

### Re-description of the Lake Pedder Earthworm: *Hypolimnus pedderensis*

- The first extinct earthworm listed on IUCN **Red List** of the World's Threatened Spp. [IUCN (2004) and see <http://www.redlist.org/search/details.php?species=41254> , <http://www.artensterben.de>].

#### Introduction

This article concerns earthworms at Lake Pedder in the heart of Tasmanian Wilderness World Heritage Area (TWWHA). Inundation of the original spectacular and pristine lake was impetus for the foundation in 1976 of the Wilderness Society that, although unsuccessful in this issue, helped prevent damming of the Gordon and Franklin Rivers and gained international interest as a precursor to several other “Green” groups (<http://www.wilderness.org.au/campaigns/forests/tasmania/ftfchron/> and see [Wikipedia](#)). Prior to its flooding for hydro-electric power in 1972, the original lake was regarded as the only significant Australian example of a glacial outwash impoundment and was notable for the large quartzite beach formed at its eastern end that had unique faunal associations of psammon groups – i.e., organisms growing on, in or moving through sand (Bayly *et al.*, 1966; Bayly *et al.*, 1972; Bayly, 1973). Bryant & Jackson (1999) and Driessen (1999) detail the known invertebrate species threatened by this flooding and summaris wider conservation issues of the TWWHA. Before the work reported here, the only oligochaetes recorded from around the original lake included several tubificid and phreodrilid microdriles (see Brinkhurst and Fulton, 1979) and just one megadrile earthworm, the subject of this study, *Hypolimnus pedderensis*. An extensive eco-taxonomic survey by the present author led to revision of this list, addition of 23 new species records, but no further trace of “The Pedder Earthworm” (Blakemore, 1996, 1997, 2000a, b). Presented here are a summary of these findings and conclusions.

Taxonomic treatment - description after Blakemore (1996, 1997, 2000a,b).

Family MEGASCOLECIDAE Rosa, 1891 *s. stricto* (s. Blakemore, 2000)

Genus *Hypolimnus* Blakemore, 2000

*Hypolimnus* Blakemore, 2000a: 4, b; 2004; 2005 (omitted from ABRS website, 2005).

Diagnosis: Setae more than eight per segment. Dorsal pores present but reduced (confined to midbody). Male pores from tubuloracemose prostates paired on 18. Multiple oesophageal gizzards in 5-6,½7; extramural calciferous glands absent; typhlosole absent. Nephridia vesiculate holoic (absent from anterior segments). Spermathecae four pairs; diverticula single, uniloculate.

Type species: *Perionychella (Vesiculodrilus) pedderensis* Jamieson, 1974: 251.

Etymology: 'hypolimnus' Greek, - beneath the lake. Masculine.

[Note: The genus *Hypolimnas* Hubner, 1816 (Nymphalidae : Lepidoptera) differs by one letter and is not a homonym, although sometimes it is misspelt "*Hypolimnus*".]

Distribution: Shore of Lake Pedder, Tasmania (now extinct).

Remarks: *Hypolimnus* is defined principally on the multiplication of its oesophageal gizzard, that appears unique to this perichaetine, holoic megascolecid. The reduced dorsal pores are another feature of this genus. Were it not for these gizzards, the monotypic type-species would comply with *Perionychella* as redefined by Blakemore (2000). Multiple gizzards in some or all of of 5-7 are found in *Digaster* Perrier, 1872, *Didymogaster* Fletcher, 1886 and *Perrisogaster* Fletcher, 1887; however, these three mainland Australian genera are lumbricine and meroic (see Blakemore, 1997b; 2000c). Western Tasmanian *Provescus* Blakemore, 2000, monotypic for *Provescus crottyi* Blakemore, 2000, shares several characters with *Hypolimnus* including multiple oesophageal gizzards, but this genus has tubular prostates, dorsal pores from the anterior, and lacks nephridial bladders.

#### Species description (monotypic)

##### ***Hypolimnus pedderensis* (Jamieson, 1974)**

[Fig. 1](#) (ex Blakemore, 2000a: fig. 11; 2000b: fig. 127).

*Perionychella (Vesiculodrilus) pedderensis* Jamieson, 1974: 251, figs. 12C (p. 244), 16W (p. 256); Jamieson, 2000/1: xxi; 441.

*Diporochoeta pedderensis*; Jamieson, 1976: 4; Driessen, 1999: 333, fig. 2.

*Perionychella pedderensis*; Dyne, 1991: 2, fig. 1 (a copy from Jamieson, 1974).

*Atlantodrilus pedderensis*; Blakemore, 1997 [nomen nudum - a name not available and to be excluded for purposes of zoological nomenclature, provisionally announced at Adelaide ASBS conference and inadvertently listed by editors <http://www.anbg.gov.au/asbs/conferences/1997-adelaide/asbs-agm-1997-abstracts-systematics.html>].

*Hypolimnus pedderensis*; Blakemore, 2000a: 18-20, fig 11 (redrawn from type); 2000b: 318, fig. 127; 2004: 168; 2005.

*Diporochoeta (Diporochoeta?) pedderensis*; Jamieson, 2000/1: 500 figs. 10.47-8 (a copy from Jamieson, 1974) - without attempting re-examination of type, this description fails to acknowledge the subsequent studies and repeats most mistakes, and the omissions from Jamieson (1974) such as multiple oesophageal gizzards, tubuloracemose prostates, and presence of dorsal pores, etc..

Jamieson (2000/1: 501) retains it in the invalidated and restricted "Megascolecinae" and merely states "Placement in a separate, new genus on the basis of absence of dorsal pores, and nephridial reduction would require additional reasons" - presumably reasons such as those provided here.

#### MATERIAL EXAMINED

HOLOTYPE: (H) Tasmanian Museum Hobart TM:K311, Lake Pedder, 146°12'E. 42°57'S, 25.ii.1971, P. Tyler, labeled thus: "Collected by Dr Peter Tyler on main beach of Lake Pedder, near where Maria Creek came to the lake. Dr P. Tyler pers. comm. 15.ii.1991, R.H. Green" - "sorted from interstitial fauna" (complete mature specimen, coiled and slightly damaged, previously dissected in the anterior only, re-inspected, and re-sketched). [Note: the type specimen was in good condition when last inspected by the author, but was subsequently handled and re-figured by an artist in Driessen (1999)].

#### EXTERNAL FEATURES

Body tapering to tail, coiled with broad dorsal gutter in hindbody (possibly due to emaciation or preservation). Length mm: 50. Width: 1.5 mm. Segments: 129. Colour: anterior and dorsum faint brown pigmentation, yellowed in alcohol, clitellum buff. Prostomium: open epilobous (previously sectioned so furrowing not discernible). Clitellum: ½13-17 (damaged on lhs in 16). Dorsal pores: absent from anterior, present in midbody from 39/40 for about 35 segments (visible and detectable by mucal ejecta). Setae: 10 on 12 increasing to 24 in posterior with one or two extra setae caudally to give up to 28 per segment, in mostly regular series. Nephropores: lateral in straight series in c lines in anterior and d lines in posterior. Spermathecal pores: 5/6/7/8/9, diverging from just lateral of a lines, to mid-ab, to just median of b lines. Female pores: paired on 14. Male pores: paired on slight mounds in mid-ab lines on 18 with protruding penial seta ("structure not elucidated" by Jamieson), setae b retained. Genital markings: small, paired markings just antero-median of spermathecal pores in 8; elongate pads in 17/18 and 18/19 as wide as male pores, extending to mid-ab; paired eye-like markings in ab in 19/20, and an analogue in 20/21lhs (none in 20/21rhs).

#### INTERNAL ANATOMY

Septa delicate except for 11/12/13. Gizzards: muscular in 5, 6 and part of 7 (i.e., 2½ segments), smooth with muscular sheen externally, an anterior rim in 5 and a larger posterior rim in 6 that continues into 7, waisted at 5/6; previously sectioned and showing muscular body wall and deep longitudinal lamellae internally. Oesophagus: dilated in 8-13 but not calciferous, narrow in 14-16. Nephridia: vesiculate holoic with small, thickened, spherical bladders apparent only from segment 5; not tufted anteriorly, nephridia reduced in size before segment 12. Vascularization: dorsal blood vessel

single, widened on intestine; hearts 10-12, supra-oesophageal vessel developed in 8-13. Spermathecae: four pairs in 6-9, sub-spherical or heart-shaped ampulla on short duct with simple diverticulum ectally, 8lhs slightly bifid, (Note: 8rhs and 9rhs had previously been removed and were loose in body cavity in jar). Male organs: holandric, iridescent testes and funnels in mucus in 10 and 11; seminal vesicles racemose in 9 and, larger, in 12. Ovaries: palmate in 13; large paired ovisacs present on anterior septum in 14. Prostates: tubuloracemose 18-19,20, surface slightly lobular with weak central canal on section; penial seta seen externally but not found internally (partially removed previously?). Intestine: origin 17; no typhlosole but low dorsal ridge present; gut contains mucus and several large quartzite grains (some of 0.8 mm diameter).

### Discussion

Jamieson's student, Geoff Dyne (Dyne, 1991: 2-3), claimed to have re-inspected the holotype, yet he concurred with the erroneous original description (apart from noting that the collection was mistakenly attributed to a "Mr D Tyler" rather than to Dr P.A. Tyler), stating only that: "The type specimen of *P. pedderensis* in the Tasmanian Museum was re-examined to confirm the morphological characteristics recorded by Jamieson (1974)". This corrected collection data was omitted by Jamieson (2000/2001: 500) who says only that: "Dyne (pers. comm.)" was unable to find new material at the Lake (whence he seems to have collected just two worms in 1991).

The current author's redescription considerably augmented the original account, with the following characters differing from Jamieson's descriptions, or newly recorded by Blakemore (1996; 1997; 2000a) from detailed inspection of the same material:

1. Gizzards in 5- $\frac{1}{2}$ 7 (cf. "Gizzard moderate, in VI.").
2. Dorsal pores present, but confined to the mid-body (cf. "absent").
3. Nephropores lateral in c-d lines (cf. "?").
4. Clitellum  $\frac{1}{2}$ 13-16 (cf. all of "XIII-XVI" and as in Jamieson, 1974: fig. 12C).
5. Nephridia reduced before segment 12 (cf. "appearing rudimentary to VII" - possibly a typo for "XII"?).
6. Prostates actually tubuloracemose (cf. "thickly tubular").
7. Presence of a supra-oesophageal vessel (cf. "Suboesophageal" - another typo?).
8. Divergence of spermathecal pores to just median to b in 8/9 (cf. figs).
9. Correct locations of spermathecal pores and setae (cf. Jamieson, fig. 12C).
10. Absence of genital marking in 20/21rhs in setal a line as described but not shown in Jamieson (1974: fig. 12C; 2000/1: fig. 10.47).

According to Jamieson's original description, rather than *Perionychella* that has non-tubular prostates or *Vesiculodrilus* that has lumbricine setae, this species would have been permissible in *Diporochaeta* for which it qualified on the basis of tubular prostates and non-lumbricine setae. However, the discovery of multiple oesophageal gizzards (and reduced dorsal pores) now warrant its placement in a new genus. As noted above, doubled or tripled oesophageal gizzards are a characteristic of several mainland genera (i.e., *Digaster*, *Perrisogaster*, *Didymogaster*), but these are lumbricine and meroic, whereas *Hypolimnus* is perichaetine and holoic as is the Tasmanian genus *Provescus* Blakemore, 2000 which shares several characters with *Hypolimnus* including multiple oesophageal gizzards, but this genus has tubular prostates, dorsal pores from the anterior, and lacks nephridial bladders unlike *Hypolimnus*.

Results of a detailed eco-taxonomic survey of Lake Pedder proposed, initiated and conducted by the author (Blakemore, 1996, 1997, 2000a) described 16 natives (14 new) and 5 exotics (two new Australian/Tasmanian records - see also Blakemore, 2002), plus 3 microdriles on its shores. Several sympatric species were morphologically close to *Hypolimnus pedderensis* (perhaps indicating a common ancestry), notably those having some modification of the oesophagus in segments 6-7. For example, *Vesiculodrilus ventralis*, *Diporochaeta diadema*, *D. gordonii* and *D. rubertumula*, *D. lacustris* and *D. setosa* were similar, and one specimen of *D. lacustris* also had most of its dorsal pores occluded. However, none of these other species had such development of gizzards, and the question remains of whether the single specimen of *H. pedderensis* was a slightly aberrant individual with regard to its dorsal pores. Unfortunately, this will probably remain the subject of speculation as the intensive survey of the new shoreline of Lake Pedder, including subsequently formed beaches in the region of Maria Creek, failed to locate any specimens corresponding with *H. pedderensis*, even allowing for errors of the original account.

Furthermore, no additional material remained in the sample in which *H. pedderensis* was originally contained, apart from several immature tubificids - QVM 14:3476, labeled "Lake Pedder, S.E. Tasmania, 15.ii.1971, P.A. Tyler from interstitial fauna", and a Zoology Dept. Univ. of Qld. label [in Jamieson's hand?]: "Loc. 45 - Enchytraeids" (22 specimens, shrivelled and brittle, apparently immatures).

Known only from a single specimen collected from the original (now submerged) beach of east Lake Pedder, interstitial (in sand), *H. pedderensis* is likely to now be extinct. An extensive ecological survey of the locality, including beaches newly formed on the lake's raised shoreline, followed by intensive taxonomic treatment by the current author found no trace (Blakemore, 1996; 2000a).

An earlier survey, also commissioned by Tasmanian Parks and Wildlife (TasPaWS), by Dyne (1991) conducted between 28/2/1991-2/3/1991 reached similar conclusions about its 'threatened' status, but can hardly be considered extensive as neither of the specimens collected from beside the trout-stocked lake were thought to be anything like the type-description (which he also appears to have superficially endorsed, cf. the detailed and corrected description above).

### Acknowledgements

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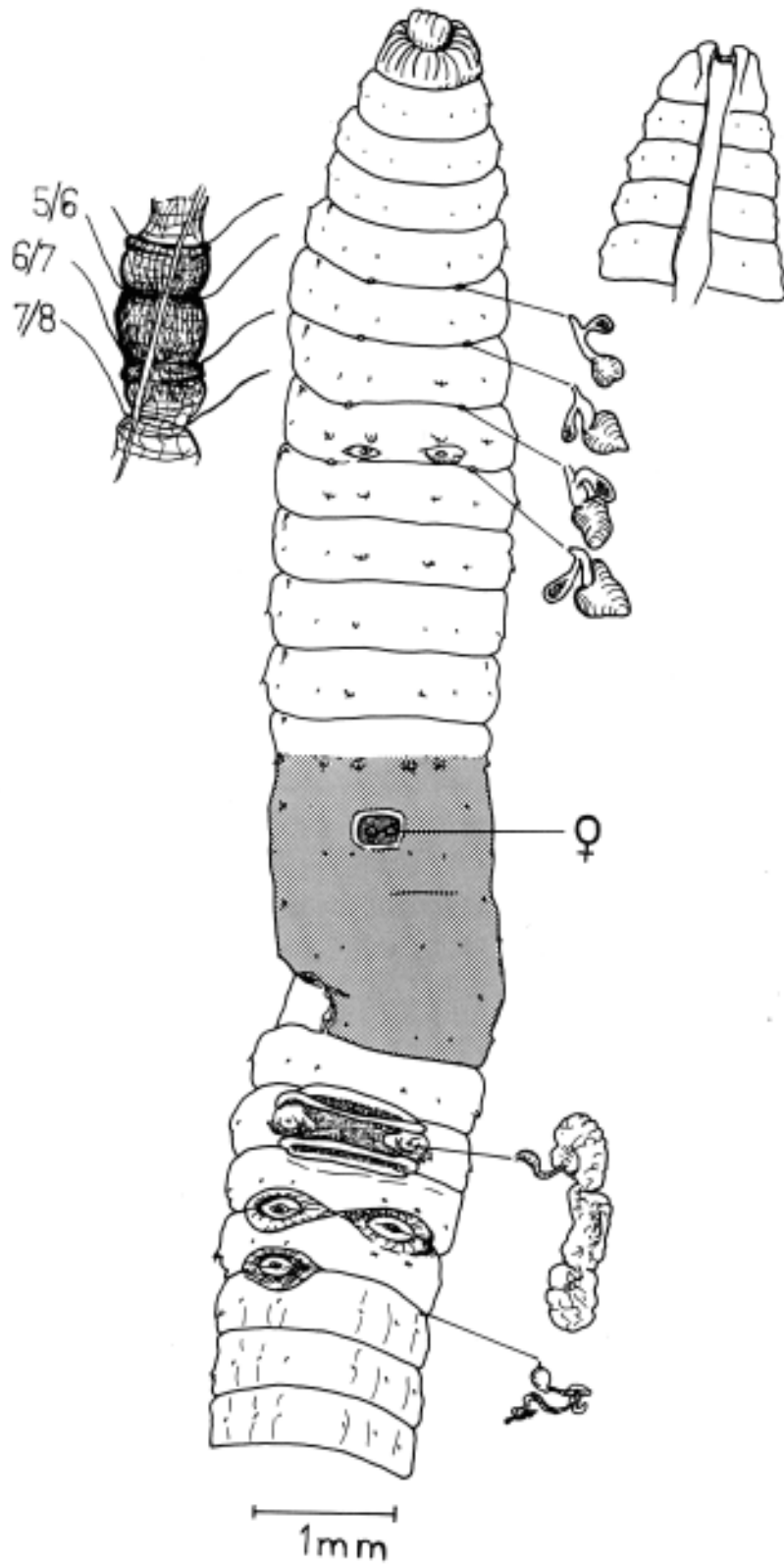


Fig. 127. *Hypolimnus pedderensis* (Jamieson, 1974), H.

Fig. 1 (above) ©R.J.Blakemore (2000)