher than the second, $1\frac{3}{4}$ in the length of the head; behind the third the spines decrease in height to the sixth or seventh, and then rise to the last, which is but little less than the third and inappreciably more than those immediately preceding it,*

*The tips of the spines are very fragile and easily broken off, but from a comparison of three specimens the above appears to be the normal sequence in height. In all the fourth spine is apparently lower than the third or fifth, but this may not be the case with perfect examples.

soft dorsal rays as high as the spinous; outer border angularly rounded; last ray almost wholly attached to the peduncle. Anal fin originating below the twelfth dorsal spine; the spines evenly graduated, the second intermediate in height between the first and the third, which is $1\frac{3}{5}$ to $1\frac{3}{4}$ times the height of the first, and subequal to the highest dorsal spine and to the rays. Caudal fin with 10 branched rays, the middle pair the longest, 3 to $3\frac{1}{5}$ in the total length. Pectoral fin extending backwards to the vertical from the anterior third of the anal, the upper and eight lower rays simple; the lowest branched ray subequal to the adjoining simple ray, its length thrice or more than thrice the width of its base and a little more than the length of the head. Ventral fin pointed, $1\frac{2}{5}$ in the head, extending to the origin of the anal; its spine stronger and longer than or as long as the third anal spine. Pale reddish brown, the head, thorax, and abdomen lighter with a yellowish tinge; a dusky band below the second and third dorsal spines, passing downwards through the eye, where it forks, the anterior moiety extending to the base of the preorbital spine, the posterior to that of the upper preopercular spine; a broad black band from the sixth and seventh spines to the middle of the appressed pectoral fin; an oval, or oblong black spot below and upon the basal half of the last two spinous and first two soft rays, not reaching to the lateral line; behind this spot, and occasionally in contact with it is a much less conspicuous spot, which crosses the lateral line, but does not reach to the dorsal fin. Dorsal, caudal, anal, and pectoral fins with numerous small brown spots or dark edged ocelli; ventral fins uniform gray. (*præpositus*, an officer: in allusion to the black shoulder bands).

Length to 120 millimeters. (Head and body 90, caudal fin 30). Coast of Queensland.

Type in the Queensland Museum, Brisbane.

Note:—In the "Records of the Australian Museum" (vol. iv., pp. 181-184, 1902) Waite describes as *Hypoplectrodes armatus* and gives an outline drawing of a fish which he identifies with *Serranus armatus*, Castelnau. He has, however, somehow neglected to notice that it is the same fish that I had previously described (Proc. Linn. Soc. N.S. Wales, xxiv. 1899, p. 169 et seq.) as *Epinephelides leai*. The characters which he notices as separating his fish from *Gilbertia* and *Hypoplectrodes*, and which induced him to propose the subgenus

Gilbertella,* are alluded to in almost precisely the same words as those in which I pointed them out; as there can be no question as to the identity of the two fishes, my description having been taken from an immature, his from an adult example, the name *Gilbertella* is fortunately unnecessary. Whether it is Castelnau's *Serranus armatus* or not, it is impossible to decide, unless the type be in existence; if this be not the case, his description is so bad that the name should be ignored.

* My friend Mr. Waite appears to have become inoculated with some of the prevailing topsyturvydom of Australian nomenclature, since he proposes the diminutive appellation for the larger fish.