Observations on Some Tasmanian Fishes

Part III

By

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(Read 30th September, 1935)

The present paper, the precise scope of which is summarized in the concluding paragraph, follows the general plan of previous communications under the same title (1934, 1935).

Registration numbers are those of the Queen Victoria Museum, Launceston.

Family HAPLOCHITONIDAE

Genus **Lovettia** McCulloch, 1915

Lovettia sealii (Johnston)

Haplochiton sealii Johnston, *Pap. Roy. Soc. Tasm.* 1882 (1883). p. 128.
Lovettia sealii McCulloch, *Proc. Linn. Soc. N.S.W.* xl. 2. 1915. p. 259. pl. XXXV. fig. 2.

Whitebait-Constituent. Johnston has noted the appearance of this species in large shoals in the Derwent, near New Norfolk, in October and November, the females then being full of mature ova.

In two samples of 'whitebait', each containing 200 individuals, purchased in Launceston fish-shops, the first sample, consisting of material from the Tamar River, on 17th September, 1934, the second, consisting of material from the Mersey River, near Latrobe, on 14th September, 1935, this species was found in each case to be easily the dominant constituent. First sample: 192 *L. sealii* (total length 41·5-56 mm.); 7 *Galaxias attenuatus* (44-52 mm.); 1 *Galaxias sp.*, probably *G. truttaceus* (58 mm.). Second sample: 172 *L. sealii* (55-65 mm.); 23 *Galaxias attenuatus* (38·5-52 mm.); 5 *Galaxias sp.*, probably *G. truttaceus* (49-65 mm.). As an indication of its abundance, it may be noted that whitebait is sold in Launceston at the rate of between two hundred and three hundred fish for a penny.

The results of these analyses are rather surprising, as it is generally believed, in view of the statements of Johnston (1883, p. 62) on the subject, that the Tasmanian 'whitebait' consists essentially

of *Retropinna tasmanica* McCulloch, accompanied in varying numbers by *Galaxias attenuatus* (Jenyns) and *Atherina spp.* It is evident that either the composition of the shoals is subject to remarkable variation, or else, more probably, at least two distinct migrations are being confused.

An examination of numerous examples confirms the statement by McCulloch (1915, p. 260) that the maxillary extends only to the level of the anterior fourth or third, and not, as described by Johnston, to below the middle, of the eye.

Family ECHELIDAE

Genus **Muraenichthys** Bleeker, 1865

Muraenichthys australis Macleay

Muraenichthys australis Macleay, *Proc. Linn. Soc. N.S.W.* VI. 2. 1881. p. 272.
Scolenchelys australis Ogilby, *Proc. Linn. Soc. N.S.W.* XXII. 2. 1897. p. 246.

Record. A specimen from Northern Tasmania in the Museum collection (Reg. No. FR 947) appears clearly to be referable to this species. The origin of the dorsal is shortly behind that of the anal, as noted by McCulloch (1911, p. 20) in his re-examination of the holotype in the Macleay Museum, and not over the vent, as stated in Macleay's original description.

Proportions. The principal proportions of the specimen are recorded for comparison with those of the holotype as given by McCulloch. Depth of body behind gill opening (5·8 mm.) 3·9, behind vent (5·5) 4·1, in head (22·5). Head 12·1 in total length (272), 4·1 in trunk (91·5). Eye (1·2) 3·5 in snout (4·25), which is 5·0 in head. Mouth-cleft (8) 2·6 in head. Length to vent (114) 1·39 in tail (158). Length to origin of anal (116) 1·01 in length to origin of dorsal (117).

Remarks. First record for Tasmania. The species has previously been recorded only from New South Wales.

Genus **Ophiclinus** Castelnau, 1872

Ophiclinus greeni, sp. nov.

(Text-fig. 1)

D. xlix, 1 [xlix, 1]. A. iii, 31 [iii, 31-32]. P. 11 (left fin), 12 (right fin) [11-12]. V. 2 [2]. C. 13 + $\frac{1}{1}$ [13 + $\frac{1}{1}$].

Depth 7·6 [7·1-8·2] in total length, 6·9 [6·4-7·5] in standard length; depth at level of first anal ray 7·8 [7·7-8·9] in total length, 7·1 [6·9-8·1] in standard length. Head 5·7 [4·9-5·4] in total length, 5·2 [4·4-5·0] in standard length. Eye 5·5 [5·3-6·1] in head, 1·5 [1·2-1·4] in snout, 1·2 [1·1] times interocular distance. Head and trunk 1·2 [1·1-1·2] in tail without caudal fin.

Body elongate, compressed, covered with small non-imbricating scales, somewhat more closely set posteriorly (not shown in figure). Head subconical; naked, as also is nape. Eye moderate, not cutting superior profile; interorbital space convex. Lower jaw projecting slightly beyond upper; maxillary extending to [or slightly beyond] level of middle of eye. Anterior nostril tubular, higher than wide, surmounted posteriorly by a short blunt tentacle; inserted at about the position of two (or ten) o'clock relative to the eye, rather nearer upper lip than orbit; its distance from its fellow 1·8 [2·0] in length of snout. Posterior nostril a simple opening close to orbit, at about the position of one o'clock.

Lateral teeth in upper jaw small, uniserial or biserial, the row or rows widening anteriorly to form a very broad patch, among which are larger teeth. Mandibulary teeth in a fairly broad band anteriorly, becoming uniserial laterally. Vomerine teeth acute, fairly large, in a uniserial or biserial proconvex arc.

Fairly large pores on dorsal surface of snout, between eyes, encircling eye, fringing preoperculum, on mandible, on superolateral and dorsal surfaces of postorbital portion of head. Lateral line short, comprising about 15 pores; very slightly arched, its origin and termination at about the same horizontal level; originating just above base of opercular flap, at level of 2nd dorsal spine; terminating at about level of 10th dorsal spine.

Dorsal fin originating about midway between levels of preopercular and opercular margins; length to its origin 1·1 [1·1] in head; joined to proximal third of caudal; 1st spine 5·2 [5·7-6·0], 25th spine 3·1 [3·6-3·9], the single ray 2·8 [3·0-3·4], in head. Anal fin originating below 20th [19th-20th] dorsal spine; length to its origin 2·2 [2·1-2·2] in standard length; joined to proximal third of caudal; 2nd spine 6·0 [7·2-7·7], 16th ray 2·9 [3·0-3·7], in head. Pectoral fin rounded; all rays simple; extending 0·5 [0·4-0·5] of distance between its origin and vent; longest (6th) [6th-7th] ray 1·7 [1·7-1·9] in head. Pelvic fins contiguous basally; length to their origin 1·2 [1·2-1·3] in head; longer (inner and hinder) ray 1·4 [1·6-1·8] in head. Caudal fin truncate, feebly rounded; all rays simple; 1·9 [2·0-2·1] in head, 9·8 [8·8-10·6] in standard length.

General colour dark brown, approaching black, above, greyish brown, or pale brown, below. On the body the essential features of the colour-pattern are: first, a broad dark region bounded inferiorly by a line running from a little below the upper angle of the operculum to near the middle of the caudal base; secondly, below this, a slighter broader region, which, in advance of the vent, is much lighter in colour than, and very sharply delimited from, the first region, but which, behind the vent, progressively darkens, and ultimately becomes more or less assimilated with the upper region, there always being left, however, several small islands of light ground colour between the partial fusion of the two regions posteriorly. The

intensity and extent of the darkish region above the anal base vary considerably. In the larger paratype a narrow yellowish streak immediately underlies the dark upper region of the sides, and the distal islands are a discrete backward extension of this, rather than of the brownish of the general lower region: a similar state of affairs obtains, in a much less marked degree, in the holotype. In the anterior half or third of its length the dorsal base is narrowly bordered on each side with yellowish; further back there appear a few discontinuous indications of the extension caudad of this stripe. A longitudinal band, either wholly blackish or dark brown margined with blackish, runs from tip of snout, just embracing eye, to operculum, where its inferior margin becomes confluent, without change of direction, with the lower border of dark region of sides of body, and its superior margin rises to join the upper border of the same region where it bounds the yellowish streak at base of dorsal. Anteriorly this band embraces the upper third of both upper and lower lips, which, being elsewhere greenish, immaculate, are thus

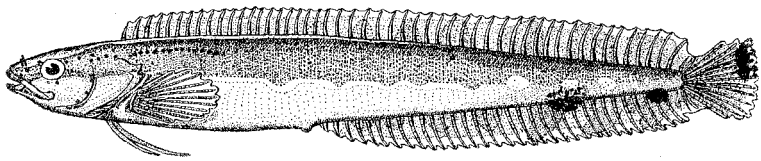

Fig. 1.—*Ophiclinus greeni*, sp. nov. Holotype. Low Head, Tasmania. Total length 44·6 mm. [The small non-imbricate scales are not shown.]

conspicuously bicolor. Dorsal surface of head brownish; ventral and lateral aspects concolorous with corresponding light-coloured aspects of body, and, like them, minutely punctulate with brownish. Dorsal fin brownish, with narrow distal band of white; the dark brown of the sides continued up on to the fin in a variable number of blotches, most extensive, most closely set, and darkest posteriorly. Anal fin similar to dorsal, but with rather wider white border. Pectoral fin white. Pelvic fin greyish; in one paratype pale pinkish brown.

Life-colours, as noted by collector. ' Dorsal fin light with dark continuations of body-colour. Lower portion [of body] light pinkish colour. Pectoral fins tipped with pink.'

Total length 44·6 mm. [34·3-49·8 mm.]; standard length 40·5 mm. [31·9-45·5 mm.].

Specific name in honour of Mr. G. R. F. Green, collector of the specimens described, whose interest in rock-pool fauna has enriched the Museum collections with much interesting ichthyological and invertebrate material.

Types. Described and figured from the holotype (Text-fig. 1) and from two paratypes, the numerical characters of the latter being

recorded throughout in square brackets. Holotype in the Queen Victoria Museum, Launceston (Reg. No. HT 805). Paratypes will be offered to the British Museum (Natural History), London, and Australian Institute of Anatomy, Canberra.

Locality. Lady Lucy Beach, Low Head, Northern Tasmania; 17th January, 1934, and 3rd June, 1934.

Affinities. *Ophiclinus greeni* belongs to the group of species (*O. gracilis* Waite, and *O. gabrieli* Waite) comprised under the heading 'Vomerine teeth pointed, forming an angular row or series' in the key by McCulloch and Waite (1918, p. 55). It may readily be distinguished from *O. microchirus* (Herzenstein) and *O. homocanthus* (Herzenstein), which are not noted in the key by McCulloch and Waite, and for copies of the descriptions of which I am indebted to the courtesy of Mr. G. P. Whitley, Ichthyologist, Australian Museum, Sydney, by its decidedly fewer dorsal and anal rays (*O. microchirus* has D. 90, A. 56; *O. homocanthus*, D. 56-60, A. 40-42).

It finds its nearest ally in *O. gracilis* Waite, which in general appearance and coloration it very closely approaches, and from which it is chiefly distinguished by the following characters: consistently greater number of dorsal spines and anal rays; rather fewer pectoral rays; origin of anal below about 20th, instead of 17th, dorsal spine; lateral line nearly straight, not, or scarcely, continued obliquely downwards posteriorly. From *O. gabrieli* Waite, which it approaches in the formulae of the vertical fins, and in the course of the lateral line, it is readily separable by the more anterior origin, and greater evenness of height anteriorly, of the dorsal fin; larger pectoral; less rounded caudal; coloration. In the legend to Waite's plate (1906, pl. XXXVI) accompanying the original descriptions of *O. gracilis* and *O. gabrieli* the names of the two species are transposed.

Remarks. First record of the family Ophiclinidae from Tasmania.

Family OPHIDIIDAE

Genus **Genypterus** Philippi, 1857

Genypterus blacodes (Bloch and Schneider)

Ophidium blacodes Bloch and Schneider, *Syst. Ichth.* 1801. p. 484.
Genypterus blacodes McCulloch, *Aust. Mus. Mem.* V. III. 1929. p. 357 (references and synonymy).

Variation. A specimen, 402 mm. in total length, caught near George Town, on or about 20th March, 1934 (Reg. No. 832), exhibits an interesting, and (at least in Tasmanian examples) apparently rare, variation in colour-pattern. Instead of being whitish, immaculate, the preanal ventral region is somewhat bluish green, faintly tinged with pale brown, and is conspicuously mottled with the dark vandyck brown of the ordinary lateral blotches. The mottlings, of which there are about 150, are longest longitudinally: they vary in

form from elliptical to linear, and in size from about 2 mm. to about 15 mm. The chin, which is normally white, and immaculate, save that a small patch of punctulations is often present at about the level of the hinder end of the maxillary, is here minutely but thickly dotted throughout with brown. The specimen exhibits no deviation from the normal in structure or proportions.

Distribution. This appears to be the common species of Northern Tasmania, practically all the locally obtained ling retailed in Launceston fish-shops being this form. On the other hand, supplies received in Launceston from Strahan consist almost exclusively of *Genypterus microstomus* Regan.

Family GOBIESOCIDAE

Remarks. In spite of its small size, the Australian group of Gobiesocidae has been dogged by confusion, which has followed it not only along the seemingly inescapable highway of nomenclatural misapprehension, but also even into the byways of trivial error in orthography and the notation of illustrations. Whitley (1931) has recently defined more clearly the relationships of several species, both to one another, and to extralimital forms. The whole group, however, appears to be in need of anatomical and osteological revision: accordingly, in the arbitrary key given below generic affinities as customarily recognised are expressly disregarded, and emphasis is placed on characters that, though of minor taxonomic significance, afford practical criteria for ready determination.

Reduced to the simplest terms by the omission of purely formal and derivative references, the histories of the six Australian members of the family, considered in historical sequence, are as follow:

(*a*) *Aspasmogaster tasmaniensis* (Günther). Original description (1861, p. 507), as logotype of *Crepidogaster*, based on a single individual, 26 lines in total length, presented to the British Museum by Ronald Gunn; not figured. McCulloch (1922, p. 122) notes a record by Kner (1867, p. 277) from Sydney, but regards it as an error, and in the Check-List (1929, p. 359) gives New South Wales as a queried locality. Waite, who had already (1906, p. 201) discussed, under the generic name *Crepidogaster*, the species next to be mentioned, later (1907, p. 315) called attention to the fact that *Crepidogaster* Günther, 1861, was preoccupied by *Crepidogaster* Boheman, 1848 (Coleoptera), and put forward the *nom nov.*, *Aspasmogaster*—afterwards, *fide* McCulloch (1929, p. 359), spelt *Aspasmagaster* by Jordon in *Genera of Fishes*. Included by Waite (1923) in his last South Australian catalogue. The species, which is not the subject of recent description in literature available to me, is redescribed and figured below.

(*b*) *Aspasmogaster spatula* (Günther). Original description (1861, p. 508) based on a single specimen, 21 lines in total length, from Gages Road, Swan River, Western Australia; not figured. Described in detail (p. 201), and figured by Waite (1906), who gives Victorian records. Waite's text correctly refers to his pl. XXXVI, fig. 4, but the legend to the plate gives fig. 2 as *A. spatula*, fig. 2 actually being *V. cardinalis*. Generic history as in (*a*).

(*c*) *Volgiolus cardinalis* (Ramsay). Günther (1861, p. 506) established *Diplocrepis*, with *Lepadogaster puniceus* Richardson, from New Zealand, as haplotype, and Ramsay's Gobiesocid from near George Town, Tasmania, originally described (1882, p. 148) as *Gobiesox cardinalis*, has been referred to Günther's genus by Waite and Australian authors generally. Detailed description (p. 204) and figure (pl. XXXVI, fig. 2) by Waite (1906), based on three specimens from near Launceston, and three from Ulverstone, forwarded from this Museum in 1903. Waite's text cites pl. XXXVI, fig. 1, but fig. 1 is a Symbranchid; the legend to the plate, on the other hand, gives *V. cardinalis* as fig. 4, but actually fig. 4 is *A. spatula*, the figure of *V. cardinalis* being that numbered 2 on the plate. Included in synopsis of species of *Diplocrepis* by Waite (1906, p. 205). Whitley (1931, p. 325) considers that the Australian species hitherto relegated to *Diplocrepis* are not congeneric with *Lepadogaster puniceus* Richardson, and has proposed *Parvicrepis* for *D. parvipinnis* Waite, with *Volgiolus* as a subgenus having as orthotype *D. costatus* Ogilby, and apparently including also *G. cardinalis* Ramsay. More recently (1935, p. 292), in giving illustrations of the adhesive apparatus, he elevates the two species last mentioned to separate generic status as *Volgiolus costatus* and *V. cardinalis*, respectively. Life-colours of present species, apparently hitherto unrecorded, described below.

(*d*) *Volgiolus costatus* (Ogilby). The first reference to the species (1885, p. iii) is a *nom. nud.*, the description (1885, p. 270) being made available some five weeks later; not figured. Type-locality: Shark Reef, Port Jackson, N.S.W. Since recorded, *fide* McCulloch (1929, p. 360), from South Australia, Victoria, Lord Howe Island, New Caledonia. Figure (fish) by Waite (1904, pl. XXIV, fig. 1); inclusion in synopsis of species of *Diplocrepis* by Waite (1906, p. 205); variation in radial formulae by McCulloch and Waite (1918, p. 66); generic history as in (*c*); figure (ventral aspect of head and trunk) by Whitley (1935, p. 292).

(*e*) *Parvicrepis parvipinnis* (Waite). Original description (1906, p. 202), with figure (pl. XXXVI, fig. 3), and inclusion in synopsis of species of *Diplocrepis* (p. 205); New South Wales. For generic history, see (*c*).

(*f*) *Lepadichthys frenatus* Waite. Originally described (1904, p. 180) and figured (pl. XXIV, fig. 2) from two specimens from Lord Howe Island; since recorded also from Queensland.

KEY TO THE AUSTRALIAN GOBIESOCIDAE.

A. Dorsal fin not connected by membrane with base of caudal fin

B. Horizontal distance between termination of dorsal and base of median caudal rays much greater than (nearly twice) total base of dorsal .... *Parvicrepis parvipinnis*

BB. Horizontal distance between termination of dorsal and base of median caudal rays much less than (about one-third of) total base of dorsal:

C. Vent much nearer to anal fin than to adhesive apparatus. Anal origin slightly behind dorsal origin .... *Volgiolus costatus*

CC. Vent rather nearer to adhesive apparatus than to anal fin. Anal origin about below middle of dorsal base .... *Volgiolus cardinalis*

BBB. Horizontal distance between termination of dorsal and base of median caudal rays rather less than (about two-thirds of) total base of dorsal .... *Aspasmogaster spatula*

AA. Dorsal fin connected by membrane with base of caudal fin

D. Dorsal with about 16 rays; its base about equal to length of head. Anal joined by membrane to caudal .... *Lepadichthys frenatus*

DD. Dorsal with 8-10 rays; its base about half length of head. Anal not joined by membranes to caudal .... *Aspasmogaster tasmaniensis*

Genus **Aspasmogaster** Waite, 1907

Aspasmogaster tasmaniensis (Günther)

(Text-fig. 2)

Crepidogaster tasmaniensis Günther, *Cat. Fish. Brit. Mus.* III. 1861, p. 507.
Aspasmogaster tasmaniensis Waite, *Rec. Aust. Mus.* VI. 4. 1907. p. 315.

B. 5. D. 8-10. A. 7-9. V. I, 4. P. 23-24. C. 12 $+\frac{c.\ 2\ -\ 3}{c.\ 3\ -\ 4}$.

Length of head 2·9-3·1, width of head 4·1-4·4, depth of body 6·2-8·4, width of body 5·6-6·5, in total length. Snout 3·3-4·1 in head, 10·0-12·0 in total length. Eye 4·1-5·1 in head, 1·1-1·3 in interorbital width.

Body subcylindrical anteriorly, somewhat compressed posteriorly. Head much depressed; moderately broad; its width subequal to distance from anterior margin of eye to origin of pectoral. Snout narrow, beak-like, greatly depressed, its tip (excluding upper lip) about on a horizontal level with inferior margin of pupil, its dorsal surface concave. Nearly half the dorsal profile in advance of eye formed by the large, completely reflexed upper lip. Upper jaw projecting beyond lower. Lower lips meeting at symphysis, immediately behind which they are markedly inflated inwardly and downwardly. Mouth extending to below anterior $\frac{1}{3}$ or $\frac{1}{2}$ of eye. Teeth in upper

jaw small, villiform; in a large patch of 5 or 6 rows in front, in one or two series behind. Teeth in lower jaw similarly disposed, but rather larger, especially laterally. Anterior nostril tubular; slightly in advance of orbit, at about level of middle of eye; its distance from its fellow subequal to its distance behind tip of snout, excluding upper lip; about as wide as high, surmounted by a bluntly bilobed process, whose length slightly exceeds distance between anterior and posterior nostril. Posterior nostril tubular; placed hard against eye, at position (left aspect) of ten o'clock; about as wide as high. Eye large, subcircular, tumid, cutting dorsal profile. Interorbital space flat, or slightly concave. No subcutaneous spine on operculum or preoperculum. Gill-membranes united across isthmus, shortly in advance of anterior adhesive disk.

Dorsal fin rather long and low; inserted far back, its last ray joined to caudal by membrane; length to its origin 1·5 in total length, 1·3-1·4 in standard length; base 1·5-1·6 in head, subequal to distance between anterior margin of sucker and tip of lower lip; median rays subequal to snout. Anal fin similar in form to, but shorter than, dorsal; originating about below 2nd dorsal ray; terminating below interspace between origin of last dorsal ray and point of attachment of membrane joining it to caudal; last ray obscurely joined to caudal peduncle by membrane; base 1·2 in that of dorsal. Pectoral fin broad, rounded; its longest (about 10th) ray 2·6-2·9 in head; its length subequal to that of posterior adhesive disk, at, or just beyond, the level of which the fin terminates. Pelvics attached to 16th-17th pectoral ray; their crenulated common anterior border free, extending to within about an eye-diameter of posterior margin of eye; their free tips extending to level of middle of posterior sucker, or slightly beyond. Caudal fin moderate, rounded; length 2·3 in head, rather less than anal base.

Anterior adhesive apparatus about as wide as body at level of pectoral origin; its inner gelatinous region subcircular, the slightly truncated posterior margin just overlapped by free anterior border of second sucker. Posterior adhesive apparatus transversely elliptical; its width, which is almost as great as that of the body at this point, nearly one and one-third times its length, which is subequal to its distance from vent, or about half width of head; its inner gelatinous region comprising an anterior subrectangular portion followed by about three-fourths of an ellipse, the transverse major axis of which is rather less than diameter of gelatinous disk of first sucker; distance of free posterior margin of whole apparatus from vent 1·3-1·6 times distance of vent from origin of anal fin.

The colour in life was noted by the collector, Mr. G. R. F. Green, as 'Dark green with brown markings when found; but when placed in a white net turned light green'. Examined shortly after their preservation in formalin, the specimens exhibited a striking colour-pattern, comprising some fourteen vertical dark bars, which, except

for the bar overlapped by the adpressed pectoral, which is twice as wide as its neighbours, are subequal in width to the interspaces of lighter ground colour. After long preservation in formalin they become a uniform dingy, very pale, pinkish yellow.

Material examined. Described from three specimens, 53, 53, 36 mm. in total length, or 46, 46, 30·75 mm., respectively, in standard length. (Reg. Nos. 903 *a-c.*) One of the larger individuals figured (Text-fig. 2).

Locality. In rocky pools, Lady Lucy Beach, Low Head, Northern Tasmania; Mr. G. R. F. Green; 4th March, 1934.

Remarks. The specimens agree reasonably well with Günther's description, the most important point of divergence being that Günther observes, 'caudal fin quite free from dorsal and anal', whereas in the present examples the dorsal is connected by membrane with the base of the caudal. The connection is, however, barely made, being decidedly less extensive, for instance, than that in *Lepadichthys frenatus* Waite (in which form the anal also is joined to the caudal):

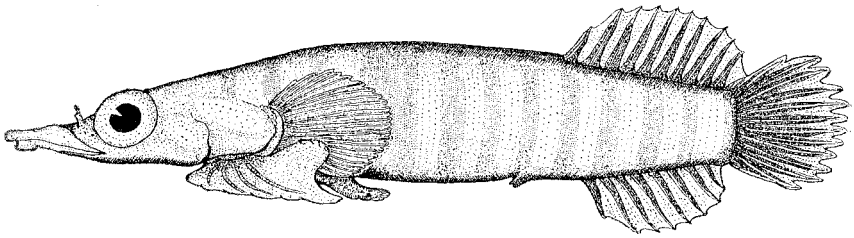

Fig. 2.—*Aspasmogaster tasmaniensis* (Günther). A specimen from Low Head, Tasmania. (× 2.)

it seems probable that the connecting membrane could easily be destroyed as the result of a slight injury. The remaining characters of the present examples, including the peculiar narrow snout, are so generally conformable to the description of *A. tasmaniensis* as to leave little doubt the specimens are really referable to this species.

Affinities. A. tasmaniensis is distinguishable at sight from the only other Australian member of the genus, *A. spatula* Günther, recorded from Victoria and Western Australia, by the much more posterior insertion of, longer bases of, and inequality between, its dorsal and anal fins, and by its narrow snout. The produced snout and the union of dorsal and caudal serve also to distinguish the present form from the two New Zealand species—*A. hectoris* (Günther), type-locality southern shore of Cook's Strait, having the 'caudal peduncle slender, longer than the caudal fin' (1876, p. 396), and *A. simus* (Hutton), described from Lyttleton Harbour and Chatham Islands, having the 'distance from the end of the dorsal, or anal, to the caudal very short, about one-fifth of the length of the caudal, or one-third of the least depth of the tail' (1896, p. 316).

Genus **Volgiolus** Whitley, 1935

Volgiolus cardinalis (Ramsay)

Gobiesox cardinalis Ramsay, *Proc. Linn. Soc. N.S.W.* VII. 2. 1882. p. 148.
Volgiolus cardinalis Whitley, *Aust. Mus. Mag.* V. 9. 1935. p. 292 (text-fig.).

Occurrence. At George Town and Low Head—the type-locality is 'near George Town'—this species is quite a common constituent of the intertidal rock-pool fauna. I have met with it also at Ulverstone—from which locality, as mentioned above, specimens examined by Waite were obtained—but have not noted it as being at all common there.

Colour. While the specific name *cardinalis* clearly indicates the colour of Ramsay's material, Waite says of his specimens, 'In fluid all examples are uniformly yellow'. In my experience the colour depends on the medium of preservation. Specimens in alcohol become bright red (occasionally slightly mottled with yellow) everywhere save on the preanal ventral surface, which turns yellow, the fins assuming the colour of the body in the vicinity: examples preserved in formalin become throughout, including fins, a dull pale yellow, occasionally exhibiting a faint purplish tinge.

Waite (1906) observed that the life-colours are not known, a state of ignorance apparently still unremedied. Notes on the colours of a fresh topotypical specimen, 37 mm. in total length, collected by Mr. G. R. F. Green, on 22nd January, 1934, are given below.

General ground colour pale translucent green; ventral surface white with a tinge of green, except on tail, which is concolorous with sides and back. Dorsal surface, which behind the head exhibits a distinct purplish suffusion underlying the green, abundantly punctulated throughout, and spotted and marbled with dark greenish. Sides marked in posterior half with spots, lighter than the ground colour, that tend to form two or three longitudinal rows, those of the lowest row the largest. Three or four obscure dark green vertical bands on the body, about as wide as their interspaces, extending about halfway down the sides. Head in general concolorous with body. Purple lozenge on nape. Purplish tinge on dorsal surface of snout, with definite narial spots of purple. Extending downwards and forwards from antero-inferior border of eye a clear unpunctulated region of pale green, subtriangular, widest inferiorly, bounded behind by a well-defined subvertical dark green band. Iris green; dark blue pupil with narrow annulus of dark orange. Ventral surface in advance of sucker in general immaculate, though the punctulations of the sides extend slightly beyond inferior profile of body, and there are also present two forwardly converging bands of punctulations visible only with a lens; behind sucker with the smaller, but without the larger, spots of sides and back. Adhesive apparatus immaculate, whitish, becoming pinkish centrally. Vertical fins more or less greenish, the dorsal with a purplish spot in its upper anterior

half, the anal with some purplish, especially near its middle, the caudal with a vertical band of purplish distally. Pectorals greenish, thickly punctulated with darker. Pelvics white, with a hint of green distally; a few small dark spots, mostly placed proximally.

A second specimen, 25 mm. in total length, collected at the same time, is generally similar in coloration, but exhibits the following variations: caudal with three vertical bars of purplish, the anterior one extending on to the caudal peduncle; dorsal and anal fins, when depressed, are seen to be crossed by distinct brownish purple bands, three on dorsal, two on anal; purplish tinge on dorsal surface of body more decided, and extending further caudad; purple lozenge on nape less conspicuous; clear triangular suborbital region less clearly defined, being to some extent encroached on by punctulations.

Family PATAECIDAE

Genus **Pataecus** Richardson, 1844

Subgenus **Pataecus**, nov.

Diagnosis. Antero-dorsal profile of snout inclined forward. No verrucae. Dorsal spines and anal rays not noticeably buried.

Orthotype. Pataecus fronto Richardson = *Pataecus (Pataecus) fronto* Richardson.

Pataecus fronto Richardson, *Ann. Mag. Nat. Hist.* XIV. 91. 1844. p. 280.
Pataecus subocellatus Günther, *Proc. Zool. Soc. London.* 1871 (1872). p. 665. pl. lxiv.

Scope and Distribution. The subgenus includes only the orthotype; Western Australia, South Australia, New South Wales, Queensland.

Remarks. In the course of supplying some data on Pataecid material in the Australian Museum, Sydney, Mr. G. P. Whitley, Ichthyologist, has called my attention to the isolated position occupied by *P. fronto*, and has suggested the present discussion of the Tasmanian members of the genus might provide a convenient occasion for recognizing this by generic or subgeneric distinction: the proposal here made for the establishment of two subgenera of *Pataecus* is the outcome of Mr. Whitley's courteous suggestion.

Subgenus **Aetapcus** nov.

Diagnosis. Antero-dorsal profile of snout inclined backward. Regularly arranged verrucae on head and body. Dorsal spines and anal rays more or less buried and hidden in fleshy membrane.

Orthotype. Pataecus maculatus Günther = *Pataecus (Aetapcus) maculatus* Günther.

Pataecus maculatus Günther, *Cat. Fish. Brit. Mus.* III. 1861. p. 292.

Scope and Distribution. The subgenus comprises *P. (A.) maculatus* Günther, Western Australia, South Australia, Tasmania; *P. (A.) vincenti* Steindachner, South Australia; *P. (A.) armatus* Johnston, Tasmania.

Aetapcus, an anagram of *Pataecus*.

Pataecus (Aetapcus) armatus Johnston

(Text-fig. 3)

Pataecus armatus Johnston, *Pap. Roy. Soc. Tasm.* 1890 (1891). p. 33. *Lapsus calami.*

Pataecus maculatus Waite, *Rec. Aust. Mus.* VI. 2. 1905. p. 76 (but not Waite's actual specimen from Tasmania, nor his figure—pl. XV.—of a specimen from Fremantle, both of which = *P. maculatus* Günther). *Id.* Waite, *Rec. S. Aust. Mus.* II. 1. 1921. p. 169 (Tasmanian reference only; not fig. 276). *Id.* Lord, *Pap. Roy. Soc. Tasm.* 1922 (1923). p. 71. *Id.* Lord and Scott, *Synopsis Vert. Anim. Tas.* 1924. p. 86. Not *P. maculatus* Günther, *Cat. Fish. Brit. Mus.* III. 1861. p. 292.

Pataecus maculatus var. *armatus* Whitley, *Pap. Roy. Soc. Tasm.* 1928 (1929), p. 64. *Ex* Johnston MS.

Pataecus armatus McCulloch, *Aust. Mus. Mem.* v. III. 1929. p. 398.

D. 34. A. 10. P. 8. C. 12. (The upper two rays are imperfectly developed, failing to reach the free margin of the membrane; their presence is perhaps an individual peculiarity). Gill-rakers on lower limb of anterior arch 12, low, mammilloid, denticulate.

Depth of body (41 mm.) equal to length of head (41), or 3·0 in total length (121), 2·5 in standard length (103). Eye, including rim, (4) 10·3, snout (10) 4·1, maximum depth of head (38) 1·1, depth of head at level of eye (31) 1·3, interorbital width (5) 8·2, in length of head. Length to vent (*c.* 65) *c.* 1·9 in total length.

General form similar to that of *P. (A.) maculatus* Günther. Eye with a raised rim, lying in a concavity; about equidistant from anterior and superior profiles and about two and a half times as far from ventral profile. Posterior nostril in a concavity; tubular, as wide as high; about an eye-diameter in advance of, and about half an eye-diameter below, eye. Anterior nostril apparently a simple aperture, an eye-diameter below, and slightly in advance of, posterior nostril. Cleft of mouth oblique; its horizontal length subequal to its distance from base of first dorsal spine; jaws equal anteriorly. Maxillary extending slightly behind level of eye; the width of its expanded hinder end half its distance from eye. Teeth in lower jaw villiform, forming in each ramus a well-defined band, anteriorly with five or six somewhat irregular rows, narrowing posteriorly to a single row; bands nearly meeting at symphysis, their nearest approach being in their outer half. Teeth in upper jaw similar in form and disposition, but bands less closely approximated mesially. A small semilunar patch of villiform teeth on vomer.

General surface of skin smooth. Low verrucae and lateral ridge present, disposed more or less as in *P. (A.) maculatus*. A series of tubercles, one at the base of each ray, along the whole dorsal profile.

Dorsal fin with 22 rays spinous; originating at level of upper border of eye, well in advance of eye, the 3rd spine being above the anterior ocular margin; connected posteriorly by membrane to outer third of first complete caudal ray; 1st, 2nd (stoutest), 3rd, 11th, 22nd spines 3·5, 1·9, 1·8, 3·0, 2·6, respectively, in head; 1st, 9th (longest), 12th soft rays 2·6, 2·0, 2·2, respectively, in head; the

anterior spines partly concealed in membrane, other spines and rays readily observable. Anal fin originating below 21st dorsal spine; terminating rather less than an eye-diameter in advance of level of base of median caudal rays; its base 1·5 in head, subequal to direct distance between pectoral origin and eye; its vertical height half the length of its longest (median) ray, which is 4·1 in head; all rays more or less concealed in thick membrane. Pectoral fin deeply excavate interradially; rays fairly patent, simple, the longest (3rd) 1·3 in head. Caudal fin rounded, obliquely truncated inferiorly; 2·3 in head; rays simple, the upper rather more slender than the lower.

Ground colour (in formalin) whitish, abundantly punctulated with rufous brown, the net effect being a pale greyish brown, with a distinct reddish tinge, varying in intensity in accordance with the number of punctulations, being most marked on the head, much less marked in the region covered by the pectoral in its normal, upwardly oblique position, and scarcely observable on the throat. Except the region immediately behind the opercle, which is irregularly mottled with brownish, the sides bear a number of reddish brown spots of variable size, showing some tendency to form four or five longitudinal series, each of about a dozen; two rather large isolated spots near the dorsal profile, one shortly behind the level of the operculum, the other at about the level of the anal origin. Ventral surface of body, except throat, with numerous subcircular rufous spots. Head with a number of more or less irregularly disposed subcircular rufous spots, most numerous below the level of the eye. About ten spoke-like markings radiating from eye, those at positions of ten and four o'clock (from left aspect) more conspicuous than the rest.

Dorsal fin greyish, spotted with reddish brown; largest spots tending to form half a dozen short arcs above the head, behind which they form a single row in basal half of fin, this row being surmounted by a subparallel row of smaller, more numerous spots; a few greyish spots on non-spinous portion of fin; a number of small spots and punctulations irregularly scattered over most of fin. Anal fin pale greyish brown, lightly spotted and marbled with darker. Pectoral fin pale olivaceous, slenderly barred and mottled with whitish; tips of rays light grey. Caudal fin grey, faintly yellowish; a few dark blotches in proximal half; a broad oblique inframarginal band of black, scarcely continued to upper and lower margins of the fin.

Material examined. Described and figured (Text-fig. 3) from a specimen, 121 mm. in total length, 103 mm. in standard length, in the Queen Victoria Museum, Launceston (Reg. No. 891).

Locality. Northern Tasmania.

Affinities. The specimen here described differs from *P. (A.) maculatus* Günther chiefly in colour-pattern, in the smooth skin, and in having more dorsal and fewer anal rays. It is identified with

P. armatus mainly on the strength of the characteristic coloration, since Johnston notes his specimen as having D. 32; A. 12. There is, however, some confusion in Johnston's account, since, after giving these radial characters and correctly citing 'D. 31; A. 12' for the type-specimen of *P. (A.) maculatus* from Fremantle, he expresses the opinion that his specimen represents 'only a local variety which probably varies slightly in colour and in the number of dorsal *and anal* rays' (italics mine).

Remarks. Johnston's specimen has been lost, and no further examples appear to have been met with since. The species is here for the first time fully described and figured. The involved history

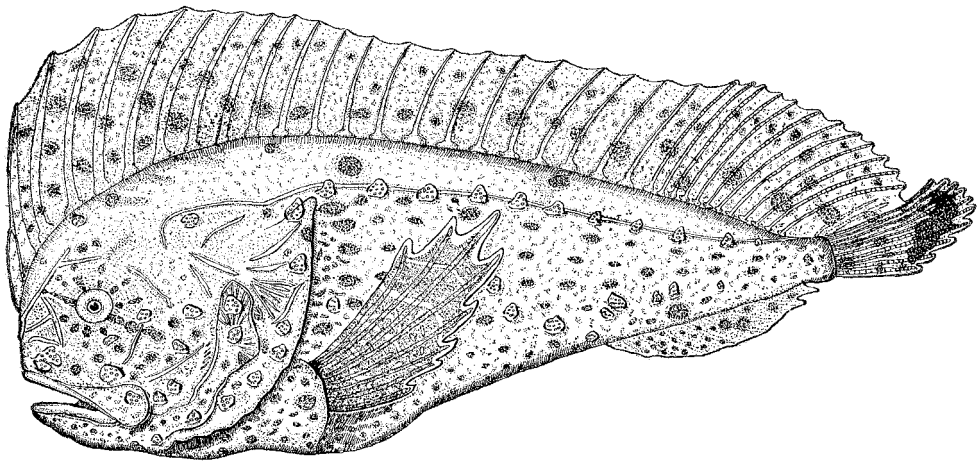

Fig 3.—*Pataecus (Aetapcus) armatus* Johnston. A specimen from Northern Tasmania. Natural size.

of this species implicit in the synonymy set forth above is deserving of a few lines of elucidation. Waite first (1905, p. 76) correctly suspected that the '*Pataecus armatus* Günther' of Johnston's second list (1891, p. 33) was a straightout *lapsus calami* for *P. maculatus* Günther; and later (1921, p. 169) formally relegated the former to the synonymy of the latter. Lord (1923, p. 71), and Lord and Scott (1924, p. 86), included *P. maculatus* on their lists, relying, it seems, solely on Johnston's record, as interpreted by Waite (1921)[1]. Whitley (1929, p. 64), making available Johnston's original memo-

[1] The grounds of this opinion are: (*a*) absence of actual Tasmanian records in Lord and Scott; (*b*) inquiry shows no specimens were then available either in the Tasmanian Museum, Hobart, or the Queen Victoria Museum, Launceston; (*c*) internal evidence of the references cited by Lord and Scott. The real case for the recognition of *P. (A.) maculatus* as a member of the Tasmanian fauna is discussed in the remarks on that species below.

randa, accepted a manuscript suggestion, and regarded Johnston's fish as a variety, *P. maculatus* Günther, var. *armatus* Johnston; while McCulloch (1929, p. 398) elevated it to full specific rank.

Pataecus (Aetapcus) maculatus Günther

Pataecus maculatus Günther, *Cat. Fish. Brit. Mus.* III. 1861. p. 292. See also synonymy listed under *P. (A.) armatus* above.

Record. There is a specimen from Northern Tasmania (probably Tamar Heads) in the Museum collection (Reg. No. 890).

Pataecus (Aetapcus) maculatus Günther has at present no satisfactory standing in the Tasmanian list. It is not accredited to Tasmania by McCulloch in the Check-List; while reasons have already been given, in the course of the remarks on *P. (A.) armatus*, for considering it highly probable that the references to it in the lists of Lord, and Lord and Scott, really relate to *P. (A.) armatus*.

A Tasmanian specimen of a *Pataecus* was, however, referred by Waite (1905, p. 75), probably correctly, to this species. Waite's record was, I believe, overlooked by Lord and Scott; while McCulloch either overlooked it, or else, more probably, assumed the specimen to be referable to *P. (A.) armatus*.

Waite observes of his specimen that it differs from a topotypical example of *P. (A.) maculatus* 'by having thirty-three dorsal spines [*i.e.*, total rays] and especially in the length of the pectoral fin, which is longer than in the Western Australian fish, and almost as long as the head. The body also is relatively deeper; these slight variations may be of individual or local import only'. The present example shares the first two, but not the third, of these peculiarities; and in view of the interesting character of these variations, the principal proportions of the specimen here noted are recorded below, as a basis for future investigations. The radial formulae are: D. 33 (xx, 13); A. 12; P. 8; C. 9.

Proportions. Depth (66 mm.) 3·2, depth at origin of anal (33) 6·4 head (60) 3·5 in total length (211); or 2·8, 5·6, 3·1, respectively, in standard length (184). Eye (4) 4·3, interocular width (10) 1·7, in snout (17). Length to vent (131) 1·6 in total length. Longest (3rd) dorsal spine (30) 2·0, longest (9th) dorsal ray (31) 1·9, longest (10th) anal ray (24) 2·5, longest (3rd) pectoral ray (57) 1·1, longest (3rd) caudal ray (27) 2·2, in head.

Summary

1. Some general observations are made on *Lovettia sealii* (Johnston) [whitebait-constituent], *Genypterus blacodes* (Bloch and Schneider) [colour-variation], family Gobiesocidae [key to Australian species], and *Volgiolus cardinalis* (Ramsay) [life-colours].

2. Little-known species described and figured are *Aspasmogaster tasmaniensis* (Günther), and *Pataecus armatus* Johnston.

3. The inclusion in the Tasmanian list of *Pataecus maculatus* Günther is confirmed.

4. *Pataecus* and *Aetapcus*, new subgenera of *Pataecus* Richardson, are diagnosed.

5. *Ophiclinus greeni*, sp. nov. (family Ophiclinidae) is described and figured.

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