

## MARINE TUBIFICIDAE (OLIGOCHAETA) OF VICTORIA, AUSTRALIA, WITH DESCRIPTIONS OF SIX NEW SPECIES

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### Abstract

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Seven species of marine Tubificidae are recorded from coastal waters of Victoria: *Heronidrilus bihamis* Erséus and Jamieson, 1981, *Bathydrilus munitus* sp. nov., *Limnodriloides triplus* sp. nov., *L. stercoreus* sp. nov., *L. problematicus* sp. nov., *L. cribensis* sp. nov., and *Marcusaedrilus assimilis* sp. nov. The first-mentioned species is widely distributed in the Indo-Pacific, including tropical areas, whereas the new taxa are likely to be members of a temperate fauna of south-eastern Australia. *Limnodriloides stercoreus* and *M. assimilis* are reported also from New South Wales, and *L. problematicus* from New Zealand.

### Introduction

Oligochaetes, particularly species belonging to the family Tubificidae, are not uncommon members of the benthic fauna of coastal marine waters, but their small body size and neglected taxonomy have made them escape attention in many parts of the world. The southern coast of Australia is one area, for which the taxonomic knowledge of marine Tubificidae has been very scanty in the past. One comprehensive study was recently made in the southern part of Western Australia (Erséus, in press), but for the other states the documentation has so far been restricted to Brinkhurst's (1986) records of *Tubificoides diazi* Brinkhurst and Baker, 1979, and *T. fraseri* Brinkhurst, 1986, from inshore localities in Victoria. These two species are widely distributed in the world, including the North Atlantic, but the large genus to which they belong is largely confined to the temperate parts of the Northern Hemisphere. It is therefore likely that they are opportunistic species, possibly introduced by man to southern Australia.

The Victoria material of *T. diazi* and *T. fraseri* studied by Brinkhurst (1986) was a part of an oligochaete collection originating from various benthic surveys undertaken in marine or brackish-water embayments on the coast of Victoria by the Marine Studies Group, Ministry for Conservation, Victoria. The collection was borrowed from the Museum of Victoria by the late Dr H.R. Baker (a former student of Dr R.O. Brinkhurst), who made tentative identifications

of the specimens. After Dr Baker's decease in 1983, tubificids other than *Tubificoides* from this collection were forwarded to me with the kind approval of the Museum of Victoria. This paper is a taxonomic account describing this material, which includes a number of species that are likely to be endemic to the temperate zone of the Southern Hemisphere.

### Materials and methods

Most of the material treated in this paper was part of a loan from the Museum of Victoria to H.R. Baker, transferred to the present author. Additional specimens of *Limnodriloides stercoreus* sp. nov. and *Marcusaedrilus assimilis* sp. nov. from New South Wales localities, were found in material borrowed from the Australian Museum, Sydney, and two lots of *L. problematicus* collected in New Zealand, were kindly placed at my disposal by Dr S.F. Thrush (Hamilton, NZ), and Dr K.A. Coates (Toronto, Canada), respectively.

The worms were stained with paracarmine and mounted whole in Canada balsam, for the most part by H.R. Baker. All measurements were taken on these mounted, somewhat compressed, specimens. Roman numerals in the descriptions refer to segment numbers.

Type series and other reference material have been deposited in (1) the Museum of Victoria (NMV), Melbourne, Victoria, (2) the Australian Museum (AM), Sydney, NSW, and (3) the

National Museum of New Zealand (NMNZ),  
Wellington.

### Systematic descriptions

#### Rhyacodrilinae

#### Heronidrilus Erséus and Jamieson

#### Heronidrilus bihamis Erséus and Jamieson

*Heronidrilus bihamis* Erséus and Jamieson, 1981: 107–108, fig. 3.—Erséus, 1984: 140, fig. 3.—Erséus, 1989: 272.—Erséus, in press.—Erséus and Davis, 1989: fig. 1A.—Erséus et al., in press: figs 2F–H.

*New material.* NMV F57366, 2 whole-mounted specimens from off Point Cook, Port Phillip Bay, Victoria, Australia, 38°04.7'S, 144°32.7'E, 7 m, sand, 11 Jun 1971; material from the Port Phillip Bay Environmental Study (Marine Pollution Studies Group, Ministry for Conservation stn PPBES 929).

*Distribution and habitat.* Victoria (new record), Queensland, Western Australia, Hawaii, China. Intertidal and subtidal sands, to at least 70 m depth.

*Remarks.* *Heronidrilus bihamis*, which appears widely distributed in the Indo-Pacific area, has previously been reported from the Great Barrier Reef in Queensland (Erséus and Jamieson, 1981), and Western Australia (Erséus in press). The two new specimens from Victoria conform with the previous descriptions (references above).

#### Phallo-drilinae

#### Bathydrius Cook

#### *Bathydrius munitus* sp. nov.

#### Figure 1

*Material examined.* Holotype: NMV F57367, whole-mounted specimen from Crib Point, Western Port, Victoria, Australia, 38°21.33'S, 145°13.64'E, 15 m, fine sand and mud, 20 Mar 1967; material from the Crib Point Benthic Survey (Marine Studies Group, Ministry for Conservation, stn CPBS-S 31).

Paratypes: NMV F57368, 3 whole-mounted specimens from type locality. NMV F57369, whole-mounted specimen from near type locality, but 38°21.15'S, 145°13.51'E, 15 m, fine sand and mud, 15 Jul 1969 (stn CPBS 300).

Other material: NMV F57370, whole-mounted specimen from type locality (type date). NMV F57371, whole-mounted specimen from type locality, but 21 Apr 1966. NMV F57372, 7 whole-mounted specimens from off Altona, Port Phillip Bay, Victoria, 37°53.0'S, 144°51.5'E, 8 m, sand, 7 Jun 1971; material from the Port Phillip Bay Environmental Study (Marine Pollution Studies Group, Ministry for Conservation stn PPBES 901).

*Description.* Length of 2 complete specimens, 10.0 and 16.1 mm, about 85 and 116 segments. Width at XI, 0.20–0.35 mm. Prostomium somewhat elongate, rounded. Clitellum extending over X–½XIII when fully developed. Epidermal glands not observed. Somatic setae slender, 45–55 µm long, 2–2.5 µm thick, 2–5 (generally 4) per bundle anteriorly, (1)2 per bundle in postcli-

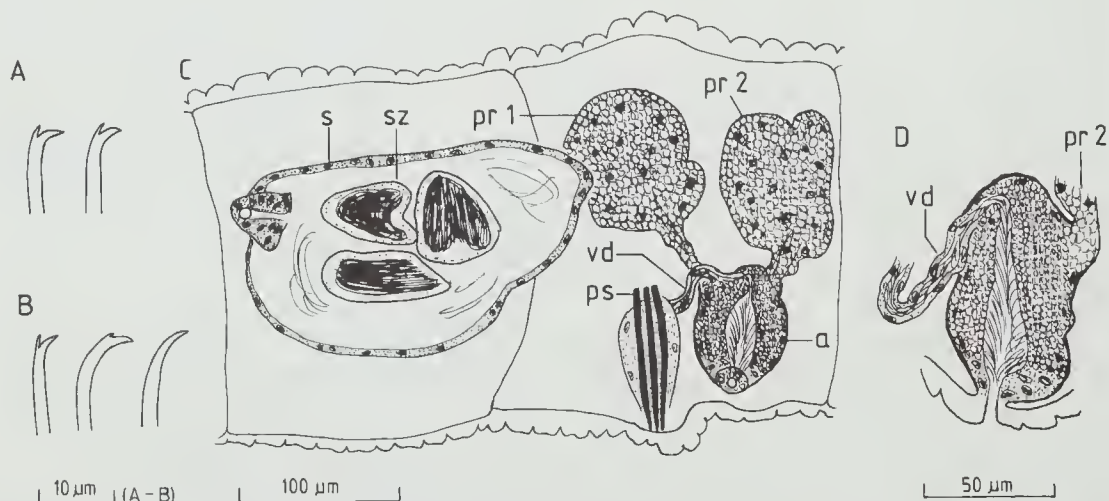


Figure 1. *Bathydrius munitus* sp. nov. A, anterior setae. B, posterior setae. C, lateral view of spermatheca and male genitalia in segments X–XI (holotype). D, atrium (paratype). a, atrium; pr1, anterior prostate gland; pr2, posterior prostate gland; ps, penial seta; s, spermatheca; sz, spermatheca zone; vd, vas deferens.

tellar segments. Anterior setae (Fig. 1A) with upper tooth thinner and much shorter than lower; lower tooth long, almost perpendicular to setal shaft. Postclitellar setae (Fig. 1B) variable, but generally with upper tooth even shorter than in anterior setae, or completely reduced (particularly in dorsal setae of most posterior segments). Penial setae (Fig. 1C, ps) generally 3–4 per bundle (sometimes fewer, occasionally absent), straight or curved, with single-pointed tips; tips of both bundles near mid-ventral line of worm. Penial setae 70–90  $\mu\text{m}$  long, 3–5  $\mu\text{m}$  thick. Male pores paired, in line with ventral somatic setae, posteriorly in XI. Spermathecal pores paired in lateral lines, anteriorly in X.

Pharyngeal glands in IV–(VII)VIII(IX). A few septa anterior to clitellum thickened, conspicuously muscular. Male genitalia (Figs 1C, D) paired. Vas deferens 7–12  $\mu\text{m}$  wide, not seen in its whole length, but clearly longer than atrium. Vas entering anterior face of atrium, but near apical end (see Fig. 1D). Atrium erect, oval-to-spindle-shaped, 65–110  $\mu\text{m}$  long, 42–60  $\mu\text{m}$  wide, with thin (1–2  $\mu\text{m}$ ) muscular lining, and granulated and ciliated inner epithelium; lumen of atrium wide. Atrium ectally opening to exterior through simple pore; copulatory sac absent. Prostate glands large with long stalks; anterior one attached to anterior face of atrium, near entrance of vas deferens; posterior one attached to posterior face of atrium, at some distance from apex, more or less opposite to attachment of anterior prostate. Spermathecae (Fig. 1C, s) with short, triangular ducts, and large, oval ampullae, latter filling a great part of X; round or somewhat triangular spermatozeugmata present in spermathecae of postcopulatory specimens.

*Etymology.* This species is named *munitus*, Latin for "fortified, walled", referring to the thickened septa in preclitellar segments.

*Distribution and habitat.* Known only from Victoria, Australia. Subtidal sand and mud, 8–15 m depth.

*Remarks.* This species belongs to a large complex of shallow-water forms within *Bathydrilus* with (1) large, single-pointed, and almost straight penial setae, generally 2 or 3 per bundle, (2) pharyngeal glands extending as far as into segment VIII or thereabouts, (3) erect, more or less spindle-shaped atria, and (4) characteristic, round-to-triangular spermatozeugmata. The other species in this complex are *B. adriaticus* (Hrabě, 1971), *B. connexus* Erséus, 1988, *B.*

*exilis* Erséus and Davis, 1989, *B. formosus* Erséus, 1986, *B. ingens* Erséus, 1986, *B. litoreus* Baker, 1983, *B. longus* Erséus, 1979, *B. notabilis* Erséus and Milligan, 1988, *B. rohdei* (Jamieson, 1977), and *B. superiovasatus* Erséus, 1981. One additional species, *B. edwardsi* Erséus, 1984, although lacking penial setae, may be a member of this phylogenetic group too. Of these species, four were previously known from Australia: *Bathydrilus rohdei* and *B. superiovasatus* from the Great Barrier Reef in Queensland (Jamieson, 1977; Erséus, 1981), *B. edwardsi* and *B. litoreus* from south Western Australia (Erséus, in press). The new form from Victoria is most similar to *B. superiovasatus* (particularly with regard to the morphology of the atria and the position of the junctions between the vasa deferentia and atria), but differs from that species by its higher number of setae (in *B. superiovasatus*, anterior somatic setae generally only 3 per bundle, penial setae only 1–2 per bundle), and its narrower vasa deferentia (vasa ectally up to 20–23  $\mu\text{m}$  wide in *B. superiovasatus*).

*Bathydrilus exilis*, from Hawaii, has slender somatic setae, with upper teeth completely reduced in posterior segments, and thickened, muscular septa anterior to clitellar region, features that indicate a close relationship to *B. munitus*. The new species, however, has clearly stouter atria than *B. exilis*, with the posterior prostates subapically attached to the atria (not apically attached as in *B. exilis*; see Erséus and Davis, 1989).

### Limnodriloidinae

#### Limnodriloides Pierantoni

#### *Limnodriloides triplus* sp. nov.

#### Figure 2

*Material examined.* Holotype: NMV F57373, whole-mounted specimen. Crib Point, Western Port, Victoria, Australia, 38°20.94'S, 145°13.62'E, 15 m, fine mud and sand, 15 Jul 1969; material originating from the Crib Point Benthic Survey (Marine Studies Group, Ministry for Conservation, stn CPBS-N 31).

*Description.* Length 8.3 mm, about 58 segments (posterior end not completely differentiated). Width at XI 0.24 mm. Prostomium large, rounded. Clitellum extending over XI–XII. Setae (Figs 2A–C) bifid, with upper tooth thinner and shorter than lower, less pronouncedly so in anterior than in more posterior setae. Setae about 45  $\mu\text{m}$  long, 1.5–2.5  $\mu\text{m}$  thick, 2–3 per bundle anteriorly, 2 per bundle in postclitellar segments, absent ventrally from X–XI. Male



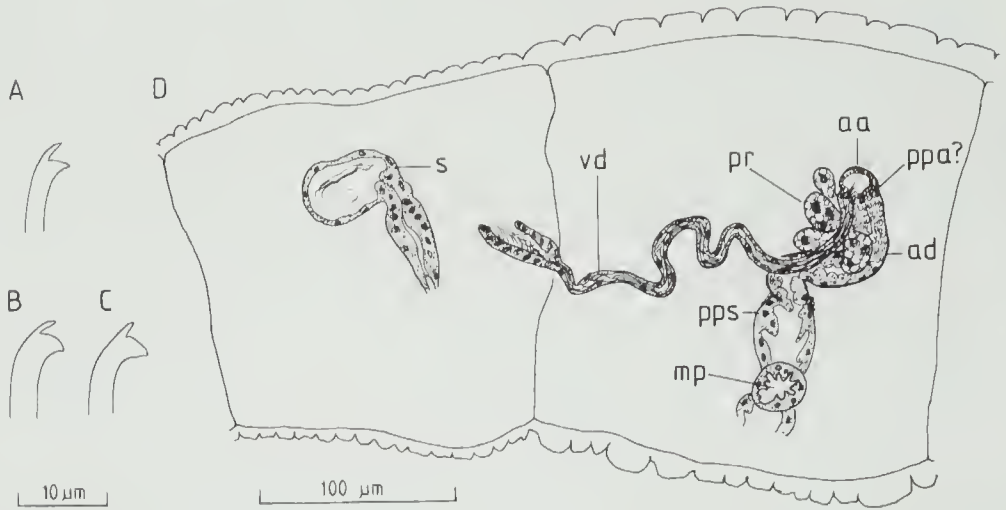


Figure 2. *Limnodriloides triplus* sp. nov. A, anterior seta. B, dorsal seta of segment XI. C, posterior seta. D, lateral view of spermatheca and male genitalia in segments X–XI. aa, atrial ampulla; ad, atrial duct; mp, male pore (unpaired); ppa?, prostatic pad (?; poorly developed); pps, pseudopenial sac; pr, prostate gland; s, spermatheca; vd, vas deferens.

pore unpaired, ventrally in posterior part of XI. Spermathecal pores paired, but close together, ventral, somewhat posterior to middle of X.

Pharyngeal glands in IV–V. Oesophageal diverticula in IX large. Male genitalia (Fig. 2D) paired. Vas deferens narrow (6–8 µm wide), much longer than atrium, entering latter sub-apically. Atrial ampulla very small, roundish, about 20 µm long, 18 µm wide, with thin walls and, possibly, a small prostatic pad (Fig. 2D, ppa?). Prostate gland small, lobed, but attachment with atrial ampulla not seen. Atrial duct not muscular, about 90 µm long, about 20 µm wide, with ental part heavily granulated; eetal part with somewhat irregular lumen. Atrial duct opening directly into about 35 µm long, 28 µm wide, pseudopenial sac; latter with somewhat folded wall, but no distinct penial or pseudopenial papilla present. Pseudopenial sacs of two sides of worm united mid-ventrally and opening to exterior through unpaired, somewhat star-shaped male pore. Spermathecae (Fig. 2D, s) with distinct ducts, about 65 µm long, 22 µm wide at middle, and oval ampullae, 42–58 µm long, 24–31 µm wide; sperm bundled in spermathecae.

*Etymology.* The epithet *tripplus*, Latin for “three-fold, triple”, refers to the three genital openings (male pores unpaired, spermathecal pores paired) in this species.

*Distribution and habitat.* Known only from the type locality, Victoria, Australia. Subtidal muddy sand, 15 m depth.

*Remarks.* This species is closely related to another species recently described from Perth and Albany in Western Australia (Erséus in press). The two species are unique within *Limnodriloides* in having very short atrial ampullae, with poorly developed (or absent?) prostatic pads, and with vasa deferentia opening into the middle of the ampullae. *Limnodriloides triplus* is, however, easily distinguished from the other species by its unpaired male pore (pores close together, but paired, in the other species). The new species also appear to have longer vasa deferentia, and somewhat more developed pseudopenial sacs, than the Western Australian form.

#### *Limnodriloides stercoreus* sp. nov.

Figures 3, 4A–D

*Material examined.* Holotype: NMV F57374, whole-mounted specimen. Near mouth of Little River, western Port Phillip Bay, Victoria, subtidal, largely sandy sediment, Nov 1975; material from a survey of benthos near an outfall of the Werribee sewage-treatment farm (Marine Studies Group, Ministry for Conservation) (see Poore and Kudenov, 1978).

Paratypes: NMV F57375, 5 whole-mounted specimens from type locality.

Other material: NMV F57376, 14 whole-mounted specimens from type locality. NMV F57377, whole-mounted specimen from Western Port, Victoria, Australia, intertidal, silty sand, 2 Jan 1974; material from the Western Port Bay Environmental Study (Marine Science Group, Ministry for Conservation) (see Shapiro, 1975). AM W203754, whole-mounted specimen from Port Hacking, S of Sydney, New South

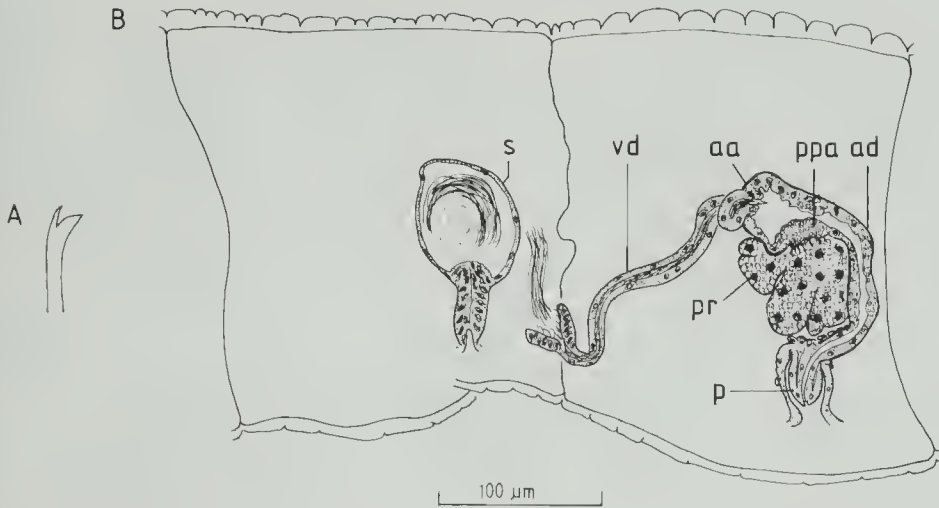


Figure 3. *Limnodriloides stercoreus* sp. nov., holotype. A, free-hand drawing of seta. B, lateral view of spermatheca and male genitalia in segments X–XI. aa, atrial ampulla; ad, atrial duct; p, penis; ppa, prostatic pad; pr, prostate gland; s, spermatheca; vd, vas deferens.

Wales, Australia, mud from artificial reef, 17 Dec 1974 (C. Glasby, NSW Fisheries).

**Description.** Length (10 specimens) 6.2–9.2 mm, 36–52 segments. Width at XI 0.22–0.36 mm. Prostomium rounded. Clitellum extending over XI–XII. Setae (Fig. 3A) bifid with upper tooth thinner and shorter than lower. Setae 40–65 µm long, about 2.5 µm thick, 2–4 (occasionally 7) per bundle anteriorly, (1)2–3 per bundle in post-clitellar segments, but absent ventrally in X and XI. Male pores paired in line with ventral setae posteriorly in XI. Spermathecal pores paired in line with ventral setae posterior to middle of X.

Pharyngeal glands in IV–V. Long and conspicuous oesophageal diverticula present in anterior part of IX. Male genitalia (Fig. 3B) paired. Vas deferens 7–13 µm wide, about as long as atrium, entering apical end of atrium (at middle of small papilla in anterior wall of atrial ampulla). Atrial ampulla more or less pear-shaped, 30–65 µm long, 25–50 µm wide, with hollow ental part. Muscular layer of ampulla thin. Prostatic pad ventral, somewhat cup-shaped, in middle-to-ectal part of ampulla. Prostate gland large, lobed, communicating with pad. Atrial duct 90–130 µm long, 16–26 µm wide, with very thin outer muscular layer, and some scattered granulation in its middle part. Atrial duct terminating in conical penis, 23–35 µm long, 20–25 µm wide at base, pendent within thin-walled penial sac. Spermathecae (Figs 3B, s; 4A–D) with distinct ducts, 35–60 µm long, 20–30 µm, and round-to-oblong ampulla, 70–120

µm long, 35–100 µm wide; when fully developed ampulla thin-walled and in postcopulatory specimens containing bundles of sperm or spermatozeugmata (cf. Figs 4C–D).

**Etymology.** The species epithet *stercoreus* is Latin for “dirty, filthy”; here alluding to the proximity of the type locality to an outfall from a sewage-treatment farm.

**Distribution and habitat.** Victoria and New South Wales, Australia. Intertidal and subtidal, muddy and sandy sediments. Depth range unknown.

**Remarks.** This species appears closely related to *L. atriotumidus* Erséus, 1982 and *L. validus* Erséus, 1982, both from the South Atlantic. It is distinguished from the former by lacking a ventral bulge (containing the prostatic pad in *L. atriotumidus*) on the atrial ampulla, and from the latter by lacking very thick atrial muscles. *Limnodriloides stercoreus* is very similar to *L. problematicus* sp. nov.; see *Remarks* for that species below.

#### *Limnodriloides problematicus* sp. nov.

Figures 4E–H, 5–6

**Material examined.** Holotype: NMV F57379, whole-mounted specimen. Banksia Peninsula, E end of Lake Victoria, Gippsland Lakes, Victoria, Australia, 38°01.3'S, 147°36.6'E, 1 m. sand with scagrass, annual salinity regime approximately 10–25 ppt, 29 Mar 1979; material from the Gippsland Regional Environmental Study, Benthic Surveys (Marine Studies

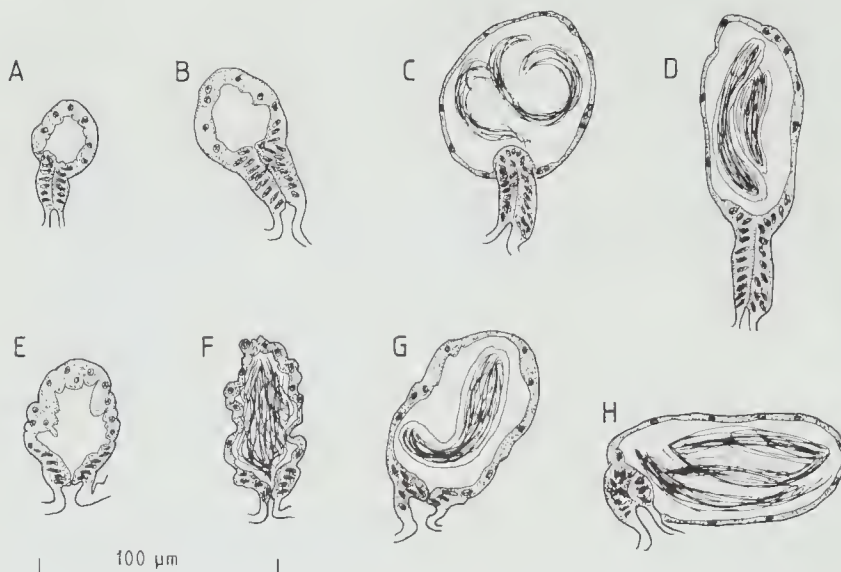


Figure 4. A–D, *Limnodriloides stercoreus* sp. nov., spermathecae from different specimens (all from Victoria). E–H, *Limnodriloides problematicus* sp. nov., spermathecae from different specimens (all from Victoria).

Group, Ministry for Conservation) (Poore, 1982; Bird, 1978).

Paratypes: NMV F57380, 4 whole-mounted specimens from type locality.

Other material: NMV F57381, 8 specimens from type locality (type date). NMV F57382, specimen from type locality, but 26 Jul 1979. NMV F57383, 2 specimens from beside jetty, Lake King, Gippsland Lakes, Victoria, 1 m, sand with seagrass, 1 Mar 1979.

NMNZ ZW1282, 1283, 2 specimens from mudflat at Maungatapu, Tauranga, in Tauranga Harbour (W part of Bay of Plenty), North Island, New Zealand, 37.7°S, 176.3°E, intertidal mud, Jan 1980, K.A. Coates. NMNZ ZW1284, specimen from mudflat in Manukau Harbour, Auckland, North Island, New Zealand, 37°S, 174°35'E, soft mud, Nov 1986, S.F. Thrush and D.S. Roper. NMNZ ZW1285, specimen from subtidal slope leading into a 10 m deep channel between Portobello Marine Laboratory wharf and St Martins Island, Otago Harbour, Dunedin, South Island, New Zealand, 45°55'S, 170°40'E, unvegetated muddy sand, 6–8 m, Jul/Aug 1985, S.F. Thrush. Author's collection: 4 specimens from Maungatapu, New Zealand (as above).

*Description of material from Australia* (Figs 4E–H, 5). Length (5 specimens) 6.8–9.2 mm, 51–55 segments. Width at XI 0.16–0.25 mm. Prostomium rounded. Clitellum extending over XI–XII. Somatic setae (Fig. 5A) bifid, somewhat variable, but with upper tooth thinner, and at least slightly shorter, than lower. Bifids 35–55  $\mu$ m long, 2–3  $\mu$ m thick, (1)2–3 per bundle an-

teriorly, 1–2 (more often 1 than 2) per bundle in postclitellar segments; ventral setae always absent from XI. Ventral setae of X (Fig. 5B, ss) generally modified into 65–80  $\mu$ m long, 3–3.5  $\mu$ m thick, single-pointed, more or less straight spermathecal setae, 1 at each side of worm. Ectal one-third of spermathecal setae grooved. Ectal part of this seta enclosed in heavily muscular glandular body, which also bears a large external gland (Fig. 5B, gss). In some individuals, spermathecal setae missing at one side of body or missing completely. Male pores paired in line with ventral setae posteriorly in XI. Spermathecal pores paired in line with ventral somatic setae posterior to middle of X.

Pharyngeal glands in IV–V. Large and conspicuous oesophageal diverticula present anteriorly in IX. Male genitalia (Fig. 5B) paired. Vas deferens 15–21  $\mu$ m wide, about as long as atrium, entering apical end of atrium (at middle of small papilla in anterior wall of atrial ampulla). Atrial ampulla oblong, 42–60  $\mu$ m long, 29–37  $\mu$ m wide, with very thin outer muscular layer. Prostatic pad somewhat cup-shaped, in ventral wall of middle-to-ectal part of ampulla. Atrial duct 80–100  $\mu$ m long, 14–18  $\mu$ m wide, with very thin outer muscular layer and some scattered granulation in its middle part. Atrial duct terminating in conical penis, 19–26  $\mu$ m long, 19–29  $\mu$ m wide at base, pendent within penial sac. Spermathecae (Figs 4E–H; 5B, s) with indistinct, very short ducts and somewhat oval



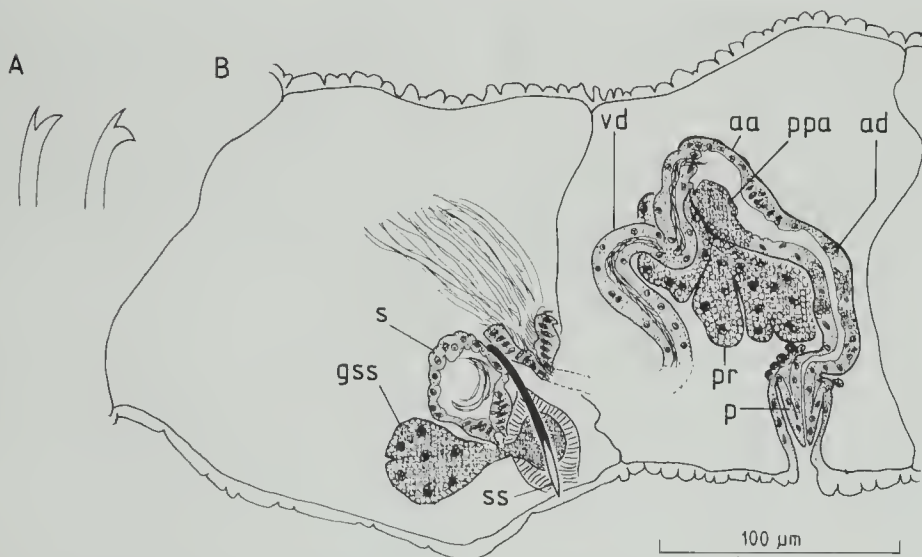


Figure 5. *Limnodriloides problematicus* sp. nov., from Victoria. A, free-hand drawings of setae. B, lateral view of spermatheca and male genitalia in segments X–XI. aa, atrial ampulla; ad, atrial duct; gss, gland associated with spermathecal seta; p, penis; ppa, prostatic pad; pr, prostate gland; s, spermatheca; ss, spermathecal seta; vd, vas deferens.

(often with irregular outline) ampullae. Ampullae 35–100 µm long, 35–55 µm wide, with thick walls in precopulatory specimens; walls much thinner in postcopulatory individuals. When present, sperm random (poor fixation?), in bundles or as spermatozeugmata in ampulla (Figs 4F–H).

**Description of material from New Zealand** (Fig. 6). Length 4.9–10.9 mm, up to about 48 segments (difficult to count; specimens much coiled and twisted). Width at XI, 0.22–0.36 mm. Bifid

setae 40–60 µm long, 2–2.5 µm thick, 1–2(3) per bundle anteriorly, 1–2 per bundle in postclitellar segments. Spermathecal setae 70–90 µm long, 2–2.5 µm thick, located either posterior (most common) or anterior to spermathecal pores; these setae present on both sides in all specimens. Vas deferens 14–19 µm wide. Atrial ampulla (Fig. 6A, aa) 60–80 µm long, 25–50 µm wide. Atrial duct (ad) 95–175 µm long (measured in 2 specimens only), 12–30 µm wide. Penis (p) 30–50 µm long, 20–50 µm wide at base. Spermathecae (Fig. 6B) with indistinct, very short ducts, and oval or round ampullae, latter 60–115 µm long, 50–115 µm wide.

**Etymology.** Named *problematicus* as it is difficult to establish whether this form really is a species separate from *L. stercoreus*.

**Distribution and habitat.** Victoria, Australia, and both North and South Islands, New Zealand. Intertidal and subtidal, muddy or sandy sediment, to at least about 8 m depth; marine and brackish water.

**Remarks.** Most of the worms studied (including material from one Australian and three New Zealand populations) have spermathecal setae, at least at one side of the body. A few worms from Australia lack these setae, but the characteristic glandular sacs (otherwise associated with

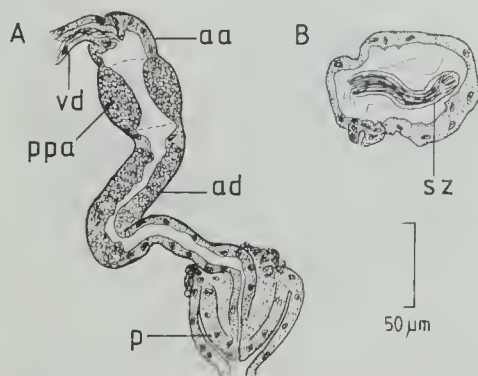


Figure 6. *Limnodriloides problematicus* sp. nov., from North Island, New Zealand. A, part of male duct. B, spermatheca. aa, atrial ampulla; ad, atrial duct; p, penis; ppa, prostatic pad; sz, spermatozeugma; vd, vas deferens.

spermathecal setae) are present ventrally in segment X. This form is described as a new species with some hesitation, as its male ducts are virtually identical to those of *L. stercoreus* described above, and most of the differences between the two forms (absence versus presence of spermathecal setae; slightly different numbers of bifid setae; dimensional differences in vas deferens width, body diameter, etc.) could per se be regarded as intraspecific. One important reason for regarding *L. problematicus* as a separate species is, therefore, its consistently shorter spermathecal ducts as compared to those of *L. stercoreus* (difference illustrated in Fig. 4). However, the most useful diagnostic feature of most specimens of *L. problematicus* is their possession of spermathecal setae.

By possessing spermathecal setae, *L. problematicus* qualifies as a member of the "winckelmanni group" within *Limnodriloides* (see Erséus, 1982). This group is not necessarily monophyletic; it has been recognized largely for convenience. *Limnodriloides problematicus* is certainly more closely related to *L. stercoreus* (which always lacks spermathecal setae) than to any of the other species with spermathecal setae.

*Limnodriloides cribensis* sp. nov.

Figure 7

*Material examined.* Holotype: NMV F57384, whole-mounted specimen. Crib Point, Western Port, Vic-

toria, Australia, 38°21.15'S, 145°13.51'E, 15 m, fine sand and mud, 15 Jul 1969; material from the Crib Point Benthic Survey (Marine Studies Group, Ministry for Conservation, stn CPBS 300) (see Shapiro, 1975).

Paratypes: NMV F57385, 2 specimens from type locality, but 24 Aug 1967. NMV F577386, 2 specimens from off Altona, Port Phillip Bay, Victoria, 37°53.0'S, 144°51.5'E, 8 m, sand, 7 Jun 1971; material from the Port Phillip Bay Environmental Study (Marine Pollution Studies Group, Ministry for Conservation stn PPBES 901).

*Description.* Length (only 1 complete specimen) 7.5 mm, 46 segments. Width at XI, 0.22–0.29 mm. Prostomium rounded. Clitellum extending over ½X–XII. Somatic setae (Fig. 7A) bifid, with upper tooth thinner and shorter than lower (but most tips broken off). Bifids about 40–50 µm long, 2–2.5 µm thick, 2–3(4) per bundle anteriorly. 1 seta representing each bundle in postclitellar segments. Ventral setae of X and XI modified into genital setae, one at each spermathecal and male pore. Spermathecal setae (Fig. 7B, ss) single-pointed with ental ends strongly curved, and with groove extending along ectal two-fifths of seta; these setae 110–140 µm long, entally about 3 µm thick. Penial setae (Fig. 7B, ps) very similar to spermathecal setae but with less strongly curved ental ends; these setae 135–160 µm long, entally about 3.5 µm thick. Each spermathecal and penial seta ectally enclosed in an oval glandular sac (whether latter bears an

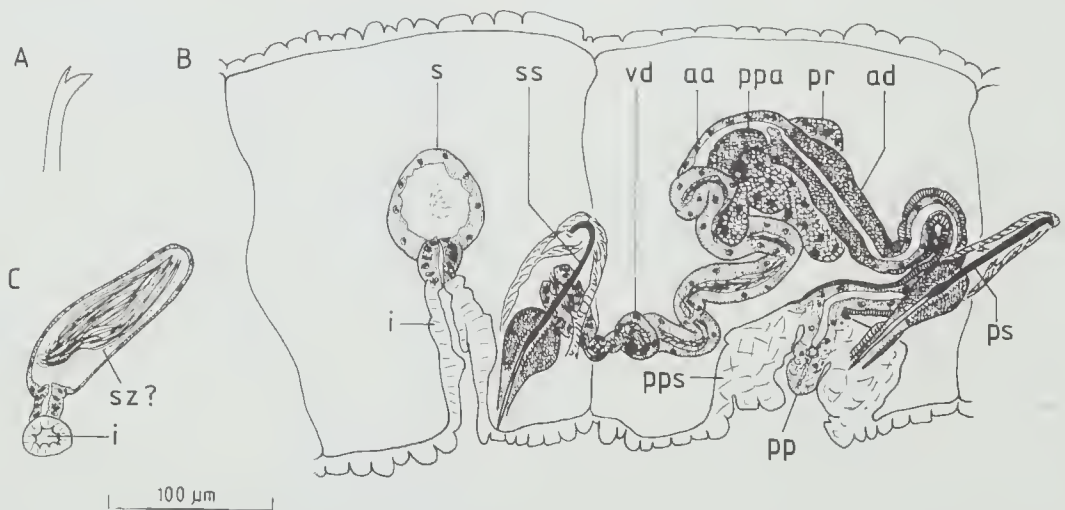


Figure 7. *Limnodriloides cribensis* sp. nov. A, free-hand drawing of somatic seta. B, lateral view of spermatheca and male genitalia in segments X–XI. C, spermatheca of another specimen. aa, atrial ampulla; ad, atrial duct; i, secondary invagination at spermathecal pore; pp, pseudopenis, ppa, prostatic pad; pps, pseudopenial sac; pr, prostate gland; ps, penial seta; s, spermatheca; ss, spermathecal seta; vd, vas deferens.



not be ascertained on basis of available material). Sac of spermathecal setae wider than that of penial setae; both types of setae also supported by muscles. Male pores paired in line with ventral setae somewhat posterior to middle of XI. Spermathecal pores paired in line with ventral setae in middle of X.

Pharyngeal glands in IV–V. Large and conspicuous oesophageal diverticula present, in anterior part of IX. Male genitalia (Fig. 7B) paired. Vas deferens conspicuous, ectally 21–26  $\mu\text{m}$  wide, almost as long as atrium, entering atrium somewhat subapically. Atrial ampulla elongate oval, about 80  $\mu\text{m}$  long, 26–28  $\mu\text{m}$  wide, with very thin outer lining, thin dorsal inner epithelium and elongate ventral prostatic pad, latter bearing lobed prostate gland. Atrial duct 320–340  $\mu\text{m}$  long (measured in 2 specimens only), entally 28–35  $\mu\text{m}$  wide and heavily granulated but lacking outer muscles, ectally 21–32  $\mu\text{m}$  wide and heavily muscular but not granulated. Atrial duct terminating in a papilla-like structure in middle of complex, massive pseudopenial sac (containing both glandular and muscular tissue?). Spermathecae (Figs 7B, s; 7C) consisting of short duct, opening at inner end of deep invagination of body wall (Fig. 7B, i), and an oval or elongate, thin-walled ampulla; each of latter with one large, compact bundle of sperm (probably a poorly preserved spermatozeugma) in postcopulatory specimens (Fig. 7C).

*Etymology.* Named for the type locality (Crib Point).

*Distribution and habitat.* Known only from Victoria, Australia. Subtidal, muddy sand, 8–15 m depth.

*Remarks.* *Limnodriloides cribensis* belongs to the “*winkelmanni* group”, those species of *Limnodriloides* which possess grooved spermathecal setae (see Remarks for *L. problematicus* above). The new species is separated from all other members of this group by its conspicuous, secondary invaginations at the spermathecal pores. Moreover, it has modified slender grooved setae present in X as well as XI, a feature previously known only for *L. fuscus* Erséus, 1984, and certain individuals of *L. victoriensis* Brinkhurst and Baker, 1979.

### *Marcusaedrilus* Righi and Kanner

#### *Marcusaedrilus assimilis* sp. nov.

#### Figure 8

*Material examined.* Holotype: NMV F57387, whole-mounted specimen. Hobsons Bay (at Melbourne), Port Phillip Bay, Victoria, Australia, 37°52'S, 144°55'E, 8 m, very fine sand, 9–11 Mar 1971; material from the Port Phillip Bay Environmental Study, Hobsons Bay Survey (Marine Pollution Studies Group, Ministry for Conservation stn PPBES 125).

Paratypes: NMV F57388, specimen from Western Port, Victoria, Australia, 38°14.36'S, 145°20.62'E, intertidal, sand, 8 Jan 1974; material from the Western Port Bay Environmental Study (Marine Studies Group, Ministry for Conservation stn WBES 1709) (Shapiro, 1975). NMV F57389, specimen from Port Phillip Bay, Victoria, 38°07.0'S, 144°27.0'E, 9 m, silt

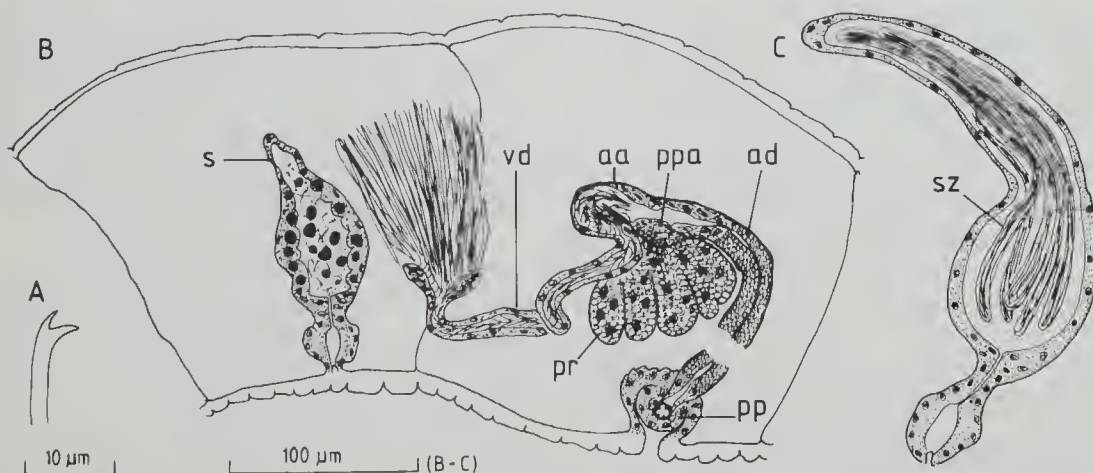


Figure 8. *Marcusaedrilus assimilis* sp. nov. A, somatic seta. B, lateral view of spermatheca and male genitalia in segments X–XI (holotype). C, spermatheca (specimen from Port Hacking, NSW). aa, atrial ampulla; ad, atrial duct; pp, pseudopenis; ppa, prostatic pad; pr, prostate gland; s, spermatheca; sz, spermatozeugma; and, vd, vas deferens.

and clay, 12 Feb 1970; and NMV F57390, specimen from same area and date, but 38°07.0'S, 144°31.0'E, 7 m, silt and clay; both material the Port Phillip Bay Environmental Study (Marine Pollution Studies Group, Ministry for Conservation stns PPBES 941 and 942). AM W11275, specimen from Merimbula, southern New South Wales, Australia.

Other material examined: AM W9656, specimen from Black Neds Cay, L. Macquarie, Newcastle, NSW. AM W195216, specimen from Port Hacking, Sydney, NSW, mud from artificial reef, 17 Dec 1974 (coll. C. Glasby, NSW Fisheries). AM W11329, specimen from seaward end of Merimbula Lake, NSW.

**Description.** Length 6.8–13.2 mm, 45–75 segments. Width at XI, 0.22–0.38 mm. Prostomium elongate and large, often somewhat pointed. Clitellum extending over XI– $\frac{2}{3}$ XII when developed. Setae (Fig. 8A) bifid, with upper tooth thinner and shorter than lower. Setae 37–50  $\mu$ m long, 2–3  $\mu$ m thick, (1)2(3) per bundle anteriorly, 1(2) per bundle in mid-body, generally 2 per bundle in most posterior part of worm. Ventral setae absent from X–XI. Male pores paired, more or less in line with ventral setae, posteriorly in XI. Spermathecal pores paired, more or less in line with ventral setae, immediately posterior to middle of X.

Pharyngeal glands in IV–V. Oesophageal diverticula in IX small. Male genitalia (Fig. 8B) paired. Vas deferens 12–16  $\mu$ m wide, about as long as atrium, entering apical end of latter. Atrial ampulla cylindrical, 105–140  $\mu$ m long, 23–40  $\mu$ m wide, with 1–2  $\mu$ m thick outer lining of muscles, and with long cilia in its ental part; this part also characteristically folded in all specimens studied (cf. Fig. 8B). Ectal part of atrial ampulla with small, but distinct, ventral prostatic pad. Prostate gland large, lobed. Atrial duct 95–190  $\mu$ m long, 16–26  $\mu$ m wide, with very thin outer lining, but with granulation in inner epithelium for most parts. Atrial duct terminating in large papilla inside a roundish pseudopenial sac. Spermathecae (Figs 8B, s; 8C) consisting of (1) ducts, 37–70  $\mu$ m long, 28–46  $\mu$ m wide at bulbous ectal swelling, much narrower immediately ental to this swelling, and (2) somewhat pear-shaped ampullae, 100–290  $\mu$ m long, maximally 35–73  $\mu$ m wide, with much prolonged, narrow inner ends (particularly in postcopulatory specimens; Fig. 8C). In pre-copulatory specimens, spermathecae with thick walls and droplets of secretion (Fig. 8B, s); in post-copulatory worms, spermathecae with thinner walls and lumen filled with slender spermatozeugmata (Fig. 8C).

**Etymology.** This species is "similar" (Latin *assimilis*) to two other species of *Marcusaedrilus* (see *Remarks*).

**Distribution and habitat.** Victoria and New South Wales, Australia. Intertidal and subtidal, muddy or sandy sediments, to at least 9 m depth.

**Remarks.** *Marcusaedrilus assimilis* is closely related to *M. grandiculus* Erséus, 1983, from the Great Barrier Reef, and *M. vesiculatus* Erséus, 1984, from southern China. It is, however, easily distinguished from both of these by the characteristically folded, ciliated part of the atrial ampullae. It is further discriminated from *M. grandiculus* by the conspicuous swellings on its spermathecal ducts (such swellings absent in *L. grandiculus*), and from *M. vesiculatus* by its lower number of anterior setae (setae up to 3 or 4 per bundle in *L. vesiculatus*), and its more developed pseudopenes and spermathecae.

#### Discussion

Of the nine marine species of Tubificidae now known from Victoria, only three, *Heronidrilus bihamis*, *Tubificoides diazi* and *T. fraseri* are widely distributed outside the southern, temperate part of Australia. *Heronidrilus bihamis* is in fact the only taxon so far known to occur both in Victoria and in southern Western Australia; none of the 22 other tubificid species recorded from the Albany area in the latter state (Erséus, in press) has yet been found in Victoria. Although still scanty, the available information thus seems to indicate that the marine tubificid fauna of Victoria is much different from that of south-western Australia. The occurrence of two species also in New South Wales (*Limnodriloides stercoreus* and *Marcusaedrilus assimilis*), and one also in New Zealand (*L. problematicus*) rather support a truly south-eastern affinity of this fauna.

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