

A REVISION OF THE TEMPERATE AUSTRALIAN
GOBIID (GOBIOIDEI) FISH GENUS *TASMANOGOBIOUS*
WITH A COMMENT ON THE GENUS *KIMBERLEYELEOTRIS*

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Abstract

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Two new species of the genus *Tasmanogobius* are described from Tasmania, Victoria and South Australia. The type species, *T. lordi*, known only from Tasmania, is redescribed. The three species are separated on the basis of fin-ray counts, colour and scale coverage. The species live in estuarine and sometimes freshwater environments, typically over mud or sand. At least one species occupies burrows. One species shows considerable variability in coloration and meristic features.

Introduction

Only a small percentage of gobioid fishes occurs in temperate regions. The largest concentration of gobioid genera, restricted to temperate regions, occurs in the north Pacific from California to Japan, Korea and China, with about 20 genera (of 270 recognised genera within the suborder) confined to this region. Few genera are restricted to temperate regions of South America and northern Europe. In Australia only three genera (*Nesogobius*, *Tasmanogobius* and the eleotridid *Thalasseleotris*) have their greatest concentration of species in extreme southern Australia (Victoria, Tasmania, South Australia and south-western Western Australia). Although about 30 of the 400 gobioid fishes known from Australia occur in this region, over half belong to widespread tropical Indo-Pacific genera, such as *Favonigobius* and *Pseudogobius*. These tropical genera have only one or two species each occurring in the region, although most of these species are restricted to temperate Australia.

The three species of *Tasmanogobius* are known only from Tasmania, Victoria and South Australia. Of the nine known species of *Nesogobius*, all occur in Victoria and only two range to New South Wales and Western Australia. Relationships of *Tasmanogobius* are uncertain, but the genus is superficially similar to the sympatric genus *Nesogobius*, which differs from the former in having 13 segmented caudal rays.

Hoese and Allen (1987) illustrated the papilla pattern of *Tasmanogobius lordi*. The captions had been mixed (incorrectly labelled *Kimber-*

leyeleotris hutchinsi). The correct figure for that species is illustrated here (Fig. 1). It should also be noted that the genus was incorrectly spelled as *Kimberleotris* on page 36 of the same publication.

Methods

Counts and measurements largely follow those given by Hubbs and Lagler (1958). The longitudinal scale count was taken from behind the pectoral base to the end of the caudal peduncle and is a count of scale rows, rather than a straight line count since the scales are irregularly developed anteriorly. In *Tasmanogobius* the anal spine and spine in the second dorsal fin may be present or absent. Total elements in these fins refers to rays and spine (if present). Vertebral counts were determined from radiographs and cleared and stained material and include the urostyle. In descriptions, data are presented as the count followed by its frequency in parentheses. The osteology was studied from trypsin-prepared cleared material stained with alizarin. Much of the material was in poor condition and data are given only from those specimens where accurate data could be obtained. The papilla patterns were drawn from well preserved material and cleared and stained material, using a camera lucida for basic drawings. The patterns are a composite of several specimens, since all papillae are rarely discernible on a single specimen. All fish sizes refer to standard length (SL). Sex was determined from the shape of the urogenital papilla.

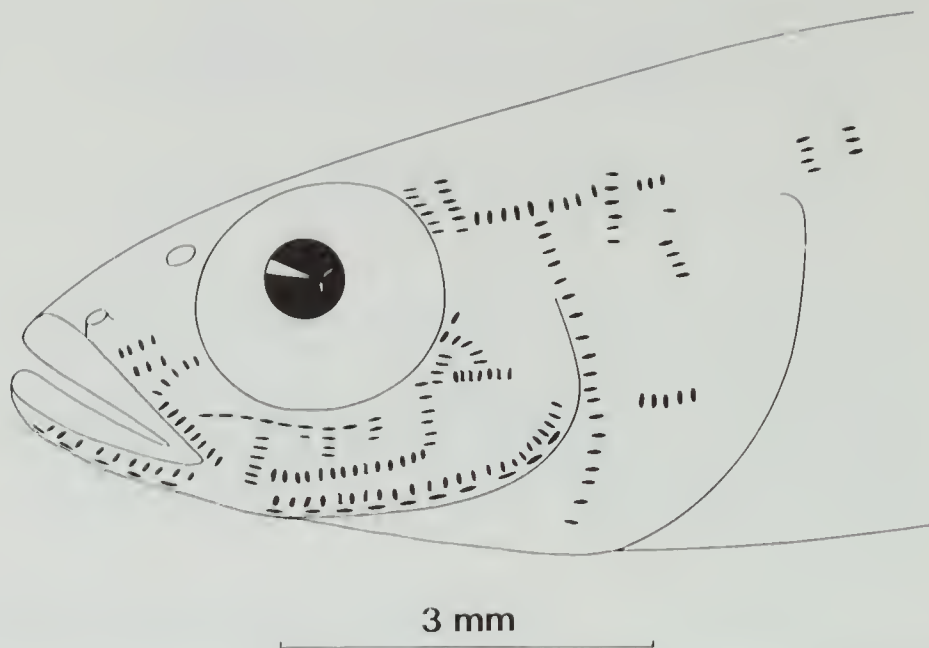


Figure 1. Head papilla pattern of *Kimberleyeleotris hutchinsi*, based on holotype and several paratypes.

The pterygiophore formula follows Birdsong (1975). The papilla pattern terminology follows Hoese (1983). The type of lines is designated by two letters, the first giving the orientation of the line (V = vertical, L = longitudinal, T = transverse) and the second the orientation of the papilla axes in relation to the axis of the line (L = axis along the papilla line, T = axis at right angles to axis of line).

Tasmanogobius

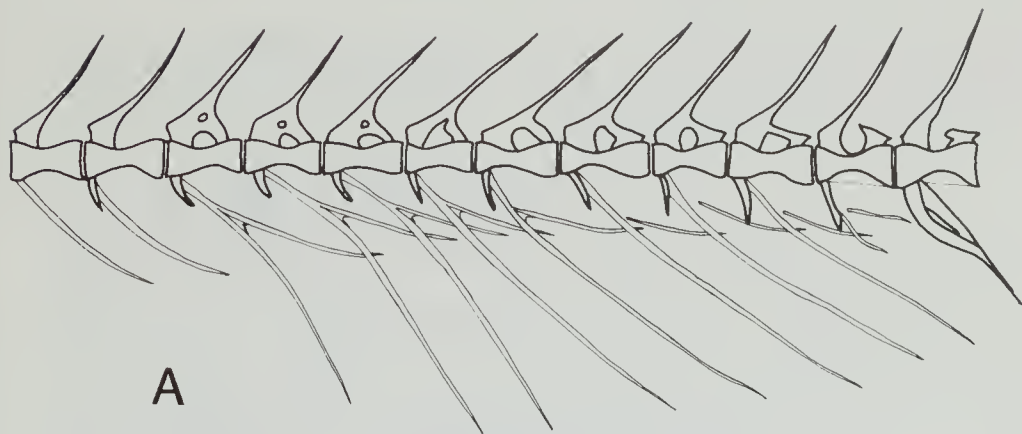
Diagnosis. General. Head more-or-less rounded. Snout rounded in dorsal view; steep in side view. Gill opening restricted to pectoral base. Rakers on inner face of first arch and other arches unossified, short and papillate. Pelvic fins fused into a large cup-shaped disc. Tongue tip truncate to slightly emarginate. Head canals, when present, fused between eyes. No anterior interorbital pore. Scales on sides of belly vertically elongate. Second dorsal and anal fins long based, much longer than caudal peduncle length. First dorsal spines VI-VIII; second dorsal elements 0-1, 13-16; anal elements 0-1, 12-16; pectoral fin-rays 16-21; segmented caudal rays 17; vertebrae 26-32.

Osteology. No bony connection between symplectic and preoperculum; metapterygoid

elongate without ventral process extending over quadrate; basihyal broad and spatulate; a single epural; neural arches reduced, without a posterior connection to centra (Fig. 2) in *T. lordi* and juveniles of other species, posterior connection of neural arch to central, when developed, usually confined to precaudal vertebrae; 2 pterygiophores precede first haemal arch.

Head Papilla Pattern. (Figs 3, 5 and 8). Cheek with 5 (in *T. lasti* and *T. gloveri*) or 6 (in *T. lordi*) VT lines extending ventrally from eye; second and third lines not reaching dorsally to eye; first, fourth and fifth (in *T. lasti* and *T. gloveri*) or fifth and sixth (in *T. lordi*) reaching eye; last 1 or 2 lines incomplete, interrupted by upper longitudinal (LT) line. Preopercular-mandibular series composed of an inner LL line and an outer LT line, both normally interrupted just below posterior end of jaws. Behind eye 2 transverse (TT) lines (in *T. lasti* and *T. gloveri*) or 1 (in *T. gloveri*); 2 longitudinal (LT) lines dorso-medial to transverse lines. Anteriorly on operculum a VT line dorsally disjunct from ventral VT line. LT line above dorsal margin of preoperculum and operculum, interrupted by 2 short transverse lines; short LL line developed above posterior-dorsal margin of operculum.

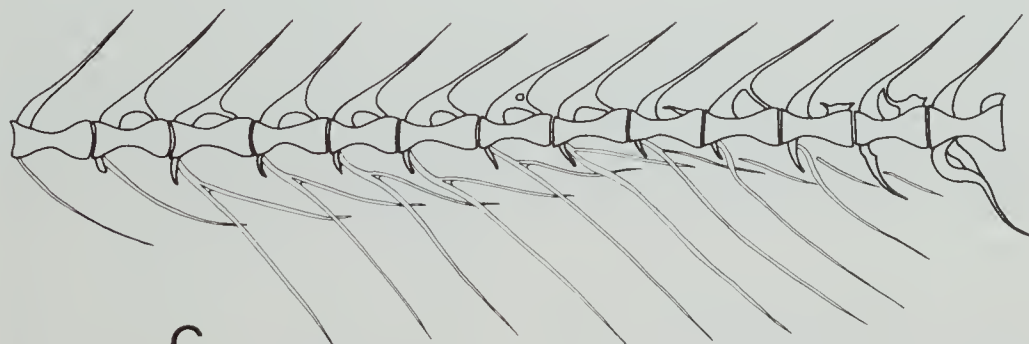
Remarks. Vertically elongate scales and reduc-



A



B



C

Figure 2. Section of vertebral column of 3 species of *Tasmanogobius*, based on cleared and stained specimens. A = *T. gloveri*, 26 mm SL; B = *T. lordi*, 27 mm SL; C = *T. lasti*, 21 mm SL.

tion of neural arches are also common to at least some species of *Nesogobius*.

Several meristic features of the species are given in Tables 1–5. Sexual dimorphism was

found only in the shape of the urogenital papilla. In males the papilla is slender and elongate, and in females it is short and rounded.

Key to species of *Tasmanogobius*

1. First dorsal fin VI; pectoral rays 19–21; total anal elements usually 12–13; body with a whitish longitudinal stripe, interrupted by short vertical bars *T. gloveri* sp. nov.
- First dorsal usually VII–VIII; pectoral rays 16–20 (rarely 20); total anal elements usually 14–15; body without stripe, but with thin vertical bars 2
2. Head pores present; first dorsal usually VIII; second dorsal and anal spine frequently present; body extensively scaled, scales usually continuous, sometimes broken into a patch behind pectoral fin and a second patch on body; posterior scales extending forward at least to just behind second dorsal origin *T. lasti* sp. nov.
- No head pores; first dorsal usually VII; second dorsal and anal spine rarely present; scales confined to a patch behind pectoral fin and a patch on caudal peduncle *T. lordi*

Tasmanogobius gloveri sp. nov.

Figures 3 and 4

Tasmanogobius sp. 1.—Last, Scott and Talbot, 1983: 453, fig. 30.132 (Tasmania and South Australia).

Material examined. Holotype, South Australia, American River, Kangaroo Island, D. Hoese and party, 8 and 10 Mar 1978 (AMS 1.20179–025, 34 mm SL).

Paratypes, South Australia. Type locality, AMS 1.20179–003, 14(21–34) and AMS 1.20179–026, 2(23–26), cleared and stained. Pelican Lagoon, Kangaroo Island, SAM F.5082, 1(34), H.M. Cooper, Apr 1954; SAM F.5083, 1(32), H.M. Cooper, 4 Aug 1957; SAM F.5084, 1(40), H.M. Cooper; SAM F.5085, 4(32–42), H.M. Cooper, 13–18 Aug 1958; SAM F.5086, 6(33–44), H.M. Cooper, 13 Aug 1958; SAM F.5087, 13(24–34), H.M. Cooper, 14 Apr 1959.

Tasmania, Parsons Bay, AMS 1.28791–001, 2(40–40), P. Last, Nov 1978. D'Encastreaux Channel, NMV A.7770, 1(39), P. Last, 1974. Greens Beach to Kelso, QVM 439, 5(15–22). R. Green, 28 Jan 1967. Green Island, TM D.2052–D.2053, 2(28–29), D.F. Turner, 21 Jul 1948.

Victoria, Crib Point, Western Port, AMS 1.19783–001, 1(34), A. Robertson, 30 May 1975.

Diagnosis. First dorsal fin usually VI. Vertebrae usually 12 + 15. Pectoral rays usually 19–21. No head pores. Body partly scaled with cycloid scales; no scales ventrally on belly, narrow area immediately behind pectoral base and area before a line from behind middle of pectoral base to below posterior end of first dorsal fin; scales on sides of belly vertically elongate. Gill

rakers on outer face of first arch triangular, raker at angle of first gill arch slightly shorter than upper gill filaments. First dorsal fin long based, with membrane connecting to base of second dorsal fin origin. Body moderately robust, depth at anal origin 14.4–18% SL; depth at pelvic origin 16.2–20.5% SL. Body light brown with a whitish midlateral stripe, broken by short vertical brown bars. Five vertical (VT) papilla lines on cheek.

Description. First dorsal fin VI(46), pterygiophore formula 3(12210) in 9 specimens. Second dorsal fin with 13–15 elements, (usually 14), all rays segmented. Anal fin with 12–14 elements (usually 13), all rays segmented. Longitudinal scale count 38–47. Gill rakers on outer face of first arch 1–4 + 6–7 = 5–10; lower rakers 6(3), 7(1); total rakers 8(1), 9(1), 10(2). Segmented caudal rays 17(45). Branched caudal rays 12–15, usually 13–15; upper unsegmented caudal rays 7(2), 8(3), 9(4), 10(2); lower unsegmented caudal rays 8(2), 9(3), 10(6). Vertebrae 11 + 15 (20).

Head length 26.5–34.0% SL. Eye about equal to snout in adult. Anterior nostril at end of short tube, about midway between upper margin of upper lip and eye, about 2 nostril diameters above upper lip. Posterior nostril with raised rim, immediately before anterior margin of eye and above anterior nostril. Gill opening restricted to pectoral base. Teeth in upper jaw conical and close-set in outer row, 1–2 inner rows of smaller teeth anteriorly; lower jaw teeth

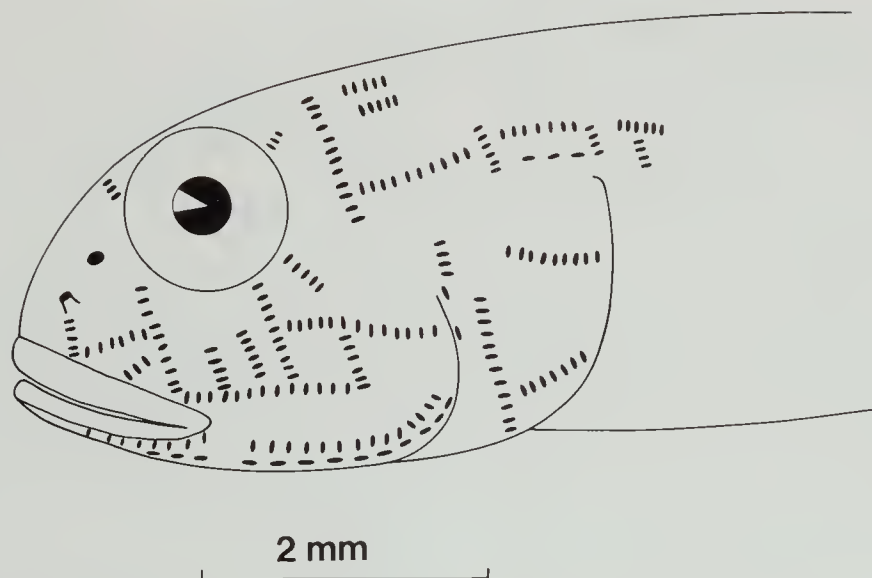


Figure 3. Head papilla pattern of *Tasmanogobius gloveri*, based on holotype and several paratypes.

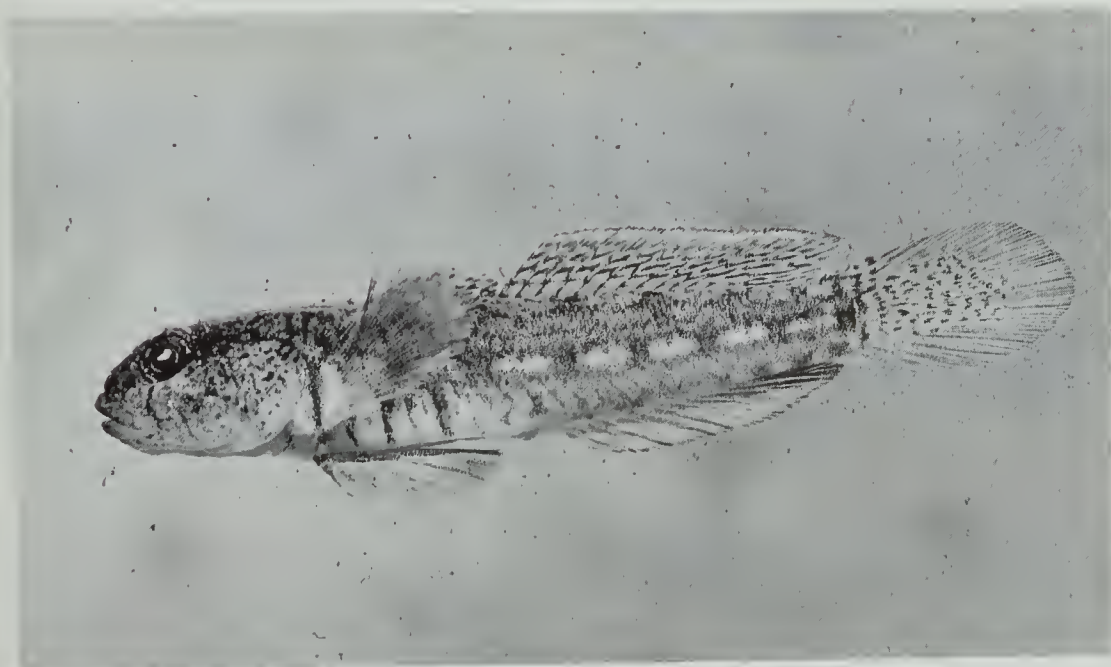


Figure 4. Holotype of *Tasmanogobius gloveri*, AMS I.20179-025, 34 mm SL.

similar to upper jaw teeth, but with outer row teeth more wide-set. Mental frenum low and rounded. Mouth small and oblique; reaching to below middle of eye in adult; jaws forming an angle of 20–25° with body axis; upper margin of

upper jaw in line with or below lower margin of eye. Tongue tip emarginate. Upper part of gill arches with numerous small fleshy bumps extending onto pharyngeals; gill rakers on outer face of first arch with slender ossified rod anter-

torily, with slightly expanded posterior fleshy section; rakers curving into oral cavity; rakers slightly shorter than filament length. Body scales ctenoid. Pectoral base, prepelvic area and mid-belly naked. First dorsal fin with low rounded margin. Pectoral fin with rounded margin, reaching to point below or just beyond second dorsal origin. Pelvic fins fused to form large cup-shaped disc, reaching anus.

Colour of fresh material. Head and body whitish to grey. Head with scattered white flecks and thin grey lines and minute spots. Often prominent black stripe extending posteriorly from mideye to caudal peduncle above midside. Pectoral base with distinct vertical brown or grey bar. Body with 3-5 thin vertical grey to brown bars below pectoral fin, ventrally on belly. Midline of body with distinct subcutaneous white stripe, bordered by thin grey to brown margins; white stripe interrupted by thin vertical grey to brown bars; first below second dorsal origin, second below anterior part of second dorsal fin, third below middle of second dorsal fin, fourth near end of second dorsal fin, fifth on middle of caudal peduncle and last at end of caudal peduncle. Two thin horizontal grey lines above midside. Dorsal fins transparent to translucent with thin black distal margin and broader submarginal white stripe; below white stripe series of elongate black spots forming 4-5 dark longitudinal lines, alternating with narrow white stripes. Caudal fin translucent to grey with scattered small black spots centrally and basally. Anal fin largely white, often with grey stripe basally, expanding onto whole fin posteriorly; margin black to grey. Pectoral and pelvic fins translucent with scattered minute white spots.

Colour in alcohol as in fresh material, but head, body and fins becoming brown and opaque.

Distribution and ecology. *Tasmanogobius gloveri* occurs in estuarine and marine muddy environments from Kangaroo Island, Victoria and Tasmania. The species was observed in burrows over soft mud.

Etymology. For J. Glover, Curator of Fishes at the South Australian Museum.

Tasmanogobius lasti sp. nov.

Figures 5-7

Tasmanogobius sp. 2.—Last, Scott and Falbot, 1983: 454, fig. 30.133 (Tasmania and South Australia).

Material examined. Holotype. Victoria, Princetown, G. Backhouse, 1981 (AMS L.22950-001, 28.7 mm SL).

Paratypes. South Australia. Vivonne Bay, Kangaroo Island, AMS L.20158-002, 4(19-24), D. Hoese and party, 2 Mar 1978; AMS L.20159-004, 1(26), D. Hoese and party, 2 Mar 1978; Southwest River, Kangaroo Island, AMS L.20170-005, 4(19-24), D. Hoese and party, 6 Mar 1978.

Tasmania. Southern region, AMS L.28971-001, 1(27), cleared and stained, P. Last, Browns River estuary, AMS L.17546-004, 3(22-28), D. Hoese and W. Ivantsoff, 30 Nov 1972. Gawler estuary, AMS L.22535-001, 70(16-28) and AMS L.22535-007, 9(16-21), cleared and stained, D. Hoese and G. Allen, 19 Feb 1981. Moulting Lagoon, AMS L.22563-001, 2(36-40), P. Last, 5 Jul, Camerons Inlet, Flinders Island, AMS L.22567-001, 2(38-39), P. Last, 25 Jun 1978. Arthurs River, AMS L.22568-001, 3(40-41), P. Last, Oct 1979. Nicinna Creek, AMS L.22570-001, 1(38), T. Walker, 26 Aug 1974. Huon River, AMS L.28794-001, 1(31), R. Buttermore, 19 Jul 1977. Duck River, AMS L.28795-001, 2(26-27), P. Last, 17 Feb 1978. Big Waterhouse Lagoon, AMS L.28796-001, 3(20-25), R. Mawbey, 2 May 1979. Patriaehs Inlet, Flinders Island, AMS L.28797-001, 2(22-35), P. Last, 5 Feb 1977; AMS L.28798-001, 9(22-28), P. Last, 29 Jan 1978. Yellow Roek River, King Island, AMS L.28799-001, 1(32), P. Last, 9 Aug 1978; AMS L.28800-001, 3(30-39), P. Last, 23 Feb 1978. Andersons Creek, Tamar River, AMS L.28870-001, 12(12-27), Andersons Creek, 23 Apr 1975; NTM S.12580-001, 10(18-23); QVM 440, 29(17-26), 23 Apr 1975; SAM F.6676, 10(17-25), 23 Apr 1975; WAM P.30008-001, 10(20-27), 23 Apr 1975. Davey River, CSIRO H1982-01, 1(33), P. Last, Mar 1979. Derwent River, CSIRO H1983-01-02, 2(28-33), P. Last, 30 May 1978. Opposite Berridale Reserve, Derwent River, IM D.2057, 1(25), 7 Dec 1960.

Victoria. Hollands Landing, AMS L.16975-010, 1(26), D. Hoese, 2 Mar 1972. Brnthen Creek estuary, south-east Gippsland, AMS L.22944-002, 19(30-39), J. Benmer, 3-9 Aug 1979; AMS L.22946-005, 2(32-36), J. Benmer, 12 Aug 1979; NMV A.3255, 2(31-33), J. Benmer, 20 Jul 1979; NMV A.3256, 20(22-41), J. Benmer, 5-19 Jul 1979. Princetown, AMS L.22950-001, 8(26-32), G. Backhouse, 1981. Lower Barwon River, NMV A.7691, 1(21), Victorian Fisheries and Wildlife Department, 3 Jul 1987. Hobsons Bay, Port Phillip, NMV A.3253, 1(31), J. Watson, 1 May 1972. Lake Monibeong, NMV A.3568, 17(25-28), Victorian Fisheries and Wildlife Department, 25 Mar 1980. Barham River, NMV A.3569, 5(34-36), Victorian Fisheries and Wildlife Department, 15 Jun 1976.

Non-type material. Tasmania. Big Lagoon, AMS L.28793-001, 2(23-30), Big Lagoon, P. Gaymer, 15 Apr 1973.

Victoria. Estuary at Petersborough, AMS L.16987-009, 1(33), D. Hoese and W. Congleton, 21 Mar 1972. Barham River, NMV A.3567, 1(29), Glenelg River, NMV A.3583, 1(31), J. Kudenov, Greens Beach, QVM 1972/5/454, 1(33), R.H. Green, 11 Nov 1963.

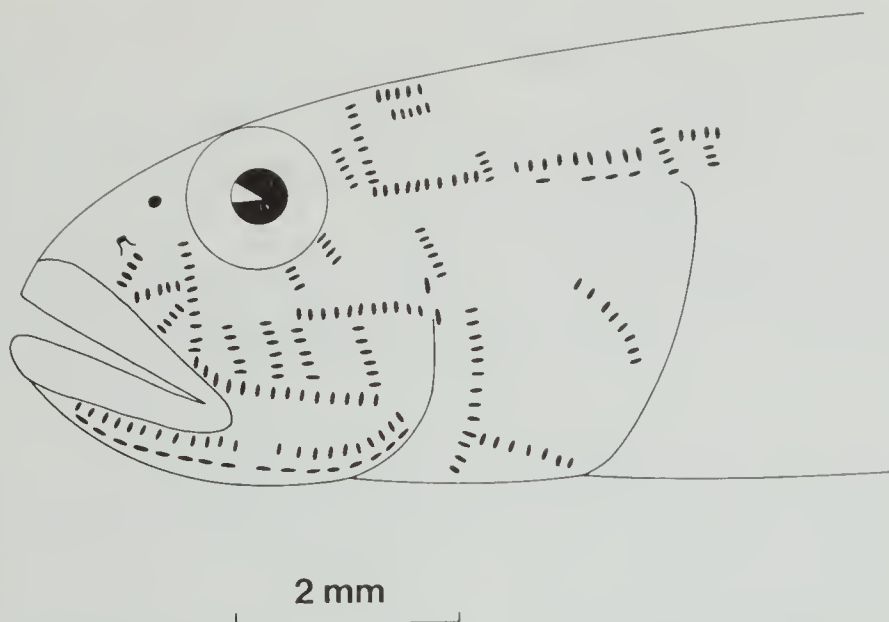


Figure 5. Head papilla pattern of *Tasmanogobius lasti*, based on holotype and several paratypes.



Figure 6. Holotype of *Tasmanogobius lasti*, AMS I.22950-002, 28.7 mm SL.

Diagnosis. First dorsal fin usually VIII. Vertebrae usually 12 + 19. Pectoral rays usually 17–18. At least 5 lateralis system open head pores. Body partly scaled; vertically elongate scales behind pectoral base on sides of belly usually continuous with posterior body scales; posterior scale patch tapering anteriorly, always reaching well forward of middle of second dorsal fin; rest of body naked. Gill rakers short, outer raker at angle of first gill arch much shorter than upper gill filaments. First dorsal fin long based, membrane from end of first dorsal fin reaching near, but not to second dorsal origin. Body slender, depth at anal origin 13.5–15% SL; depth at pel-

vic origin 15.3–16.4% SL. Body light brown with a series of dark spots, usually vertically elongated on midsides; usually with a small black median transverse bar or spot just before first dorsal fin. Five vertical (VT) papilla cheek lines.

Description. First dorsal fin VII(9), VIII(90), IX(1); pterygiophore formula variable, 3(122110) in 2 specimens, 3(1221100) in 1, 3(1221101) in 1, 3(1221110) in 15, 3(12211110) in 1, spine often missing from last or penultimate pterygiophore. Second dorsal with 13–16 elements, (usually 14–15), typically with first ray

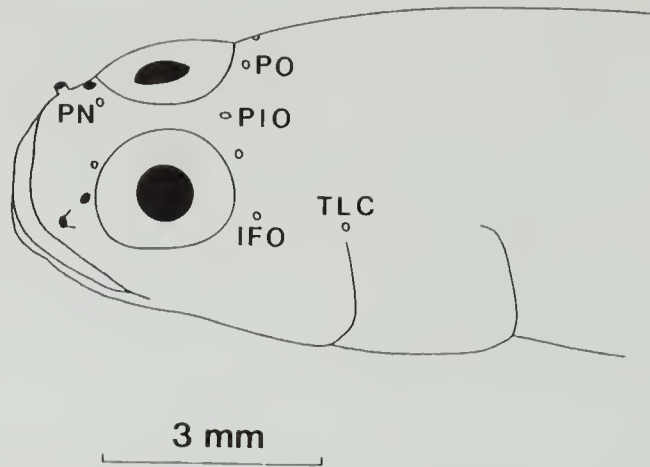


Figure 7. Composite head pore pattern in *Tasmanogobius lasti*. PN = posterior nasal pore, PIO = posterior interorbital pore, PO = postorbital pore, IFO = infraorbital pore, TLC = terminal lateral canal pore.

unsegmented. Anal ray elements 12–16 (usually 14), typically with first ray unsegmented. Longitudinal scale count 29–47. Gill rakers on outer face of first arch 1–3 + 4–7 = 5–10; lower rakers 4(1), 5(7), 6(5), 7(2); total rakers 5(1), 6(1), 7(2), 8(5), 9(2), 10(3). Segmented caudal rays 16(2), 17(108); branched caudal rays 13–17, usually 14–15; upper unsegmented caudal rays 8(5), 9(11), 10(4); lower unsegmented caudal rays 7(2), 8(8), 9(9), 10(1). Vertebrae 12 + 18(11), 12 + 19(67), 12 + 20(1), 13 + 18(1), 13 + 19(2).

Head length 25.7–28.1% SL. Eye about equal to snout in adult. Anterior nostril at end of short tube, about midway between upper margin of upper lip and eye, about 2 nostril diameters above upper lip. Posterior nostril with raised rim, immediately before anterior margin of eye and above and behind anterior nostril. Gill opening restricted to pectoral base. Teeth in upper jaw conical, outer row teeth close-set; second row of smaller teeth anteriorly; lower jaw teeth similar to upper jaw teeth, but with outer row teeth more wide-set. Mental frenum indistinct. Mouth small and oblique; reaching to below middle of eye in male and below anterior quarter of pupil in female; jaws forming an angle of 35–40° with body axis; upper margin of upper jaw in line with middle of eye to lower quarter of eye. Tongue tip truncate to slightly emarginate. Upper part of gill arches with numerous small fleshy bumps extending onto pharyngeals; gill rakers on outer face of first arch with slender ossified rod anteriorly, and with slightly expanded posterior fleshy section; rakers much shorter than filament length (about one-third

length). Body scales largely etenoid. Pectoral base, prepelvic area and midline of belly naked; posterior portion of body completely sealed; anteriorly scale coverage becoming reduced, with naked patch beginning below and near front of second dorsal fin, with scale coverage narrowest between dorsal fins and below posterior end of first dorsal fin, coverage broadening anteriorly near pectoral insertion; belly naked or sometimes sealed on sides. First dorsal fin with low rounded margin. Pectoral fin with rounded margin, reaching to a point below middle of first dorsal fin. Pelvic fins fused to form large cup-shaped disc reaching to below point just beyond middle of first dorsal fin, well short of anus.

Colour of fresh material from Kangaroo Island. Head and body translucent light brown. Head with numerous scattered melanophores; thin black bar from ventral margin of eye to posterior end of jaws. A diffuse grey spot behind eye and similar diffuse spot at dorsoposterior margin of operculum; cranium behind eye with dense subcutaneous concentration of melanophores. Body with scattered, irregularly shaped black spots dorsally; 2–3 vertical black bars below first dorsal fin, extending onto sides of belly; midside with 4 more-or-less rectangular large black spots, first below second dorsal origin, second below middle of second dorsal fin, third below posterior end of second dorsal fin and fourth at posterior end of caudal peduncle; smaller, vertically elongate or rounded black spot, midway between each pair of rectangular spots; belly white to silvery. Pectoral

base light brown to yellow, with small black spot dorsally near base of fin rays. Fins transparent. First dorsal fin with small dark spots forming 2–3 horizontal black stripes; second dorsal with dark spots forming 3–5 oblique stripes; caudal fin with 2–4 wavy black bars; anal fin without pigment; pelvic and pectoral fin with scattered black flecks.

Colour in alcohol similar to fresh coloration, except that dorsal irregularly shaped spots become faint or obscure; back often with scattered dense concentrations of melanophores. The more-or-less rectangular spots on side often oval or vertically elongate. Intensity of dark markings variable.

Variation. *Tasmanogobius lasti* shows considerable variation in several characteristics. Females reach and tend to average a larger size than males (Table 4). The largest male examined is 36 mm SL, while the largest female is 41 mm SL. Males average 23.5 mm, with 31 of the 37 examined smaller than 29 mm SL, while females average 29 mm SL, with 33 of the 63 examined larger than 27 mm SL. The greater number of females is probably related to sampling bias, since collectors and seine nets generally select for largest individuals. Males have intense black pigment, usually forming a black bar between last 2–3 dorsal spines. The first dorsal is pale to grey posteriorly in females.

Head pores also vary considerably. Juveniles of other gobioid species often have reduced pore patterns, but the variation is high in adults of this species. The following discussion is based only on specimens greater than 24 mm SL. A composite head pore pattern is shown in Figure 7. In the most common pattern, individuals have a posterior nasal pore on each side of the snout just above the posterior nostril, a median posterior interorbital pore just behind the eyes and an infraorbital pore behind each eye. This pattern was found in 24 of 50 specimens examined. The pattern was found in almost all specimens below 24 mm SL. In the other 26 adult specimens the typical pores are sometimes absent, or more frequently extra pores were found (Table 7). In two specimens the posterior interorbital pore is absent. In some individuals a lateral canal extends from the infraorbital pore above the preoperculum, ending in a terminal lateral canal pore. In others the lateral canal is restricted to a short tube above the preoperculum, with a pore at each end (not shown in Fig. 7). In two individuals there is a postorbital pore behind the eye above the infraorbital pore. Of the 26 variant specimens, 15 are asymmetrical,

with different number of pores of the two sides of the head.

This species differs from other species of *Tasmanogobius* in frequently having a distinct anal spine and a spine at the beginning of the second dorsal fin. About 80–83% of specimens have the spines (Tables 1, 2).

The scale pattern also varies considerably. In most individuals, the body scales extend from behind the pectoral base to the caudal peduncle. In juveniles, below 20 mm SL and some adults, the scales on the sides of the belly are isolated into a separate patch from the posterior body scales.

Geographical variation is also apparent. Analysis of variance was carried out on 6 populations (5 for scale counts): Kangaroo Island, South Australia; Bruthen Creek, Victoria; Lake Monibeong, Victoria; Flinders Island, Bass Strait; Tamar River, Tasmania and Gawler Estuary, Tasmania. Specimens from Lake Monibeong, Victoria, are unusual in having the scales reduced in size and in having less extensive scale coverage, with the posterior scale patch extending forward to just behind the second dorsal origin, and an extensive naked area below the anterior half of the first dorsal fin and a similar naked patch above the anterior two-thirds of the anal fin. The anterior scale patch has a few non-imbricate scales. Most scales are missing in the specimens, preventing accurate scale counts to be made. All specimens have large dermal parasite cysts and the scale pattern may not be normal. The scales on the caudal peduncle in this population are approximately half the height of scales in specimens from Kangaroo Island. Specimens from Kangaroo Island have the largest scales, hence the lowest longitudinal scale counts (Table 4). Analysis of variance comparing scale counts of the five specific localities, indicated that specimens from Kangaroo Island differed significantly from specimens from these other localities ($P < 0.001$). Comparison of other features gave mixed results. Second dorsal-ray counts (Table 1) showed significant geographical variation ($p < 0.05$), but with no single population being significantly different from any other, although the lowest counts were found in the few specimens from Kangaroo Island. No significant differences were noted in anal ray counts (Table 2). Pectoral ray counts also indicated significant geographical variation ($p < 0.05$), with Flinders Island specimens averaging highest counts and Kangaroo Island the lowest. Branched caudal ray counts also showed significant geographical variation ($p < 0.01$).

with Flinders Island specimens averaging significantly higher counts than other populations, with the exception of Lake Monibeong and Kangaroo Island.

While there was some variability in the meristic features for various populations the most distinctive population was that of Flinders Island. Specimens from Flinders Island averaged higher branched caudal-ray and pectoral-ray counts (Tables 3, 5). Similarly about half of the specimens from Flinders Island had anal and second dorsal spines. In most other populations the spines were present in about 80–90% of the specimens. However, about half the specimens from Kangaroo Island also had the spines.

Distribution. *Tasmanogobius lasti* is known from estuarine and muddy marine areas from Kangaroo Island, South Australia, Victoria and throughout Tasmania.

Etymology. For Peter Last, CSIRO Division of Fisheries, Hobart, who supplied much of the Tasmanian material of this species.

Remarks. Although superficially similar to *T. lordi*, the species differs in several features in addition to those given in the key. For example *T. lasti* is deeper bodied and has fewer VT cheek papilla lines. Although it is possible that more

than one species is included here, the high variability within populations suggests a single highly variable species.

Tasmanogobius lordi Scott, 1935

Figures 8 and 9

Tasmanogobius lordi Scott, 1935: 56, figs 1, 2, pl. 4 fig. 2 (type locality: mouth of Leven River, Tasmania).

Material examined. Tasmania. Rubicon River, AMS 1.28970–002, 7(26–31) and AMS 1.28970–002, 4(25–27), cleared and stained. Duck River, AMS 1.22561–001, 2(27–28). Inglis River, AMS 1.22564–001, 3(25–29). Rubicon River, AMS 1.27505–001, 27(25–29); TM D.2054–2056, 3(27–28). Forth River, AMS 1.28792–001, 1(30). Greens Beach to Kelso, QVM 1972/5/421B, 1(28). Greens Beach, QVM 1972/5/488C, 2(27–28); QVM 1972/5/695B, 1(27).

Diagnosis. First dorsal fin usually VII. Vertebrae usually 12 + 18. Pectoral rays usually 18–19. No head pores. Body partly scaled; small patch of vertically elongate scales behind pectoral base on sides of belly and isolated patch of few scales on caudal peduncle, sometimes extending forward in narrow wedge to under end of second dorsal fin; rest of body naked. Gill rakers short, outer raker at angle of first gill arch shorter than upper gill filaments. First dorsal fin short based,

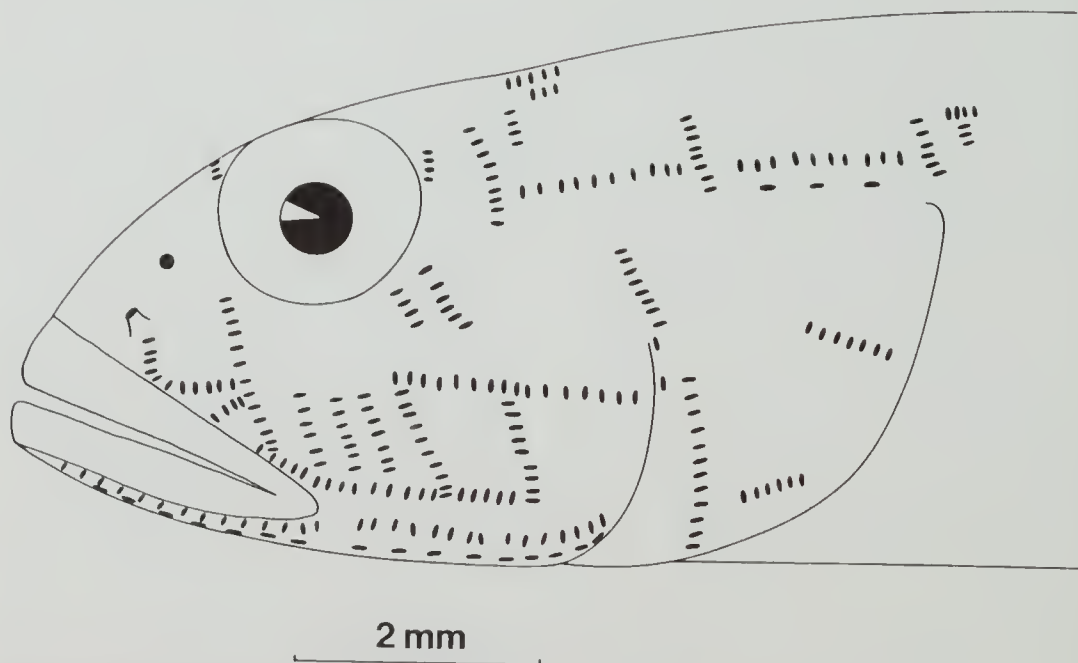


Figure 8. Head papilla pattern of *Tasmanogobius lordi*, based on several specimens.



Figure 9. *Tasmanogobius lordi*, AMS 1.22564—001, 29 mm SL.

base subequal to distance from last dorsal spine of first dorsal fin to second dorsal origin. Body light brown with series of dark brown spots, usually vertically elongate on midsides. Body slender. depth at anal origin 9.4–10.3% SL; depth at pelvic origin 10.2–11.4% SL. Six vertical (VT) cheek papilla lines.

Description. First dorsal fin VI(3), VII(18), VIII(3). Second dorsal fin with 13–16 elements, (usually 15), typically all rays segmented. Anal fin with 12–14 elements, (usually 12–13), typically with all rays segmented. Longitudinal scale count 10–24; longitudinal count of anterior scale patch 6(3), 7(1), 8(3), 9(1), 10(1); posterior scale patch 3(2), 4(2), 5(2), 8(1), 9(1), 14(1). Gill rakers on outer face of first arch 1–2 + 6–8 = 8–10; lower rakers 6(2), 8(2); total rakers 8(2), 9(1), 10(1). Segmented caudal rays 17(28); branched caudal rays 12–14, usually 13; upper unsegmented caudal rays 8(1), 9(5), 10(3), 11(2); lower unsegmented caudal rays 8(3), 9(4), 10(2), 11(2). Vertebrae 12 + 17(2), 12 + 18(19), 12 + 19(3).

Head length 23.9–25.6% SL. Eye about equal to snout in adult. Anterior nostril at end of short tube, about midway between upper margin of upper lip and eye, about 2 nostril diameters above upper lip. Posterior nostril with raised rim, immediately before anterior margin of eye. Gill opening restricted to pectoral base. Teeth in upper jaw conical, an outer row of close-set teeth; few smaller teeth anteriorly in second row; lower jaw teeth similar to upper jaw teeth, but with outer row teeth more wide-set. Mental frenum indistinct. Mouth small and oblique; reaching to below middle of eye in male and below anterior quarter of eye in female; jaws forming angle of 35–40° with body axis; upper margin of upper jaw in line with middle of eye. Tongue tip truncate to slightly emarginate. Upper part of

gill arches with numerous small fleshy bumps extending onto pharyngeals; gill rakers on outer face of first arch with slender ossified rod anteriorly, and slightly expanded posterior fleshy section; rakers much shorter than filament length (about half length). Body scales largely ctenoid. Pectoral base, prepelvic area and belly naked. First dorsal fin with low rounded margin. Pectoral fin with rounded margin, reaching to point below middle of first dorsal fin. Pelvic fins fused to form large cup-shaped disc reaching to below end of first dorsal fin, well short of anus.

Colour of preserved material. Head and body light brown. A thin black vertical bar from ventral margin of eye to posterior end of jaws; diffuse black spot behind posterior margin of eye and similar diffuse black mark on dorsoposterior margin of operculum. Body with scattered brown to black spots dorsally; single vertical bar below anterior quarter of first dorsal fin; shorter and fainter bar below end of first dorsal fin and series (4–6) of short, vertically elongate, more-or-less evenly spaced black spots on midside below second dorsal fin, first below second dorsal origin and last at posterior end of caudal peduncle. Fins largely opaque; dorsal fins usually with black spots forming oblique lines, caudal fin sometimes with wavy vertical grey bars.

Distribution. *Tasmanogobius lordi* is known from scattered localities in fresh water and estuaries in Tasmania.

Remarks. Live colour was described (Scott, 1935) as transparent, with a row of about nine small fawn markings along the midlateral line, many being vertically elongate, and with other fawn markings dorsally.

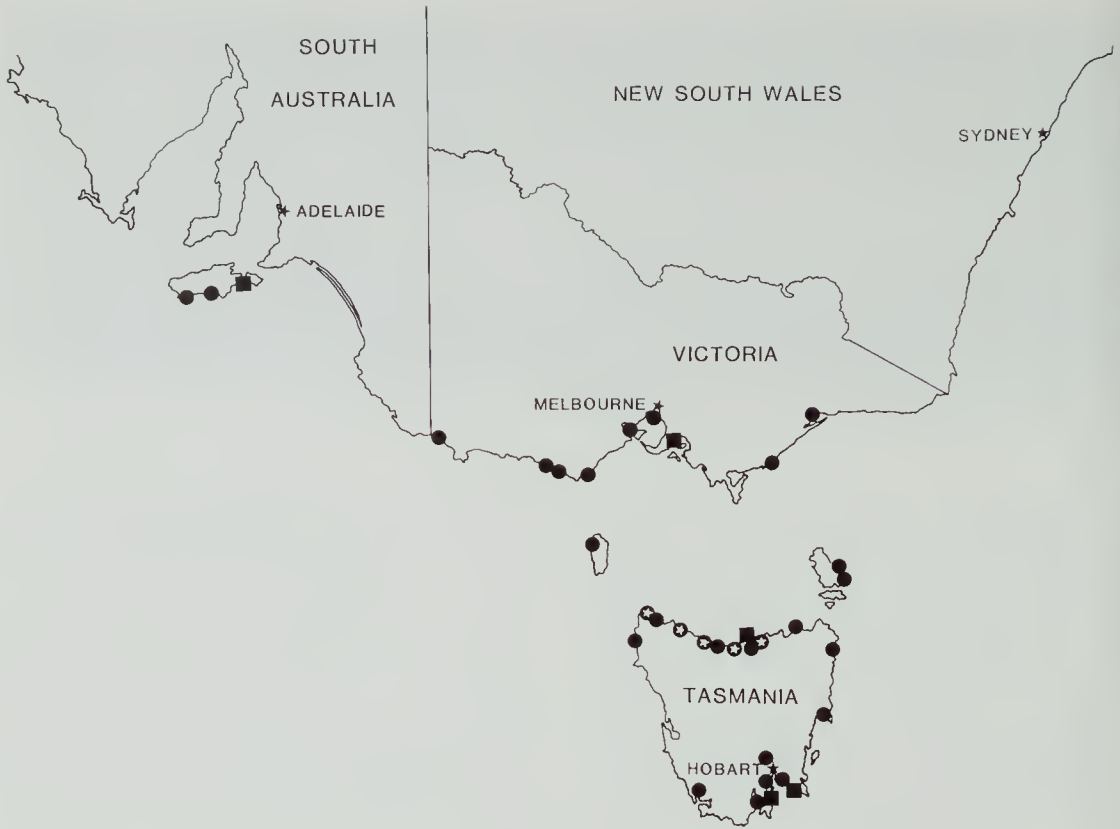


Figure 10. Distribution of species of *Tasmanogobius*. squares = *T. gloveri*, circles = *T. lasti*, white stars = *T. lordi*. Black stars indicate capital cities in southern states.

Table 1. Second dorsal fin rays in *Tasmanogobius*.

Species/Locality	Total Dorsal Elements				Mean	Dorsal spine	
	13	14	15	16		0	1
<i>T. lordi</i>	2	4	28	1	14.8	29	6
<i>T. gloveri</i>	3	39	3	—	14.0	45	—
<i>T. lasti</i>							
Total	6	60	58	5	14.5	26	103
Kangaroo Is., SA	2	6	—	—	13.8	3	5
Bruther Creek, Vic.	1	10	9	—	14.4	6	14
Lake Monibeong, Vic.	—	7	9	1	14.6	4	13
Other Victoria	—	10	3	—	14.2	2	11
Flinders Is., Tas.	—	5	6	1	14.7	5	7
King Is., Tas.	1	1	2	—	14.3	2	2
Tamar R., Tas.	—	9	11	—	14.6	—	20
Gawler Estuary, Tas.	—	9	11	—	14.6	2	18
Other Tasmania	2	3	7	3	14.7	2	13

Table 2. Anal fin rays in *Tasmanogobius*.

Species/Locality	Total Anal Elements					Mean	Anal spine	
	12	13	14	15	16		0	1
<i>T. lordi</i>	—	2	19	12	1	14.4	33	1
<i>T. gloveri</i>	8	36	1	—	—	12.8	45	—
<i>T. lasti</i>								
Total	1	10	102	16	3	14.1	32	100
Kangaroo Is., SA	—	2	6	—	—	13.8	6	2
Bruther Creek, Vic.	—	—	15	5	—	14.3	2	18
Lake Monibeong, Vic.	—	2	12	2	1	14.1	4	13
Other Victoria	—	—	12	1	—	14.1	3	10
Flinders Is., Tas.	1	—	9	3	—	14.1	6	7
King Is., Tas.	—	2	1	1	—	13.8	2	2
Tamar R., Tas.	—	2	15	2	1	14.1	1	19
Gawler Estuary, Tas.	—	1	18	1	—	14.2	5	15
Other Tasmania	—	1	14	1	1	14.1	3	14

Table 3. Pectoral-fin rays in *Tasmanogobius*.

Species/Locality	Pectoral Rays						Mean
	16	17	18	19	20	21	
<i>T. lordi</i>	—	4	22	8	—	—	18.2
<i>T. gloveri</i>	—	—	—	17	26	3	19.7
<i>T. lasti</i>							
Total	11	53	58	9	1	—	17.5
Kangaroo Is., SA	2	5	1	—	—	—	16.9
Bruther Creek, Vic.	2	6	20	1	—	—	17.7
Lake Monibeong, Vic.	1	10	3	3	—	—	17.5
Other Victoria	1	5	7	—	—	—	17.4
Flinders Is., Tas.	—	3	4	4	1	—	18.3
King Is., Tas.	—	3	1	—	—	—	17.3
Tamar R., Tas.	1	6	12	1	—	—	17.7
Gawler Estuary, Tas.	3	12	5	—	—	—	17.1
Other Tasmania	3	8	6	—	—	—	17.1

Table 4. Longitudinal scale counts in species of *Tasmanogobius*.

Species/Locality	Scale count																						
	10	11	13	16	18	24	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	47
<i>T. lordi</i>	3	2	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>T. gloveri</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kangaroo Is., SA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Vic. and Tas.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2	4	1	—	2	1
<i>T. lasti</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	2	2	2	2	2	4	6	8	12	12	14	5	3	2	1	1	1	—
Kangaroo Is., SA	—	—	—	—	—	2	2	2	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Bruther Creek, Vic.	—	—	—	—	—	—	—	—	—	—	—	1	1	2	—	4	1	—	1	—	—	—	—
Other Victoria	—	—	—	—	—	—	—	—	—	2	1	1	2	2	—	2	—	—	—	—	—	—	—
Flinders Is., Tas.	—	—	—	—	—	—	—	—	—	—	—	—	1	2	1	2	—	1	2	—	—	—	—
King Is., Tas.	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2	—	—	—	—	—	—	—	—
Tamar R., Tas.	—	—	—	—	—	—	—	—	—	—	—	2	1	3	2	2	—	—	—	—	—	—	—
Gawler Estuary, Tas.	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	2	—	—	—	—	—	—	—
Other Tasmania	—	—	—	—	—	—	—	—	—	—	2	1	1	2	3	4	—	1	—	—	—	—	—

Table 5. Branched caudal-fin rays in *Tasmanogobius*.

Species/Locality	Caudal Rays						Mean
	12	13	14	15	16	17	
<i>T. lordi</i>	1	16	1	—	—	—	13.0
<i>T. gloveri</i>	2	7	17	19	—	—	14.2
<i>T. lasti</i>							
Total	—	9	38	55	6	4	14.6
Kangaroo Is., SA	—	—	2	5	1	—	15.0
Bruther Creek, Vic.	—	1	7	8	—	—	14.4
Lake Monibeong, Vic.	—	—	2	9	2	1	15.1
Other Victoria	—	1	3	7	—	—	14.5
Flinders Is., Tas.	—	—	—	7	2	3	15.7
King Is., Tas.	—	—	1	2	1	—	15.0
Tamar R, Tas.	—	4	9	6	—	—	14.1
Gawler Estuary, Tas.	—	1	11	8	—	—	14.4
Other Tasmania	—	2	3	3	—	—	14.1

Table 6. Size distribution of males and females of *Tasmanogobius lasti*.

Sex	Size Class (mm SL)					
	17–22	23–27	28–32	33–37	38–42	43–49
Males	20	6	9	2	—	—
Females	12	20	9	14	8	1

Table 7. Head pore variation in 50 specimens of *Tasmanogobius lasti*. Numbers indicate number of specimens with or without pore.

Pore/canal	Present			Absent		
	Left	Right	Median	Left	Right	Median
Posterior nasal	50	50		—	—	
Posterior interorbital			48			2
Postorbital	1	2		49	48	
Infraorbital	50	50		—	—	
Terminal lateral canal	9	11		41	39	
Lateral canal tube	5	6		45	44	

Individuals with normal pattern = 24; variants = 26; number of asymmetrical variants = 15.

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