OBSERVATIONS ON SOME TASMANIAN FISHES: PART IX

By

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One text figure

ABSTRACT

A case of mass mortality in *Navodon setosus* (Waite), 1899 [Aluteridae], a species now first formally recorded from Tasmania, is reported: some features of two juveniles are described and figured. Taxonomic data on *Mitotichthys tuckeri* (Scott), 1942 [Syngnathidae], hitherto known only from the holotype, are extended by an account of two virtual topotypes. Miscellaneous observations are made on *Stigmatopora argus* (Richardson), 1840 [Syngnathidae] (status of several species commonly reduced to synonymy); *Lampris regius* (Bonnaterre), 1788 [Lampridae] (third Tasmanian record; dimensions); *Dactylosargus arctidens* (Richardson), 1839 [Aplodactylidae] (differences from published accounts and figures; general observations); *Lepidopus caudatus* Euphrasen), 1788 [Trichiuridae] (dimensions); *Pseudaphritis urvillii* (Cuvier & Valenciennes), 1831 [Pseudaphritidae] (correction of standard figures); *Gymnapistes marmorata* (Cuvier & Valenciennes), 1829 [Scorpaenidae] (variation, coloration, behaviour). Keys to the Tasmanian members of the families Scorpaenidae, Aluteridae are provided.

This contribution follows the general pattern of others in the series. As before, standard length, total length are denoted by *Ls*, *Lt*, respectively: all linear dimensions are given in millimetres, the name of the unit customarily being omitted.

Two new conventions are introduced. (*a*) *Specification of members of a series*.—Where two, or more, specimens are noticed in the one context, the sequence of citation of the relevant specification is that of increasing size of individual fish, as measured by *Ls* (rarely, if *Ls* is not determinable, by *Lt*). (*b*) *Designation of localities*.—The general practice hitherto followed of recording Tasmanian localities in the form exemplified by 'Devonport, North West Coast' is now superseded by the employment, for the second, more general specification, of the county name. This procedure offers two advantages. First, it is more precise. Secondly, it avoids certain ambiguities arising from some local usages, in which the terms to be replaced are applied to districts the limits of which are not by any means necessarily inherent in the designations. Thus Devonport, Lat. 41° 12′ S., Long. 146° 21′ E., is on the north coast, nearer in a direct line to the north-east corner of the Island at Cape Portland than to the north-west corner at Cape Grim; and Railton, Lat. 41° 21′ S., Long. 146° 26′ E., lies a dozen miles from the sea; the conventional location of both, however, is 'North West Coast'. Again, Bridport, Lat. 41° 01′ S., Long. 147° 23′ E., and St. Helens, Lat. 41° 20′ S., Long. 148° 14′ E., are approximately equidistant—westward, southward, respectively—from Cape Portland; yet the former is a 'North East Coast', the latter an 'East Coast', town: Stanley, Lat. 40° 47′ S., Long. 145° 19′ E., which stands in about the same relation to Cape Grim as Bridport does to Cape Portland, belongs to the 'Far North West'.

Entries in tables of synonymy, particularly citations from the earlier authors, are not necessarily identical with the originals in point of typographical detail (earlier employment of initial capitals for some trivial names; no general, or indescriminate use of parentheses; and so on); being rendered in a standard pattern in accord with contemporary conventions.

Family SYNGNATHIDAE

In the Australian Check List (McCulloch, 1929) seven species, representing six genera, are accredited to Tasmania: these totals have now been increased (largely in the present series of studies) to fifteen species and (on conservative taxonomy) ten or eleven genera. For keys see Scott (1939: 140; 1942*a*: 19; 1955: 135): note, however, the presence of more than thirty dorsal rays in *Mitotichthys tuckeri* (Scott) leads to invalidation of second clause of couplet 8 in the 1939 key.

Genus Mitotichthys Whitley, 1948

Mitotichthys tuckeri (Scott), 1942

Syngnathus tuckeri Scott, 1942, *Rec. Queen Vict. Mus.*, I, i: 17, pl. V. Type locality: Bridport, Northern Tasmania [Dorset]; netted in shallow water.

Mitotoichthys tuckeri (Scott). Whitley, 1948, *Rec. Aust. Mus.*, XXII, 1: 75.

Generic status.—Until a complete review of Australian pipefish genera in the light of recent advances in Syngnathid systematics—in particular the full diagnostic use of variations in brood pouch morphology and egg distribution: see, *e.g.*, Herald (1953)—has been made, the true generic status of a number of our pipefishes (including even some long-established species, for which the newly relevant data is not recorded in the literature) must unfortunately remain more or less obscure. From *Syngnathus* Linné, as understood by, *e.g.*, Weber & De Beaufort (1922) the present form departs in several particulars, most notably perhaps in the location of the dorsal fin.

Virtual topotypes.—The species appears not to have been reported since its publication in 1942, and has hitherto been known only from the unique holotype, a male, *Ls* 121·3, *Lt* 126·6. Our existing knowledge is now usefully supplemented by the receipt of two virtual topotypes, both secured at Piper River Heads, Dorset, about a dozen air-miles westward from the type locality, Bridport: (*a*) female, *Ls* 91·2, *Lt* 95·6, collected by Master Hugh Holyman in 1956; (*b*) male, *Ls* 126·9, *Lt* 132·4, caught in a permanent rock-walled fish trap by Mr. J. Allchin on 4th November, 1957. No evidence has come to light, it will be noted, to suggest the species is of other than smallish size.

Proportions, meristic characters.—A brief comparison of the three known individuals [in sequence (*a*), holotype, (*b*)] follows: in present paragraph dimensions of Piper River Heads specimens (only) are recorded in parentheses, other values being body proportions of all examples. Head (13·1, 16·1) 2·9, 3·0, 3·2 in length to vent (38·6, 52·0); 7·0, 7·6, 7·9 in length to base of caudal (91·2, 126·9); 7·3, 7·9, 8·2 in total length (95·6, 132·4). Eye (2·0, 2·3) 3·1, 3·1, 3·3 in snout (6·2, 7·7), which is 2·1, 2·1, 2·1 in head. Depth at opercular margin (3·0, 4·4) 32, 32, 30; at middle of trunk (3·0, 3·3) 32, 33, 40; at vent (2·2, 3·0) 44, 37, 44; at middle of tail (1·5, 1·9) 64, 79, 71, in total length. Vertical height of dorsal [*i.e.*, as preserved] (2·4, 4·0), 5·1, 4·2, 4·3 in its base (12·3, 17·3), which is 2·4, 2·2, 2·2 in its distance from snout (29·9, 38·3). Pectoral (3·1, 4·8) 4·7, 3·6, 3·4; caudal (4·4, 5·5) 3·0, 3·0, 2·9, in head. Interorbital width (1·0, 1·3) 2·0, 1·5, 1·8 in eye. Base of pectoral (1·9, 2·4) 1·6, 2·5, 2·0 in fin length.

Annuli 22 +40, 23 +42, 22 + 41. Subdorsal annuli 10·0 + 2·3, 10 + 2 (fractions not recorded), 9·8 + 1·9. Brood annuli none, caudal 1-12, caudal 1·0-11·4. Dorsal 35, 35, 35. Pectoral 12, 11, 12. Anal not found.

Superolateral trunk ridge extends on to 0·4 of, on to (faction not recorded), to 0·4 of first caudal scute (on left side of (*b*) only to 0·7 of last body scute): mediolateral trunk ridge terminates on 0·5 of last, on penultimate, on 0·8 of penultimate trunk scute (tip turning down slightly in (*a*) and on left side of (*b*); no record for holotype): superolateral caudal ridge originates on left side at 0·9 of penultimate, middle of antepenultimate, 0·4 of penultimate, and on right side at 0·4 of last, front of penultimate, 0·5 of penultimate trunk scute; inferolateral ridge of trunk and tail continuous in female, apparently continuous (brood pouch interposed) in both males: medioventral ridge of all specimens well defined on trunk, obsolescent on tail.

Comment on, and additions to, original description.—Diagnosis states concerning dorsal, 'base not distinctly elevated' (1942: 17). This correctly describes the position in so far that, in strict lateral aspect, the portion of the dorsal profile on which the fin stands is not greatly higher than its immediate cephalad and caudad extensions: on the other hand, it fails at this point of the text and in the general account of the dorsal fin (1942: 18) (though the relevant datum appears elsewhere) to make clear the fact that, as a result of the continuation (without loss of height, relative to inferolateral ridge) of the superolateral trunk ridge (which anterior to the fin virtually constitutes the dorsal profile) on to the lateral surface of the body—a continuation extending from level of origin of fin caudad through some eight or nine annuli—the anterior four-fifths or so of the fin base comes to lie measurably above this ridge, and may accordingly be regarded as being elevated. No reference is made in original description to presence or absence of lateral protective brood plates: examination of (*b*) shows none are developed.

After (*b*) was placed in preservative the spindle-shaped egg mass worked clear of pouch: eggs are imbedded in a more or less distinctly cellular jelly-like matrix; three, perhaps four, rows near middle, fewer at either end; chiefly in one layer, centrally in two (at least). Dorsal wall of pouch with from one to three more or less well-defined series of shallow, low-walled subcircular or polygonal depressions: inner surface of each pouch fold divided by about 15 low transverse ridges into subrectangular compartments, their inner ends continuous with the mesial honeycomb-like band.

Genus **Stigmatopora** Kaup, 1853

Stigmatopora argus (Richardson), 1840

Syngnathus argus Richardson, 1840, *Proc. Zool. Soc. Lond.*, VIII: 29. Type locality: not specified [= Tasmania; McCulloch (1929)].

Stigmatophora argus (Richardson). Munro, 1958, *Handbk Aust. Fish.*: 90 [instalment no. 22 in Fisheries Newsletter, XVII, 4, April, 1958: 18].

Status of various species of Stigmatopora.—Since Waite and Hale's (1921) survey of the Lophobranchiates of South Australia, it has been customary to recognize only two Australian species of *Stigmatopora*—*S. argus* (Richardson), 1840 and *S. nigra* Kaup, 1853. The latter (which has been referred to a subgenus, *Pipettella* Whitley, 1951, later elevated to a genus, *Nigracus* Whitley, 1953) is tolerably well defined, with as its only notable synonym *S. boops* Castlenau, 1872. With *S. argus* Richardson, however, Waite & Hale synonymized *S. olivacea* Castlenau, 1872, *Gasterotokeus gracilis* Klunzinger, 1872, *S. unicolor* Castlenau, 1872, *S. depressiuscula* Macleay, 1881, *S. gracilis* Macleay, 1881, *S. argus* var. *brevicaudata* Lucas, 1891.

A specimen of a *Stigmatopora* collected by Mr. B. C. Mollison at Chimney Corner, Three Hummock Island, Bass Strait, exhibits a disconcerting assortment of characters. Waite & Hale's consideration of the forms of Macleay and Lucas is confined to coloration and to number of caudal annuli (low totals reported by some authors being attributed by them to mutilation): certain other significant points of divergence are not discussed. Examination of Mr. Mollison's specimen suggests the question of the conspecificity of these half dozen nominal species could perhaps profitably be re-opened. A comparative synopsis of characters is set out in Table 1.

TABLE 1

CHARACTERISTICS OF *Stigmatopora argus* (RICHARDSON), 1840 AND OF SOME FORMS COMMONLY REGARDED AS CONSPECIFIC

SPECIES [and Chimney Corner Specimen]	CHARACTERISTIC								
	Annuli	Dorsal Rays	Opercular Ridge	Rest of Head in Snout	Trunk in Tail	Part of Dorsal above Vent	Colour Markings	Brood Pouch	Miscellaneous
S. argus Richardson	20+*ca* 75	49–52	Slight ridge in young, almost entirely disapperaing in old individuals	*ca* 2	> 2	Middle	Uper surface with numerous small black white-edged ocelli, arranged irregnlarly, or in longitudinal, or transverse, series	Shorter than trunk	..
S. olivacea Castelnau	19+84	*ca* 45	No ridge	Rather > 2	..	Middle	Inconspicuous transverse bands at junctions of annuli and on snout	On 13 rings	Brood pouch orange
S. unicolor Castelnau	17	..	Strong distinct longitudinal, rather oblique ridge	$1\frac{1}{2}$	Apparently *ca* $1\frac{1}{3}$	Anterior fourth	No spots (and apparently no bars)	..	Head ended by a broad trifid spine in centre, and a sharp spine on each side
S. depressiuscula Macleay	19+*ca* 66	49	Striated but scarcely ridged	> 2	> 2	Anterior third	Two longitudinal rows of small dark-brown or black spots along back	Slightly longer than trunk	Prominent tubercle on each side of snout in front of eyes
S. gracilis Macleay	20 (1) + 56	58	..	2	2	Middle	Brown cross bars on junctions of annuli, most distinct on back: broad brown band between these, and on eyes	..	Scarcely depressed
S. argus Richardson, as interpreted by Waite and Hale, 1921	18–22 (17) + 78–90 (68)(3)	43–50 (55) (2)	Feeble ridge in young examples	> 2	1.7–2.8	About middle [Subdorsal annuli 9–10 (7) + 8–10 (12)]	Male: numerous black white-edged spots: female often with additional narrow whitish bars (4)	..	Male depressed; female rather more depressed: supraorbital ridges not continued behind eyes
S. argus var *brevicaudata* Lucas	20 + *ca* 60	49 or 50	..	2.1	1.9	..	Dorsal spots black without white edges; in 6 longitudinal rows	..	..
Chimney Corner specimen	21 + 69	58	Strong distinct ridge to within last 0.5 mm. of opercle	2.2	2.0	About middle [Subdorsal annuli 10.8 + 11.2]	Black non-annulated spots in 2 longitudinal rows on dorsum of trunk and tail, mostly 2 spots, anteriorly 4, to each body annulus	..	No spines or prominent tubercles on head: supraorbital ridges continued behind eyes

In entries in which annuli-ranges include both unbracked and bracketed values the former are the extremes found by Waite and Hale (1921) and the latter represent extremes found by Waite and Hope (1921) and the latter represent extensions, by express or deficit, of that range as reported by other authors.

(1) Appears in Johnston's second list (1891) as 30.
(2) Should be 58.
(3) Should be 56.
(4) Description greatly condensed.

Waite & Hale attached sufficient importance to the opercular keel to use its presence or absence as a key-character (*S. nigra* 'an opercular keel'; *S. argus* 'no opercular keel in adult'): it has been employed in keys also by Waite (1923), Scott (1939) and others. In the present specimen—which with a length of 280·5 exceeds largest of Waite & Hale's 'many specimens' by 30·5, and may be presumed to be adult—a well-defined keel extends, somewhat obliquely, across the whole operculum, being most elevated anteriorly, and lapsing, within the last 0·5 mm, to little more than height of adjacent rugosities. An examination of the posterior end of the body suggested by the low total of caudal annuli reveals no evidence of mutilation: if injury has occurred, healing has been efficient, the melanophore punctuations of the four tail surfaces extending uninteruptedly round the tip. A further discrepancy may be noted. Waite & Hale observe 'the supraorbital ridges commence on the third part of the snout, but do not extend to behind the eyes'. Here these ridges, which begin 8·8 (left), 8·0 (right) in front of eye, border the orbits for 4·2, and pursue a subparallel course for a distance of about 4 well on to occiput.

The specimen may be referred provisionally to *S. argus* Richardson: but the general position regarding that species would appear to be more fluid than is usually recognized. Reference to Table 1 suggests, for example, that if any reliance can be placed on Castlenau's account of his *S. unicolor*, from Western Australia, this pipefish can hardly be conspecific with Richardson's species.

Principal dimensions of Chimney Corner specimen.—*Lt* 280·5. Length to origin of pectoral 47·1, of dorsal 90·5; to termination of adpressed pectoral 51·7, of dorsal base 160·5; to vent 123·5. Head 45·6, snout 31·5, eye 4·2, interorbital 2·4. Depth (and in parentheses width) at middle of snout 2·3 (2·6), front of eye 4·1 (4·8), opercular margin 5·1 (4·1), vent 5·1 (7·0); maximum 6·4 (8·5), occurring at 19th (14th) annulus, about 115 (105) behind tip of snout.

Family LAMPRIDAE

The family contains a single genus, *Lamprius* Retzius, 1799: the several forms described from various parts of the world are probably conspecific.

Genus **Lamprius** Retzius, 1799

Lampris regius (Bonnaterre), 1788

Pleuronectes regius Bonnaterre, 1788, Tabl. Encycl. Meth., Ichth.: 79. Type locality: 'L'Ocean' (Duhamel) = France.

Zeus guttatus Brünnich, 1788, Nye. Saml. K. Danske. Skrift., III: 403.

Zeus luna Gmelin, 1789, Syst. Nat. (Linné), ed. 13, 1: 1225. Type locality: 'In mari Normanniam' (Duhamel).

Lampris regius (Bonnaterre). McCulloch, 1929, *Mem. Aust. Mus.* V., 1: 137.

Tasmanian records.—Australian records of the opah, moonfish, or mariposa are few, a survey by Whitley (1950) listing 5 (Western Australia 1, Victoria 2, Tasmania 2): there are, however, 10 entries for New Zealand in the period 1882-1950. It is clear that this pelagic fish, though widely distributed, is rare (or, at any rate, rarely encountered) in the southern hemisphere: Smith (1950: 141) states it has been obtained only twice in Southern Africa, and it has not been recorded from Ceylon (Munro, 1955). The earliest Tasmanian (and first Australian) specimen was found washed up on the beach near Port Arthur in December, 1895: it measured 3 feet 7 inches [1092] in length to middle of caudal, or 3 feet 6 inches [1067] to caudal base, and weighed 120 lbs. (Morton, 1897). [Lord & Scott (1924), who state that the specimen is preserved in the Tasmanian Museum, Hobart, and that a coloured drawing accompanies entry in register, give weight as an improbable 29 lbs.]. Morton's account includes some dozen measurements and several other observations: a photograph found among R. M. Johnston's memoranda has been published by Whitley (1929 *a*). No details are available to supplement Whitley's second Tasmanian entry: '1936. Storm Bay between Bruny Island and Tasman Peninsula, Tasmania. About 4 feet. *Advocate* 2/12/1936'. Some observations are here given on a third local example, a female, *Ls* 1001, *Lt* 1056, weight approx. 100 lbs., found washed up at Bridport, Dorset, by Mr E. Barnett in August, 1943.

Fin formulae; general dimensions.—D. 51 (bases of first eight rays, constituting an elevated section, occupy 60; bases of next eight, 100: rays 1st-9th, 51st 268, 267, 245, 235, 203, 160, 110, 90, 65, 25 long). A. 40 (1st ray 60; longest, 21st, 80; shortest, 40th, 20: last half dozen rays flatter, shorter, more deeply cleft than rest). P. 244 (longest ray 303: fin base 80: depression into which pectoral base fits 110 by 65). V. 14 (longest, 1st and 2nd, 320; shortest, 14th, 35: all cleft, except 1st: fin base 65). C. about 20 main rays + $\frac{7\text{-}8}{10}$ (outermost rays subequal, 255; middle about 70: row of scales along each ray continuous nearly to distal end: spread of fin 400).

Head 320 (to preopercular margin 254). Eye, orbit: horizontal diameter 82, 102; vertical 93, 110. Snout 90. Lower jaw exceeds upper by 17. Height of dorsal profile above a line joining angle of mouth and middle of caudal peduncle (in parentheses depth of ventral profile below this line): at front of eye 100 (180), back of eye 160 (315), end of head 205 (385), pectoral origin 210 (410), dorsal origin 260 (—), dorsal termination 40 (—), anterior margin of vent — (375), anal origin — (370), anal termination — (45). Maximum thickness 180 (at head). Caudal peduncle: minimum depth 70; maximum thickness 50. Nearest approach of lateral line to dorsal profile at level of pectoral. Length to origin of (in parentheses to termination of) pectoral 361 (—), dorsal 469 (958), pelvic 472 (—), anal 661 (962). Vent: length to anterior, posterior margin 600, 647. *Ls* 1001, *Lt* 1056.

Coloration.—In advance of level of hind end of pectoral base chiefly silvery (near dorsal and ventral profiles patches of salmon pink: abraded here); behind this, pinkish purple, noticeably darker above lateral line: the whole liberally sprinkled with white spots (modal size 12-15 by

7-10), least abundant between eye and dorsal base. Large dark purple spot about equidistant from dorsal and ventral profiles at level of vent. Dorsal membrane bright pinkish throughout: first 8 rays chiefly pinkish, becoming purplish proximally, tipped with cream distally; other rays whitish: elevated portion of fin with, remainder without, white spots. Anal: membrane red, rays whitish. Pectoral: tips of all rays and distal one-third of membrane cream; rest of fin pinkish, except basal 25 or so of first ray, which is rich red; no white spots. Pelvic: proximal half pinkish red, distal half purplish; scattered white spots over whole fin.

Remarks.—Accounts of European examples speak of their brilliant blues, greens and reds: of these colours the third only was exhibited by our specimen; but it may well be that the dark pinkish purple occurring throughout most of the length above the lateral line was blue in life, as in the fish illustrated by Smith (pl. 8, fig. 262).

In gross form our specimen is in tolerably good agreement with most of the available illustrations in general works. From photograph of 1895 specimen (Whitley, 1929 *a*), from outline figure given by Lord & Scott (and from some other figures) it differs principally (i) in higher insertion of pectoral, base of fin being on, instead of below, a line joining middle of eye and middle of caudal peduncle; (ii) in steeper postanal ventral profile (probably an age characteristic), and longer anal base (equal to, instead of two-thirds of, base of non-elevated section of dorsal); (iii) in shape of hindmost portions of dorsal and anal fins, in which lengths of rays successively decrease, instead of increase (in some illustrations remain virtually constant) caudad (in dorsal last 8 measure 60, 55, 50, 40, 33, 30, 27, 25, in anal 49, 45, 42, 35, 28, 25, 22, 20). From Smith's coloured plate it departs noticeably (i) in more anterior insertion of pelvic (below, instead of far behind, dorsal origin); (ii) in much more extensive, and differently disposed, anal base; (iii) in having hindmost point on preoperculum at level of eye, instead of at the angle of the bone, and in having inferior border of preoperculum and operculum relatively closer to orbit.

Family APLODACTYLIDAE

Of the five members of the family enumerated in the Check List, representing three genera, one only is recorded from Tasmania.

Genus **Dactylosargus** Gill, 1862

Dactylosargus arctidens (Richardson), 1839

Aplodactylus arctidens Richardson 1839, Proc. Zool. *Soc. Lond.*, VII: 96. Type locality: Port Arthur [Pembroke], Tasmania.

[?] *Aplodactylus meandratus* Richardson, 1842, *Trans. Zool. Soc. Lond.*, III: 83 (*ex Sciaena meandrata* Solander MS). Type locality: Cape Kidnappers, New Zealand.

Haplodactylus arctidens Richardson. Günther, 1858, *Cat. Fish. Brit. Mus.*, I: 81. Johnston, 1883, *Pap. Proc. Roy. Soc. Tasm.*, 1882: 111,

[?] *Haplodactylus donaldii* Haast, 1873, *Trans. N.Z. Inst.*, V: 272, pl. XVI, uppermost fig. Type locality: New Zealand ['probably Lyttleton'; McCulloch (1939)].

Dactylosargus arctidens (Richardson). Gill, 1863, *Proc. Acad. Nat. Sci. Philad.*, XIV: 40. Waite, 1924, *Rec. S. Aust. Mus.*, II, 4: 480, pl. XXIX, text fig. 379. McCulloch, 1929, *Mem. Aust. Mus.*, V, ii: 256.

Haplodactylus meandratus (Richardson). Klunzinger, 1872, *Arch. fur Naturg.*, XXXVIII: 22.

Dactylopagrus arctidens (Richardson). Lord & Scott, 1924, Synop. Vert. Anim. Tasm.: 68.

Distribution and local records.—The Check List gives Tasmania only: however, it may well be that, as Waite (1924) has plausibly suggested, Klunzinger's Victorian fish is referable to the present species. If such is the case, the distribution covers three States, a record for South Australia having been given by Waite. Waite observes the species does not appear to have been recorded in Tasmania from any source other than the type locality: Lord & Scott (1924), however, comment, 'common in many places, such as Maria Island amid the kelp, from two to five fathoms, and amid the kelp beds of the Derwent Estuary'. On 26th August, 1956, I obtained a specimen, *Ls* 460, *Lt* 549, caught near the shore at Bicheno, Glamorgan: on 6th February, 1957, the Queen Victoria Museum, Launceston, received an example, *Ls* 350, *Lt* 410, secured by Mr T. Williams at Devonport, Devon (Q.V.M. Reg. No. 1957·5·5).

General observations.—Waite's description and plate of his specimen, 385 long, from an unidentified locality in South Australia, afford the best available specification of this species. Our material extends the range of the metrical characters recorded by him as follows. Head 4·7 (Devonport), 4·2 (South Australia), 4·3 (Bicheno); depth 3·4, 3·5, 3·2; length of caudal 5·8, 5·5, 5·2, in*Ls*. Eye 5·7, 5'8, 6'5; interorbital 3·2, 3·8, 4·0; snout 3·0, 3·3, 3·1, depth of caudal peduncle 2·1, 'twice', 1·8; longest (4th, 4th and 5th, 4th) dorsal spine 1·8, 1·7, 2·0; longest (2nd, 2nd, 2nd) anal ray 1·5, 1·3, 1·6, in head. Line lat. 105 (61 before vent), 103, 108 (64 before vent): L. tr. thus: 20/*ca* 70, 20/76, -/-. The noticeable irregularity in the course of the lateral line as depicted by Waite is not attributable to imperfect drawing, but represents a genuine characteristic of the fish. The Devonport specimen has one fewer anal ray than the South Australian. Some important dimensions, not recorded by Waite, are here given for the Tasmanian examples, expressed as thousandths of standard dength. Length to origin of; termination, of first dorsal 257, 235; 585, 574: second dorsal 617, 612; 860, 843: anal 709, 696; 800, 774: pectoral 180, 179; (adpressed) 420, 397: pelvic 291, 296; (adpressed) 480, 471.

Differences.—Our material exhibits the following differences from the South Australian specimen as described and figured by Waite. (i) Waite mentions that bases of first dorsal and anal are each set in a scaly sheath (found also in our examples), but makes no mention of, and fails to figure, any sheath at base of second dorsal. In the Tasmanian specimens the whole length of the second dorsal also is enclosed in a conspicuous sheath, best developed in the anterior two-thirds of the fin base, where its maximum height somewhat exceeds that of sheath of first dorsal. Closely set scalelets extend up dorsal rays for 0·2 (anteriorly) - 0·6 (posteriorly) of ray length. (ii) Small scales noted as being developed 'along the proximal portions' of caudal rays extend in our examples from 0·7 (medially) to 0·9 (externally) of length of ray. (iii) Waite describes, and figures, pectoral as obtusely pointed, with 7th split ray the longest. Our specimens show a very differently shaped fin. The tips of rays 1-6 form a broadly smooth parabolic curve (individual tips separated by minor scalloping not evident in Waite's figure): 7th, 8th, 9th rays project as separate, progressively longer complex tongues, between which are bold excavations: the inferior 6 simple rays are perhaps much as in the South Australian fish (the point cannot be certainly determined from the illustration), the situation as it obtains in the local examples being that the membrane is incised between successive rays by an outwardly concave curve to an extent such that the point of attachment on one ray lies cephalad of the tip of the ray immediately below it by 1-1½ times maximum width of that ray. The lowest branched ray is biramous; those immediately above it are triramous, and are distinctly narrower and flatter (hence 9th ray is to some extent intermediate in character between those flanking it). Of these three differences, (i) perhaps more probably represents a defect in specification rather than an actual morphological difference; (ii) could clearly be an individual variation; (iii) remains, till further comparative data are available, of uncertain significance.

Family TRICHIURIDAE

Of the six species, representing three genera, recorded in the Check List one only is known from Tasmania.

Genus **Lepidopus** Garman, 1770

Lepidopus caudatus (Euphrasen), 1788

Trichiurus caudatus Euphrasen, 1788, *Stock. K. Vet. Acad. Nya. Handl.*, IX: 52, pl. 9, fig. 2.

Lepidopus caudatus Euphrasen. Lord & Scott, 1924, Synop. Vert. Anim. Tasm.: 81. McCulloch, 1929, *Mem. Aust. Mus.*, IV, ii: 267.

Tasmanian records.—The only Australian States for which records of this widely ranging species are given in the Check List are New South Wales—['a young example taken by the trawlers is the only specimen recorded' (McCulloch, 1927)]—and Tasmania. The first recorded individual in Tasmania was washed ashore at Battery Point, Hobart, Buckingham, in 1875 (Allport, 1876). A specimen, *Lt* 1461, was found by Mr. E. Bennett in shallow water at Little Devil's Elbow, Tamar River, Devon (approximately 27 miles from river mouth), in 1943 (Q.V.M. Reg. No. 1943·78).

General account of Little Devil's Elbow specimen.—D.100 (longest ray, 1st, 39; shortest, 100th, 19: but height of fin does not decrease evenly caudad, length of 11th, 21st . . . 91st rays being 28, 31, 33, 32, 23, 28, 23, 29, 31). A. 25 (1st, 11th, 21st, 25th rays 5, 18, 12, 11 long); 1st ray below 77th dorsal: spines small, numerous. P. 12 (2 broad, undivided; 10 divided in distal one-third to one-half: inferior elongated, 1st, 2nd, 3rd, 5th, 7th, 9th, 11th (longest), 12th 50, 50, 50, 55, 68, 86, 93, 90). C. 18-20 principal rays (longest 60, shortest 17): spread of fin 87. Lower jaw exceeds upper by 9. Head 212 (to hind margin of preoperculum 158). Eye: horizontal, vertical, diameter 39, 36. Interorbital: soft, bony 35, 28. Snout 86. Length to anterior, posterior, margin of vent 718, 728. Distance of lateral line from dorsal profile/total depth at: origin of lateral line (top of gill opening) 25/105, end of head 30/112, pectoral origin 30/112, pelvic origin 35/103, anterior border of vent 55/101, anal origin 40/69; at point of maximum depth (*ca* 530 behind snout-tip) 52/114. Depth of caudal peduncle 7. Thickness at: anterior border of orbit 87, posterior border of orbit 43, operculum 42, vent 34, dorsal termination 11, middle of caudal peduncle 8. Length to origin (in parentheses to termination) of dorsal 143 (1368), pectoral 222, pelvic 277, anal 1170 (1373). *Ls* 1410, *Lt* 1461. Two palatine teeth (apparently originally four) in each row. Maxillary to below 0·2 of eye; its distance from eye subequal to its distal width. Uniform silvery.

Remarks.—Dorsal origin is usually shown (Günther, 1880; McCulloch, 1927; Smith, 1950) as distinctly caudad of hind margin of preoperculum, or somewhat more than one eye-diameter behind eye: in our specimen fin originates about 10 in advance of preopercular margin, or 0·6 eye-diameter behind eye.

Family PSEUDAPHRITIDAE

One Australian species only recognized: formerly included in Bovichtidae; *cf.* Scott (1935: 155).

Genus **Pseudaphritis** Castlenau, 1872

Pseudaphritis urvillii (Cuvier & Valenciennes), 1831

[?] *Eleginus bursinus* Cuvier & Valenciennes, 1830, Hist. Nat. Poiss., V: 161. Type locality: Port Jackson, New South Wales (Quoy & Gaimard).

Aphritis urvillii Cuvier & Valenciennes, 1831, Hist. Nat. Poiss., VIII: 484, pl. CCXLIII. Type locality not specified [= Tasmania; McCulloch (1929)].

Pseudaphritis bassii Castlenau, 1872, *Proc. Zool. Acclim. Soc. Vict.*, 1: 72. Type locality: Bass Strait.

Aphritis urvillii (Cuvier & Valenciennes). Johnston, 1883, *Pap. Proc. Roy. Soc. Tasm.*, 1882: 116.

Uphritis urvillii (Cuvier & Valenciennes). Johnston, 1891, *Pap. Proc. Roy. Soc. Tasm.*, 1890: 25, 33 (4, 12 of reprint).

Aphritis bassii (Castlenau). Ogilby, 1890, Rec. *Aust. Mus.*, I, ii: 68.

Pseudaphritis urvillii (Cuvier & Valenciennes). Ogilby, 1898, *Proc. Linn. Soc. N.S.W.*, XXII, iii: 554. Waite, 1923, Fish. S. Aust.: 164, fig. on p. 164. Lord & Scott, 1924, Vert. Anim. Tasm.: 78. McCulloch, 1929, *Mem. Aust. Mus.*, V, iii: 337.

Character of first dorsal.—Neither the 1831 figure—for nearly a century the only published illustration; reproduced in various Australian works, *e.g.*, Waite (1923)—nor the improved figure (based on a Tasmanian specimen 215 long) offered by Waite (1924) represents correctly the character of the first dorsal as found in two individuals, (*a*) *Ls* 75·0, *Lt* 89·5, (*b*) *Ls* 80·5, *Lt* 96·0, trapped in The Arm, George's Bay, Cornwall, on 17th January, 1953. As there depicted, first dorsal ends sheerly at its last spine, without posterior connection of that spine by membrane with dorsum; the clear interdorsal exceeding length of last dorsal spine, and being equal to about two-thirds of first dorsal base. In both our examples the first dorsal (but no other vertical fin) is broadly connected behind with body by membrane. In (*b*), of a total fin base of 12·1, 4·0 (which is subequal to eye) lies caudad of last spine: at the same time, the distance from end of membrane to second dorsal ray is found to be equal to spinous dorsal base, while in the illustrations the latter is subequal to distance from end of last spine to second ray. Subsequent examination of a number of specimens from the North Esk (near Launceston, on Cornwall-Dorset border), in which river, after an absence of two or three decades, this species suddenly appeared in abundance in 1957-58, establishes the fact that this postdorsal membrane attachment is a normal feature.

General observations.—Other points in which our specimens differ from these illustrations are: (i) in strict lateral view, eye cuts dorsal profile (this circumstance is associated with the characteristic flattening of the top of the skull, from which derives a vernacular name of River Flathead); (ii) lateral line is throughout closer to dorsal profile than in either figure; at level of termination of soft dorsal being 2½, 3 (*cf.* figures, < 2) times as far from ventral as from dorsal profile; (iii) caudad of end of second dorsal lateral line turns downwards. Ogilby (1890: 69) observes upper and hinder margins of maxilla form a right angle; this is generally true, but does not apply to right maxilla of (*b*): 'preopercle entire'; in our specimens delicately crenulated. In our fish, as in that figured by Waite, adpressed pectoral fails to reach level of anal origin.

D. VII + 20; VII + 19. A.11, 21; 11, 22. (former falls below recognised minimum). C. 14 P.18; 17. L.lat. 63; 65 (to hypural joint + 7 - 10 tubules (the anterior on normally formed scales) extending nearly half length of caudal.

Family SCORPAENIDAE

With *Glyptauchen* Günther, 1860 included in the Scorpaenidae [as in Waite (1923), McCulloch (1927); not McCulloch (1929) (Synancejidae), Whitley (1931) (Glyptauchenidae)] ten members of the family are reported from Tasmania: (*a*) *Scorpaena* Linné, 1758, (1) *S. ergastulorum* Richardson, 1842 [appears in local list of Lord & Scott as *S. cruenta* Richardson, 1842: see Scott (1942 *b*)], (2) *S. cardinalis* Richardson, 1842; (*b*) *Helicolenus* Goode & Bean, 1895, (3) *H. papillosus* (Bloch & Schneider), 1801 (*c*) *Neosebastes* Guichenot 1867, (4) *N. scorpaenoides* Guichenot, 1867, (5) *N. panda* (Richardson), 1842; (6) *N. thetidis* (Waite), 1899, (7) *N. nigropunctatus* McCulloch, 1915; (*d*) *Centropogon* Günther, 1860, (8) *C. australis* (White), 1790; (*e*) *Gymnapistes* Swainson, 1839, (9) *G. marmorata* (Cuvier & Valenciennes), 1829; (*f*) *Glyptauchen* Günther, 1860, (10) *G. panduratus* (Richardson), 1850.

Of these, (4), (6), 7), (8) are not accredited to Tasmania in the Check List. For (4) see Lord & Scott (1924: 84); for (6) see Scott (1942: 51). No. (8) is not given by Johnston (1891), and apart from the reports of Lord (1922: 71) and Lord & Scott (1924: 85) it has not been recorded south of New South Wales: confirmation of its occurrence in this State would seem to be desirable [especially as confusion has arisen elsewhere between this species and (9)].

Names used in the Check List have for convenience been retained in the key: however, Whitley regards the eastern Australian form of *Glyptauchen* which has in general been regarded as monotypic, as specifically distinct from the typical *G. panduratus* from Western Australia (type locality, King George's Sound), and has described it under the name of *G. insidiator,* with a Tasmanian subspecies *G. i. mirandus.*

KEY TO SCORPAENIDAE RECORDED FROM TASMANIA

A. Body wholly or largely scaly.

B. Dorsal spines < 15 (12-13). Length > 200 (modally 250-450).

C. Dorsal spines 12. Base of 2nd dorsal > ½ base of 1st dorsal.

D. Bony stay of cheek with several spines (2 spines from preorbital overhanging maxillary). Lower part of operculum naked. Pectoral with some rays simple; fin not cut square across upper rays.

E. Scales in a row beneath lateral line ⩽ 45. Longest dorsal spine > ½ head. 11th dorsal spine > ½ 12th .... *Scorpaena cruenta*

EE. Scales in a row beneath lateral line > 45 (50-60). Longest dorsal spine ⩽ ½ head. 11th dorsal spine < ½ 12th .... *Scorpaena cardinalis*

DD. Bony stay of cheek without spines. Lower part of operculum scaly. Pectoral with 8 lower rays simple; fin cut square across upper rays .... *Helicolenus papillosus*

CC. Dorsal spines 13. Base of 2nd dorsal < ½ base of 1st dorsal.

F. Deep naked groove on nape. Adpressed pectoral reaches about to level of anal termination. Base of 2nd dorsal ≑ 2 length of caudal peduncle. L.lat. > 50 (≑ 58) .... *Neosebastes panda*

FF. No deep naked groove on nape. Adpressed pectoral reaches, or fails to reach, level of anal origin. Base of 2nd dorsal < 2 (≑ 1) length of caudal peduncle. L.lat. < 50.

G. L.lat. > 40 (≑ 48). 2nd dorsal spine > 3rd Pectoral satisfies 2 conditions: ray tips form even curve; no incision of membrane between adjoining lower rays .... *Neosebastes scorpaenoides*

GG. L.lat. < 40 (35-38). 2nd dorsal spine < 3rd Pectoral does not satisfy both the specified conditions.

H. Curve formed by ray tips of pectoral even: incision of membrane between adjoining lower rays considerable. 12th dorsal spine > ½ 1st dorsal spine. Membrane from 2nd dorsal spine attached to 3rd below middle of latter. Body with several large black blotches; not with numerous small black dots. L.lat. 38 .... *Neosebastes thetidis*

HH. Curve formed by ray tips of pectoral sharply embayed near middle: incision of membrane between adjoining rays slight. 12th dorsal spine < ½ 1st dorsal spine. Membrane from 2nd dorsal spine attached to 3rd above middle of latter. Body without large black blotches (may have indistinct brown blotches); with numerous small black dots. L.lat. 35 .... *Neosebastes nigropunctatus*

BB. Dorsal spines ⩾ 15 (15-17). Length < 200 (modally 150).

I. A broad deep hollow on nape. Dorsal begins behind posterior border of eye (by ⩾ length of 1st dorsal spine). 2nd dorsal spine < (≑ 2/3 of) 7th dorsal spine. Anal base > (2-3 times) length of caudal peduncle. Dorsal spines 17 .... *Glyptauchen panduratus*

II. No broad deep hollow on nape. Dorsal begins at posterior border of eye. 2nd dorsal spine > (≑ 1½ times) 7th dorsal spine. Anal base ⩽ length of caudal peduncle. Dorsal spines 15-16 .... *Centropogon australis*

AA. Body scaleless .... *Gymnapistes marmorata*

Genus **Gymnapistes** Swainson, 1839

Gmnapistes marmorata (Cuvier & Valenciennes), 1829.

Apistus marmoratus Cuvier & Valenciennes, 1829, Hist. Nat. Poiss., IV: 416. Type locality: 'Timor' (Péron). [Check List suggests 'probably = West Australia'].

Apistus tasmaniensis Gray, 1838, *Ann. Mag. Nat. Hist.*, I: 111. Type locality: Van Diemen's Land (Gunn).

Pentaroge marmorata (Cuvier & Valenciennes). Günther, 1860, Cat. Fish. Brit. Mus., II: 132. Johnston, 1883, *Pap. Proc. Roy. Soc. Tasm.*, 1882: 115. McCulloch, 1915, Biol. Res. Endeavour, III, 3: 161, pl. XXXVI, fig. 2. Lord 1923, *Pap. Proc. Roy. Soc. Tasm.*, 1922: :71. Lord & Scott, 1929, Synop. Vert. Anim. Tasm.: 85.

Gymnapistes marmorata (Cuvier & Valenciennes). McCulloch, 1929, *Mem. Aust. Mus.*, V, iii: 338.

Material.—This widely spread Australian (Australasian ?) naked species—which has often been involved in confusion with the ecologically and morphologically similar scaled *Centropogon australis* see, *e.g.*, McCulloch (1915, 1927), Waite (1923)—has had a long local history, with Tasmania figuring as type locality of Gray's synonymic *G. tasmaniensis*: listed—*fide* Johnston (1883)—in Allport MS. The present observations are based on two specimens trapped in The Arm, George's Bay, Cornwall, on 18th January, 1953: (*a*) *Ls* 101·3, *Lt* 122·0; (*b*) *Ls* 105·5, *Lt* 130·0 (clearly of same year class: *V* for *Ls, Lt* 2·0, 3·2).

Variation.—The standard figure is that by McCulloch (1915, pl. XXXVI, fig. 2), based on an individual 137 long from Swan River, Western Australia. Comparison of our material with this illustration and with various descriptions reveals the following differences. (i) The spinous dorsal is usually said to range from (and is by McCulloch expressly limited to) XII to XIII, with the rayed constant at 10: specimen *a*, with XII, 10 conforms to these specifications, but *b*, with XI, 9, falls below admitted minimum for both parts of fin (and, in respect of spine-number, actually transgresses the generic limit). (ii) In *b* the first anal ray, like the last, is split almost to base, giving a ray total, on the usual conventions, of 5 only, instead of the normal 6. (iii) The generic character of union of pelvic with body by a fold of membrane is indicated in McCullochs figure, but the extent of the junction as there shown is quite insignificant in comparison with that found in our specimens, in which the fold is traceable caudad of tip of adpressed fin, its line of attachment extending behind base of 5th pelvic ray by 21, 20. (iv) Both dorsal and anal are much more broadly connected by membrane to peduncle than in the illustration, termination of anal membrane occurring caudad of last anal ray by 18·5, 14, a distance exceeding interval between first and last anal rays. (v) The cephalic spines, which are known to be variable in size, are much longer in our material than in McCulloch's, preorbital extending beyond eye, preopercular to level of pectoral origin. (vi) Length of 2nd anal slightly exceeds length of pelvic spine, and is somewhat greater than (figure, about 0·9 of) height of erected dorsal: with anal lowered, spine extends caudad of base of last ray by a distance subequal to width of free end of maxilla. (vii) Longest dorsal spine is 4th (figure, 3rd), its length exceeding (figure, 3rd about 0·9 of) combined eye and snout. These differences (of which (vii) is most likely to be of systematic significance) are certainly not of specific value: as possible pointers to subspecific differentiation their significance could be determined only by examination of further material from both sources.

General features.—At middle of caudal peduncle lateral line is (*a*) a little nearer to, or (*b*) much further from, dorsal than ventral profile. Beyond hypural it turns rather abruptly (but even in same specimen to a variable extent) upwards, continuing with one or two tubules on to fin base. Tubules total 30, 29, of which 12-13 are preanal. Mandibular tooth band almost constant in width through anterior two-thirds of length, thereafter narrowing to a point: at symphysis bands contiguous internally only. Bands in upper jaws narrowing evenly backwards; separated anteriorly by a distance subequal to anterior width of band. Palatine band similar to premaxillary band, but about one-third shorter and narrower. Vomerine teeth a subtriangular patch in *a*, a ∧-shaped set in *b*. Gill-rakers on lower limb of anterior arch 9; lobate, anteroposteriorly compressed in middle, more mound-like at ends, of series; inferior ones delicately spinigerous. From base of main preopercular spine (below which, along preopercular border, are four small spines, progressively less pungent inferiorly) conspicuous ridge extending forward to lowest point of orbit. A pair of prone supranarial spines, slightly convergent posteriorly. Median interobital groove deeper, at its middle narrower, than curved lateral grooves.

Coloration.—McCulloch (1915: 161) observes the markings 'differ very much in the different specimens from various localities, both in form and intensity, though their disposition is much the same in all; in some the larger dark blotches are brown, and surounded by more or less abundant marking, whilst in others they are deep black on a plain white ground'. Neither this, Macleay's (1880) 'dirty yellowish, largely marbled with brown', Waite's (1923) 'greyish yellow marbled with brown' nor any of the more familiar accounts conveys the slightest idea of the variety of the richness of the colours in life. The mosaic character and the irregularity in location and extent of the minor pattern elements are such as to render impracticable their specification in the space here available: as some indication of their mere diversity, however, it may be recorded that the George's Bay specimens exhibited, among others, the following features: ground colours of pale and medium grey, greenish grey, green, greenish gold, flesh, flesh tinted with gold, pure white (belly), dark greenish (occiput), silver faintly gilded; mottlings on head and body of warm brown (some patches with darker edges, some golden peripherally), blackish, golden brown, gold, reddish, green, green somewhat silvered, olivaceous, pink; line of rich purple (above upper lip in *a*); fin membranes greyish, white, greenish, pale greenish tinged with red, reddish, dusky, pinkish fawn, hyaline; markings on fins cloudings or patches of blackish, golden brown, reddish brown, pale orange, iridescent green (small patches on pectoral of *a*), two pale violet markings simulating hypurals (base of caudal of *a*), bars of blackish, imperfect bars of green (across caudal of *a*).

Behaviour.—The fish were caught in a wire trap, the diameter of the mouth of which barely exceeded one inch. It is not easy to see how they effected their entry, their maximum depths with dorsals erect being 48·5, and with dorsals lowered 31, 32·5. One individual obstinately refused for a considerable time to enter a jar the internal diameter of the mouth of which of which was 52·5. When observed in the trap, both specimens had the cephalic spines erected, the axis of the preorbital dagger being almost normal to cheek: at death spines reclined against head. While the fish were being extricated from the trap, the spines became entangled several times in the wire netting.

Vernacular name.—Lord & Scott, in agreement with Johnston (1891), head their account of this species 'Soldier (of Tasmania)', and call attention to the use in South Australia of the term 'Cobbler'. I found the name in familiar use among boys at St Helens was Cobbler.

Family ALUTERIDAE

Of the forty-eight Australian species set out in the Check List twelve, representing two genera, are credited to Tasmania: (*a*) *Meuschenia* Whitley, 1929, (1) *M. hippocrepis* (Quoy & Gaimard), 1824; (2) *M. convexirostris* (Günther), 1870; (3) *M. trachylepis* (Günther), 1870; (4) *M. maculosa* (Richardson), 1840 [type locality, Port Arthur (Pembroke) Tasmania]; (*b*) *Cantherhines* Swainson, 1839; (5) *G. güntheri* (Macleay), 1881; (6) *C. brownii* (Richardson), 1846; (7) *C. spilomelanurus* (Quoy & Gaimard), 1824 [the synonymic *Aluterius paragaudatus* Richardson, 1846 has Port Arthur, Tasmania and Port Jackson, New South Wales as type localities]; (8) *C. granulatus* (White), 1790; (9) *C. australis* (Donovan), 1824 [type locality, Van Diemen's Land: the synonymic *Monacanthus rudis* Richardson, 1844 has Port Arthur, Tasmania as type locality]; (10) *C. melas* (Günther), 1876 [Tasmania (Allport): endemic]; (11) *C. peroni* (Hollard), 1854 [type locality, 'Des terres australes' (Péron): Check List comments 'probably Tasmania']; (12) *C. gunnii* (Günther), 1870 [type locality, Tasmania: endemic]: also one species of *Aluterus* Cloquet, 1816, (13) *A. monoceros* (Linné), 1758, is recorded (*fide* Schmeltz) from Bass Strait.

Lord & Scott (1924) omit (3), (6), (8), [and (13], listing (9) as *Cantherines rudis*: they add (14) *C. mosaicus* (Ramsay & Ogilby), 1886 and one species of *Brachaluteres* Bleeker, 1866, (15) *B. trossulus* (Richardson), 1846. No specific records are given by these authors.

Records are given below of (16) *C. setosus* (Waite), 1899, a formal addition to the local list.

Since the appearance of the Check List most of our leatherjackets have been relegated to other genera of later or earlier date. In the key I have accepted generic attributions adopted in the synopsis by Fraser-Brunner (1941). This refers (1), (2), (9), (10), (16) to *Navodon* Whitley, 1930; (4) (not noticed by Fraser-Brunner), (5), (6), (7), (11), (12) to *Acanthaluteres* Bleeker, 1866; (8) to *Scobinichthys* Whitley, 1931; (14) to *Eubalichthys* Whitley, 1930: (3), (15) remain in *Meuschenia, Brachaluteres,* respectively; while on the vexed question (Whitley, 1929: 141) of the origin and form of the generic name for (13) (in Check List attributed to Cloquet, 1816 as *Aluterus*), Fraser-Brunner adopts *Alutera* (Cuvier) Oken, 1817. However, it should be observed that *Navodon* as thus defined by Fraser-Brunner is decidedly wider in scope than envisaged by its founder, and in at least one feature ('caudal spines often present' in subgenus *Navodon*) is in direct conflict with the original diagnosis ('no spines or bristles on caudal peduncle').

When providing synopses of the New South Wales and South Australian leatherjackets both McCulloch (1927) and Waite (1923) found it necessary to omit various imperfectly characterized species described last century. The restricted character of such diagnoses certainly poses difficulties for the keymaker: at times, even generic attributions may be uncertain—thus Whitley (1929) considers it probable (4) belongs to his genus *Meuschenia* (with spines on side of tail), while McCulloch (1927) suggests it may be merely a sexual form of (7), a species lacking such spines. In the key set out below an attempt has been made to cope with the position as fully as is practicable by entering two species for which basic data is wanting each at two points: it should be borne in mind, however, that the whole identificatory apparatus necessarily remains, at least in respect of some early species, at best somewhat provisional.

KEY TO ALUTERIDAE RECORDED FROM TASMANIA; AND *Aluterus monoceros* (Linné) RECORDED FROM BASS STRAIT

Dorsal fin formula records rays only: 'dorsal spine' means sole, or main, dorsal spine. In specific diagnoses the following items are regularly given in sequence [N.D., no data available: any additional special data given in parentheses at end]. Number of dorsal rays. Number of anal rays. Dorsal spine: shape; insertion relative to eye; length. Upper profile of snout. Location of gill opening relative to eye. Nature of pubic spine. Coloration. Modal standard length.

(Two species of uncertain affinity appear twice in key: see text).

A. Dorsal rays $>$ 45. Anal rays $>$ 45.

46-48. 48-53. Proconvex; before middle; 2-3 in snout. Half, or more, in advance of anterior border. No spine. Brown or black; fins yellow. 375. (Dorsal spine weak, without barbs: gill opening more nearly horizontal than vertical) .... *Aluterus monoceros*

AA. Dorsal rays $<$ 45. Anal rays $<$ 45.

B. Pubic bone without terminal spine or spines. Dorsal spines without rows of barbs; normally with flexible bristles. Dorsal and anal rays together $<$ 56. *Ls* modally $<$ 100.

24-28. 22-26. Proconvex; before middle; $\doteq$ snout. Partly concave or straight. Wholly, or mainly, behind posterior border. No spine. Dark green; with darker specks, and blue or white markings that tend to form line (or lines) along ventral contour. 90 .... *Brachaluteres trossulus*

BB. Pubic spine with terminal spine or spines (may be hidden below skin). Dorsal spine with rows (2 or 4) of barbs; normally without flexible bristles. Dorsal and anal rays together $>$ 56. *Ls* modally $>$ 100.

C. Depth at origin of second dorsal $\geqslant$ *Ls*; $\doteq$ distance from tip of snout to origin of second dorsal. Distance between first rays of dorsal and anal $>$ 4 distance between last rays of these fins. Colour pattern (which may become obscure or lost in adult) including contiguous hexagonal markings of blue.

35-36. 32-34. Proconvex; at or in advance of middle; $1\frac{1}{2}$ in snout. Concave or straight. Below. Very small, with a few spinules. Reddish or yellowish; with blue wavy lines, some joined to form contiguous hexagons, which often include brown blotch (markings may be lost in adult). 460 .... *Eubalichthys mosaicus*

CC. Depth at origin of second dorsal $<$ $\frac{1}{2}$ *Ls*; $<$ (usually $1\frac{1}{2}$-2 in) distance from tip of snout to origin of second dorsal. Distance between first rays of dorsal and anal $<$ 4 (usually 2-3) distance between last rays of these fins. Colour pattern not including contiguous hexagonal markings of blue.

D. Spines (larger than ordinary spines on scales) present on sides of tail (bristles also may be present).

E. Dorsal rays $\leqslant$ 33. Anal rays $\leqslant$ 31. Dorsal spine four-edged, edges equidistant, each with barbs.

F. Colour pattern including blue dots.

32-33. 30-31. Straight; behind middle; $1\frac{1}{2}$ in snout. Convex. Partly in advance of anterior border. Not visible, or very small. Greenish; blue dots on tail and posterior part of trunk, oblique and longitudinal lines on head and anterior part of trunk. 300. (Adult with two pairs of strong straight conical spines, and some short bristles, on each side of tail) .... *Acanthaluteres brownii*

FF. Colour pattern not including blue dots.

29-33. 29-30. Two linear segments at obtuse angle; proximal being half distal, or less; behind middle; $1\frac{3}{4}$ in snout. Straight or concave. Below. Very small, very feebly armed. Brownish or greenish with darker spots; caudal with one or two dark cross-bars. 150. (Caudal pointed). *See also* MM .... *Acanthaluteres maculosus*

EE. Dorsal rays > 33. Anal rays > 31. Dorsal spine not four-edged; anterior series of spines smaller, and decidedly closer together, than posterior series.

G. Colour pattern including blue lines and/or blue spots.

H. Two pairs of spines on each side of tail. Giill opening below, or partly below and partly behind, eye. Spinules on skin in groups of 2-5.

36-39. 33-35. Nearly straight; above middle; 1 1/5 in head. Straight. From middle to, or beyond, posterior border. Very small, with short radial spikes. Brownish or blackish; blue spots along bases of dorsal, anal, caudal; vertical fins yellow or orange. 200. (Spines on tail strong, compressed, bent forward) .... *Meuschenia trachylepis*

HH. Three (sometimes two) pairs of spines on each side of tail. Gill opening partly in advance of eye. Spinules on skin not in groups, equidistant.

35-39. 33-37. Proconvex; behind middle; $1\frac{3}{4}$-2 in head. Convex. To, or in advance of, anterior border. Evident. Olive green above, lighter below, blue lines and spots; typically, horseshoe-haped blackish markings in yellow patch behind pectoral. 460 .... *Navodon hippocrepis*

GG. Colour pattern not including blue lines and/or blue spots.

34-37. 32-35. N.D.; behind middle; much shorter than head. Convex. Partly in advance of anterior border. Small, prominent, with barbs. Greyish; uniform, or clouded with darker. 230. (Small spiny, very distinct scales). *See also* PP .... *Navodon convexirostris*

DD. No spines (larger than ordinary spines on scales) present on sides of tail (bristles may be present).

I. Four series of barbs on dorsal spine.

J. Dorsal spine four-edged, edges equidistant, each with barbs.

K. Length of caudal peduncle < ($\frac{1}{2}$-$\frac{1}{3}$ of) interdorsal, $\geqslant$ 2 in snout.

L. Colour pattern including blue spots and streaks; no pronounced dark bars across caudal. Dorsal spine long, tapering throughout whole length.

33-35. 32-33. Straight or slightly proconcave, tapering; behind middle; $1\frac{1}{2}$ in snout. Straight or slightly concave. Below. Very short. Brownish yellow; with blue spots and streaks; a blue area, with brown spots and streaks, above anal base. 300. (Toothbrush-like patch of bristles on each side of tail in adult male) .... *Acanthaluteres güntheri*

LL. Colour pattern not including blue spots or streaks; two or more narrow dark bars across caudal. Dorsal spine short, subequal in diameter throughout most of its length.

32-34. 31-33. Straight; behind middle; 2 in snout. Sigmoid. Below. Prominent, covered with spinules. Yellowish brown; dark brown markings that may form bars; dorsal spine blackish; caudal with two or more dark cross bars. 320. (Toothbrush-like patch of bristles on each side of tail in adult male) .... *Acanthaluteres peroni*

KK. Length of caudal peduncle ≑ interdorsal, < 2 (about $1\frac{1}{2}$) in snout.

M. Colour pattern including blue lines. Caudal rounded.
30-32. 28-32. Slightly proconvex behind middle; 2 in snout. Sigmoid. Below. Obsolete. Brownish green; two black-edged blue lines from chin, one through eye, one to pectoral base; dark line from eye to eye, over snout; caudal with dark cross bar. 200. (Large specimens, probably males, with tooth-brush-like patch of bristles on each side of tail) .... *Acanthaluteres spilomelanurus*

MM. Colour pattern not including blue lines. Caudal pointed.
29-33. 29-30. Two linear segments at obtuse angle, proximal half distal, or less; behind middle; $1\frac{3}{4}$ in snout. Straight or concave. Below. Very small, feebly armed. Brownish or greenish; with darker spots; caudal with one or two dark cross bars. 150. *See also* FF .... *Acanthaluteres maculosus*

JJ. Dorsal spine not four-edged; anterior barbs smaller, and if in rows decidedly closer together, than posterior series.

N. Anal rays > 30.

O. Dorsal spine long, < 2 in head, slender. Dorsal profile of snout convex.

P. Anal fin, dorsal spine black. Skin velvety, without distinct scales.
34. 34. N.D.; behind middle; $1\frac{1}{2}$ in head. Very convex. Partly in advance of anterior border. Small. Brownish black; two whitish bars across chin; dorsal spine black; caudal black, other fins light-coloured. 350 .... *Navodon melas*

PP. Anal fin, dorsal spine not black. Skin with spiny, very distinct scales.
34-37. 32-35. N.D.; behind middle; much shorter than head. Convex. Partly in advance of anterior border. Small, prominent, with barbs. Greyish; uniform, or clouded with darker. 230. *See also* GG .... *Navodon convexirostris*

OO. Dorsal spine short, > 2 in head, stout. Dorsal profile of snout straight or concave.
34. 33. N.D.; behind middle; N.D. ('strong'). Straight or concave. Largely in advance of anterior border. Small, with spines pointing forward and backward. Dark brown; mottled with black. 275 .... *Acanthaluteres gunnii*

NN. Anal rays < 30.
30. 28-29. Proconvex; at middle; ⩾ snout. Concave or sigmoid. To, or beyond, posterior border. Very short. Brownish grey; marbled darker; papillae may be whitish. 225. (Large pubic flap; each scale with one truncate spine) .... *Scobinichthys granulatus*

II. Two series of barbs on dorsal spine.

Q. Spinules on scales slender, acuminate, mostly curved. Dorsal profile of snout straight or concave. Pubic spine conspicuous.
33-35. 31-36. Proconvex; behind middle; ≑ snout. Straight or concave. Below. Conspicuous, characteristically with 8 spinules. Light greenish; darker cloudy markings on body, rather obscure oblique dark bars from snout, chin, throat, towards eye, dorsal and anal yellow, caudal usually with blackish curved inframarginal bar. 280 .... *Navodon setosus*

QQ. Spinules on scales stout, obtuse, straight. Dorsal profile of snout convex or straight. Pubic spine inconspicuous.
34-37. 34-36. Proconvex; behind middle; 4/5 snout. Convex or straight. Partly (? wholly, Saville Kent, 1897) behind. Small, 'studded with obtuse grains'. Brown; uniform, or with four indistinct whitish longitudinal bands, caudal with broad blackish margin. 225. (In breeding male, browns and whites replaced by blues and yellows) .... *Navodon australis*

Genus **Navodon** Whitley, 1931

Navodon setosus (Waite), 1899

(Text figure 1)

Monocanthus setosus Waite, 1899, *Mem. Aust. Mus.*, IV, i: 91, pl. XVI. Type locality: Off Wollongong, New South Wales; 63-75 fathoms.
Pseudomonacanthus setosus (Waite). Waite, 1904, *Mem. N.S.W. Nat. Club*, II: 56.
Cantherines setosus (Waite). Waite & McCulloch, 1915, *Trans. Roy. Soc. S. Aust.*, XXXIX: 472, pl. XIV.
Cantherhines setosus (Waite). McCulloch, 1929, *Mem. Aust. Mus.*, V, iii: 419.
Navodon setosus (Waite). Whitley, 1931, *Rec. Aust. Mus.*, XVIII, 3: 123. Fraser-Brunner, 1941, *Ann. Mag. Nat. Hist.* (11), 8, 45: 185.

Tasmanian records.—The only State recognized in the Check List is New South Wales. However, Waite & McCulloch (1915: 473) report examples from *Simplon* stations 2 (Lat. 32° 36′ S., Long., 129° 54′ E.) in 22 fms., and 8 (Lat. 34° 46′ S., Long. 133° 10′ E.) in 72 fms.; from between Port Hacking and Wollongong, New South Wales (50-70 fms.), east of Babel Island, Bass Strait (40-100 fms.), and off the Investigator Group, South Australia (37 fms.): they give the distribution as 'moderately deep water off the southern portion of New South Wales, Victoria, Tasmania, and South Australia'. Specimens from Bass Strait have been noted also by Whitley (1931). The species does not appear in any local list, and there do not seem to be any definite Tasmanian records. I have examined two juveniles (*a*) *Ls* 78·3 (fig. 1A), (*b*) *Ls* 80·5, washed up at Bicheno, Glamorgan, about May, 1955.

Mrs. C. Gray, the owner of these specimens, informs me that at the time they were collected the local beaches were strewn with hundreds of example of comparable size; while fishermen reported the presence of thousands floating on the surface for several miles out from shore. The cause of death is unknown: mass mortality of this sort has been associated elsewhere with various factors, including seismic disturbance, submarine discharge of poisonous gases, and (*e.g.*, Smith, 1959: 8) sudden decrease in temperature (for instance as the outcome of a local upwelling of cold deep water).

Fin counts; body proportions.—D. I + 36, I + 30 + (imperfect). A.36, 33. P.15, ?. C.12, 12. Some general proportions, expressed as thousandths of *Ls*, are set out in Table II: no detailed dimensions of this species have hitherto been published.

TABLE II

Navodon setosus (Waite), 1899. *Dimensions of Two Tasmanian Specimens from Bicheno, Glamorgan.* Actual measurements in millimetres in first line: all other dimensions expressed as thousandths of standard length.

Dimension	Specimen *a*		Specimen *b*	
Standard length, total length	78·3,	105·1	80·5,	imp.
Gill opening: length to front, to back	298,	331	278,	326
Gill opening: oblique length, direct distance from orbit	68,	55	85,	53
Eye: horizontal, vertical, diameter	109,	92	118,	89
Eye: direct distance from snout-tip, from second dorsal origin	234,	288	226,	302
Snout, interorbital	223,	102	206,	86
Posterior nostrils: internarial, direct distance from orbit	56,	36	58,	37
Vent: length to, direct distance from tip of pelvic spine	598,	151	610,	137
First dorsal: length to origin, to termination	285,	363	273,	368
Second dorsal: length to origin, to termination	608,	927	604,	916
Anal: length to origin, to termination	616,	944	591,	922
Pectoral: length to origin, length of fin	317,	155	311,	143
Length of dorsal spine, of longest dorsal ray	229,	163	imp.,	153
Length of longest anal ray, of longest pectoral ray	153,	152	124,	125
Length of pubic bone, of exposed pubic spine	447,	75	398,	67
Depth: at anterior, posterior, border of eye	397,	505	374,	466
Depth: at end of pubic spine, vent	603,	473	557,	465
Depth: at termination of second dorsal, caudal peduncle (min.)	148,	112	152,	104

Spines on fins.—These are not mentioned or figured in original account, though some are indicated on caudal rays (but not elsewhere) in Waite & McCulloch's plate. In these juveniles rays of second dorsal bear 4 series, mutually at right angles, of straight, slender, sharp, somewhat upwardly directed barbules, occurring on proximal one-third of most, and three-quarters of some, rays (*a*), or on more than half of most rays (*b*). Modally 16-18 barbules in a series, their length commonly two-thirds of, sometimes equal to, diameter of ray. On anal rays are similar series of barbules; those in plane of membrane extending two-thirds, exceptionally three-quarters, of inter-ray distance; some falcate; up to 24 in a series (fig. 1H). Proximal one-fourth of pectoral rays (up to beginning of flattening) with 4 series of very short spinules. All caudal rays are heavily beset with spinules. On broad face of ray (presented alternately to left and to right of fish in successive caudal rays) each internode in proximal portion of fin bears about 24 rows, each usually of 6 (occasionally 5) spinules; distally, internodes (which, except on outer rays, are twice as long as they are basally) each carry about 8 rows, each usually with 10 (up to 12) spinules—a single ray being armed with, in all, upwards of two thousand spinules. On 1st, 12th rays, which are unbranched, and basally on narrow faces of some other rays, spinules are less erect than on broad faces of branched rays. Scattered spinules occur also on caudal membrane, particularly proximally. For armature of dorsal spine see figs. 1 C, D, E: for pubic spine see figs. 1 J-M.

Other additions to original description.—(i) Waite notes: 'the teeth are damaged. There are three pairs in the lower jaw'. The complement is the family one, namely, in lower jaw 6 in a single series, in upper jaw 6 in an outer, 4 in an inner, series. In our specimens (fig. 1B), of the 3 mandibular pairs, 1st (most anterior) is highest, 2nd broadest, partly overlapped externally by 3rd: in upper jaw, of outer series 1st is longest, 3rd broadest and shortest; of inner series, 1st is represented in buccal view by a cusp, rising from posterior one-third of cutting edge, and having the appearance, on cursory examination, of being a narrow subcylindrical caniniform tooth wedged in between 1st and 2nd teeth of external series, while 2nd inner tooth makes a wider, but less elevated, appearance, without cusp, between 2nd and 3rd outer teeth. Innermost tooth in lower jaw is in contact with 1st and 2nd outer teeth, and 1st inner tooth of upper jaw. (ii) After death the elevated bases of the dorsal and anal may collapse (as in some other leatherjackets) to form a conspicuous furrow, marking the location of the second row of radials; the groove being bounded above and below by conspicuous ridges, of which the superior is constituted by the nodular third peterygiophores and the embracing dilated tips of the proximal ends of the lepidotrichia, while the inferior is the expanded upper end of the first pterygiophores. (iii) Myomeres *ca* 20, of which 6 are preanal. (iv) Pubic spine acts as a mast, to the whole length of which is attached a subtriangular (in dried fish, paper-thin, translucent) flap, narrowing back to vent; crossed by oblique lines constituted by ridges of scales, from which arise spinules, 2-6 on a scale, straighter, distinctly larger here than on most parts of body (fig. 1I). (v) Second dorsal spine (figs. 1 F, G) tumid above, broadly keeled below; with stout, upwardly concave median posterior odontoid process. (vi) In dry specimens upper end of gill opening comes to extend back to, or slightly caudad of, posterior orbital border. (vii) Anal originates below 3rd, 2nd dorsal ray. (viii) Dorsal terminates in advance of anal by 5 rays of latter.

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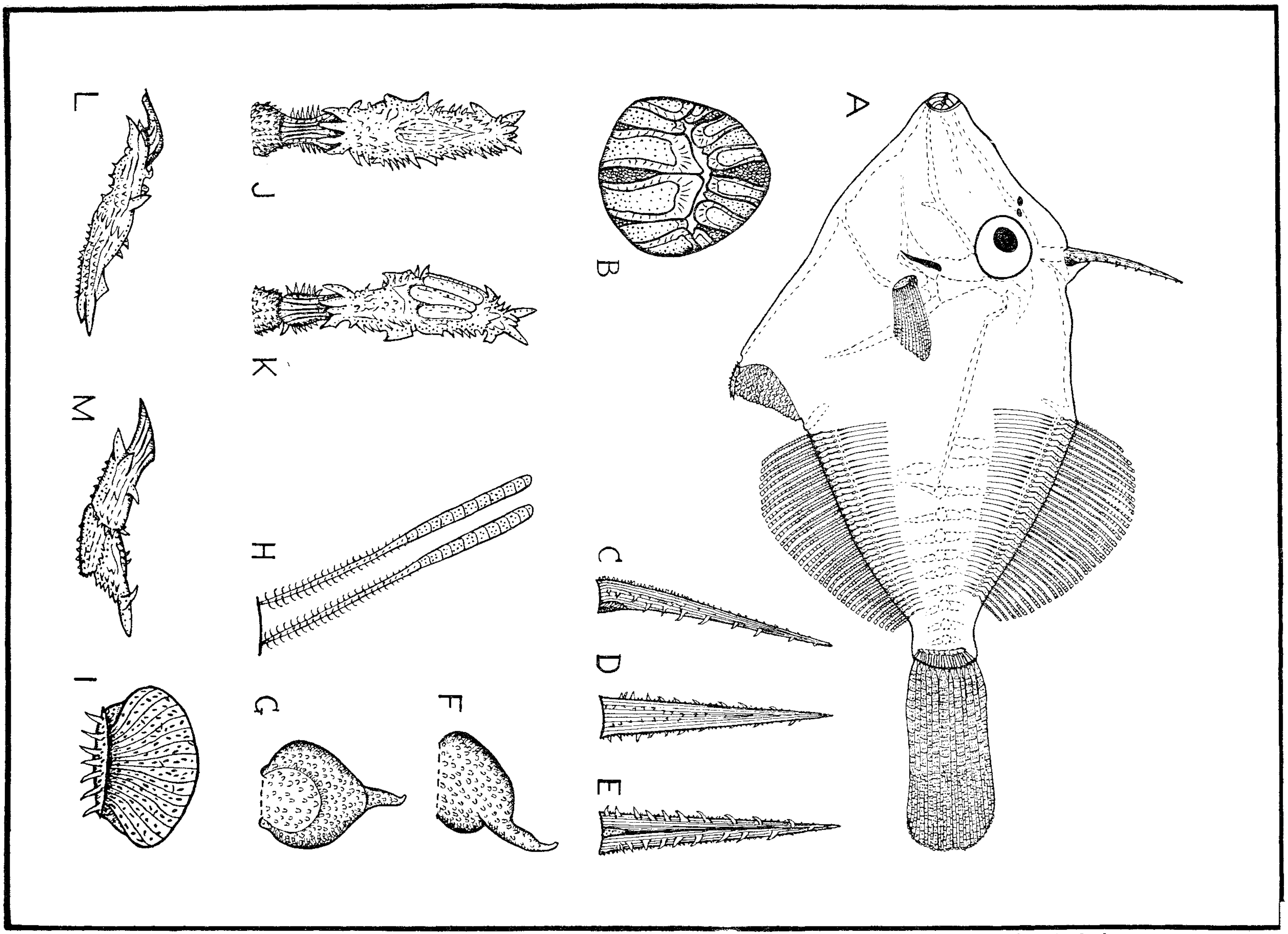

TEXT-FIGURE 1.—*Novodon setosus* (Waite), 1899. Two beach-dried juveniles from Bicheno, Glamorgan, Tasmania: standard length 78·3 (specimen *a*), 80·5 (specimen *b*). A, specimen *a*, × about 1 1/5: only scales indicated are the larger ones on the pubic flap. B, teeth, anterior aspect (reconstruction, based on *a* and *b*); × 7. C, D, E, first dorsal spine, lateral, anterior, posterior aspects (*a*); × 2. F, G, second dorsal spine, lateral, dorsal aspects (*b*); × 12. H, two consecutive anal rays (*b*) × 7. I, scale from pubic flap (*a*); × 14. J. K, pubic spine, lateral aspect (*a*, *b*); × 7. L, , pubic spine, ventral aspect (*a*, *b*); × 6.