Journal of Species Research 1(2):105-132, 2012

On Schmarda's lost earthworm and some newly found New Zealand species (Oligochaeta: Megadrilacea: Lumbricidae, Acanthodrilidae, Octochaetidae, & Megascolecidae *s. stricto*)

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The saga of *Megascolides orthostichon* (Schmarda, 1861)-the first native worm described from Australasia-continues as its type-locality is unequivocally returned from Hobart, Tasmania to Mt Wellington, Auckland where a brief survey failed to unearth it. Since it has not been seen for 150 yrs, it may qualify under NZTCS or IUCN classification as 'Nationally Critical' if not 'Extinct'. New reports are for exotic Megascolecidae *Anisochaeta kiwi* sp. nov. and *A. kiwi mihi* sub-sp. nov. plus addition to the NZ faunal list of Australian *Anisochaeta macleayi* (Fletcher, 1889) that, due to its wide distribution in Australia and now New Zealand, may be a candidate model-species suitably resilient for eco-toxicological culture and monitoring. For holarctic Lumbricidae, new records are of *Dendrobaena attemsi* (Michaelsen, 1903) and the *Murchieona muldali* (Omodeo, 1956) morph or subspecies of *M. minuscula* (Rosa, 1906), neither lumbricid previously uncovered in Asia/Australasia. Also found for the first time outside its East Asian homeland is *Eisenia japonica* (Michaelsen, 1892) (which is compared to Japanese *E. japonica hiramoto* sub-sp. nov. and to *E. anzac* Blakemore, 2011). Records of these exotics plus recent new native species described by the author-including two, *Rhododrilus mangamingi* and *Deinodrilus orcus* spp. novae, herein-raise the numbers of megadriles known from New Zealand to 228 (sub-)species in five families. Preliminary mtDNA COI sequence barcodes are presented. Genus *Tokea* Benham, 1904 is revived on its lack of dorsal pores, losing or gaining some species with *Megascolides* M'Coy, 1878. An updated checklist of all 228 New Zealand taxa is appended.

Keywords: exotic invasives, geothermal invertebrate survey, native endemics, Redbook extinctions

INTRODUCTION

Lee (1959), while describing New Zealand's 192 earthworm species, had thought *Hypogaeon orthostichon* Schmarda, 1861 was *incertae sedis* as it was previously referred to the genus *Megascolides* by Beddard (1892) or to *Notoscolex* by Michaelsen (1900: 188). On the basis of its supposed prostate tubularity, the former option was more acceptable to Blakemore (2000c) wherein it was assumed to be Tasmanian rather than a New Zealander on the authorities of Capt. Hutton, Auckland-born J.J. Fletcher and, initially, Sir W.B. Benham. Its type-locality given by Schmarda was "*Mt Wellington, New Zealand*", but Lee (1959: 349; 1962: 176) remarked that there had always been doubt as to whether this species was actually collected from NZ or whether it might have been from the more prominent Mt Wellington at Hobart, Tasmania. The main support for this latter argument was given by Fletcher (1886: 534) who, in the opening paper of his series of reports on Australian earthworms, stated:

"*Up to the present time only three* [now known to be exotic] *species of earthworms have been described from Australia, with a fourth* (Lumbricus orthostichon, *Schmarda*) *from Tasmania. This last was originally described as from New Zealand, but this locality, on the authority of Captain Hutton, is incorrect.*"

Captain F.W. Hutton, curator of Otago Museum and contemporary compatriot of Sir W.B. Benham, reported (Hutton 1878: 317 footnote) that: "*L. orthostichon Schmarda, is stated to come from New Zealand by mistake; its proper habitat is Tasmania*."

This suggestion: that the real source whence Schmarda obtained his worm was well-known Mount Wellington (1,270 m high) above Hobart and that the words "*New Zealand*" were in error, caused Benham to refer to it in a meeting at Hobart in 1902 as a "*neglected Tasmanian earthworm*", however Benham soon argued the converse

(in papers now readily accessible online) with the stated reason for his turn around (Benham 1904a: 284; 1904b: 256) being:

"*Schmarda visited Auckland, and at that period (1860, about) it is probable that little or no cultivation had then been carried out on this small mountain*".

Ludwig K. (Karl) Schmarda (1819-1908) certainly collected polychaete specimens from littoral sands at Auckland, and his three volume account of his 1853-1857 World travels gives this description (Schmarda 1861b: 194):

"*Ein charakteristischer Zug in der Configuration der Landschaft um Auckland sind die Vulcane, die meistens vollkommene Kegel von 300 bis 600 Fuβ Höhe bilden. Von einem derselben, in der Nähe von Howik, übersieht man neun Kegel auf einmal; alle, die ich besuchte, hatten Krater in Form vollkommener Minentrichter*." [A characteristic feature of the countryside around Auckland are volcanoes forming the most perfect cones 300-600 ft (100-200 m) high. From one of them, near Howick, nine cones may be overlooked at one time, all that I visited had perfect craters].

Volcanic Mount Wellington (137 m) is one of the largest in area of Auckland's monogenic basaltic field of 50 scoria cones and the most prominent shortly south-east towards the Howick suburb where much smaller (55 m) Mt Pigeon is also found. Thus is seems Schmarda visited and collected around this site, an erstwhile Māori *pā*, indeed several other cones may be seen from the summit of Mt Wellington to this day (pers. obs.). Conversely, there is no record that Schmarda went to Tasmania, the closest he came being the Bass Straits off Melbourne. Furthermore, survey by the current author of Hobart's Mt Wellington in 1996 failed to locate this species (yet several others were present-see Blakemore, 2000c). The conclusion therefore is that the home location of *M. orthostichon* is not Hobart, Tasmania-rather it is restored to Auckland's Mt Wellington and this species reassumes the mantle of first earthworm scientifically described from New Zealand.

To help determine the fate of this misplaced species, a short excursion was organized. Collection at this locality, as well as incidentally in the region of Taupo-Wairakei, unearthed several new records of exotic species, by default the subjects of this report.

Putting NZ earthworm taxonomy in context: the revised fauna lists and taxonomic changes invoked by Blakemore (1999; 2000a; 2000b; 2000c; 2004; 2006; 2008; 2010a; 2011b) updated those compiled by Lee (1959) and Martin (1977), the latter only concerning exotic lumbricids. A total of 192 species in 34 genera and just two families were provided in Lee (1959) while most recent contributions by Blakemore (2010a; 2011b) increased the species tally to 222 species in five families, including notice of some of the exotics detailed herein. The present revision raises the NZ list to approximately 228 (sub-) species comprising 187 natives, 34 exotics [including overlooked species, e.g. *Dichogaster modiglianii* (Rosa, 1896) as reported by Ude (1905) and Thomson (1922), and a couple of other doubtful alien exotics' reports], plus seven taxa that for various reasons are difficult to attribute to either category (Appendix II).

Deficiencies in nomenclature and taxonomy advice in the genetic cladogram of Buckley *et al.* (2011), that mainly concerned 33 named natives but did not provide any novel taxonomic descriptions and only inadvertently listed NZ exotics, were already advised to an online pre-publication in 2010 and in Blakemore (2011). Nonetheless, future co-operation is advised as a duty of Science to resolve the taxonomy and inventory of both natives and exotics in New Zealand and to investigate relationship with taxa endemic to Australia and Oceania as well as those introduced from Europe, Asia or elsewhere by chance.

All NZ exotics are included in the 150 or so known interloper species-the so-called 'Cosmopolitan Earthworms'-as fully described and figured with their ecology, synonymies and progressively updated global distributions in Blakemore (2002; 2008; 2010b, in prep.).

Materials and Methods

A brief resurvey expedition was mounted to Mt. Wellington, Auckland on 14th October, 2011, more than 150 years after Schmarda's visit. Findings are presented here combined with taxonomic history of the species in question:-*Megascolides orthostichon*.

Serendipitous surveys were also conducted when opportunity permitted at likely geothermal "hot-spots" in the Taupo-Wairakei region, and at Auckland's Domain periodically over a couple of months and on a limited budget with funding unforthcoming.

Specimens were anaesthetized (in dilute alcohol), fixed in 80% ethanol (EtOH), then sketched, dissected and described under low power microscopy in the author's usual style. Small tissue samples were taken for genomic DNA extraction, PCR and COI 'barcode' sequencing (methods similar to those given in http://ibol.org) with results (in Appendix I) subjected to BLAST nucleotide analyses and searches of DNA barcode sequences (http://www.blast.ncbi.nlm.nih.gov/BLAST.cgi). After verification, these new data will be submitted and registered on GenBank (http://www.ncbi.nlm.nih.gov/genbank/).

Classification follows Blakemore (2000c) at family level and Blakemore (2002; 2008; 2010a; 2010b) at genus and species levels. Specimens are deposited with acces-

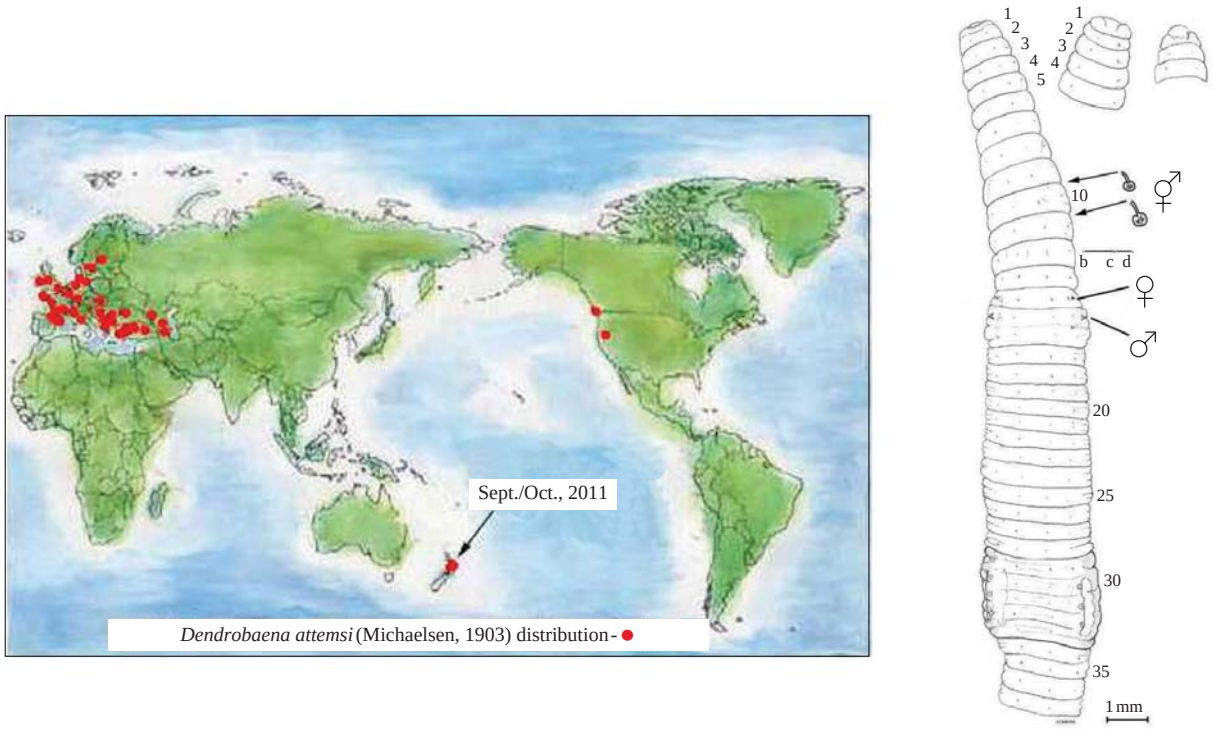

Fig. 1. *Dendrobaena attemsi* (Michaelsen, 1903) (NZ specimen AMNZ 2569) and its known distribution (full details in Blakemore, 2010b).

sion numbers prefixed AMNZxx in Auckland Museum (Tāmaki Paenga Hira) and W.0yy in Te Papa Tongarewa, Wellington or RB.95.zz in ANIC, Canberra (http://www.annelida.net/earthworm/Australasian%20Earthworms/Register.xls).

Discussion is confined to remarks accompanying species descriptions and mtDNA molecular analyses. Abbreviations are: coll.-collector, dps-dorsal pores, nps-nephropores; rhs and lhs-right- and left-hand-side, syn.-synonym, TP-tubercula pubertatis.

Appendix I presents raw COI gene barcode data, some with preliminary interpretation.

Appendix II provides an updated checklist of all known New Zealand earthworms, with a few species newly reallocated as part of routine taxonomic 'housekeeping'.

Taxonomic Results

Earthworm surveys

From a few dozen specimens unearthed, 18 or so earthworm taxa were identified, nearly half of which were new species or new records: Two were new NZ natives and new records were for three Megascolecidae Rosa, 1891 *sensu* Blakemore, 2000 in genus *Anisochaeta* Beddard, 1890 and three lumbricids, as detailed below. Other species simultaneously recovered will be treated elsewhere in due course.

Locations of species were:

1/. Mt Wellington in Auckland (ca. 36°55′00″S 174° 49′00″E, 125 m), a scoria cone with its flanks given over to cattle pasture (coll. RJB, 14th Oct., 2011), earthworms (AMNZ 5264-5269) were identified as: *Lumbricus terrestris* Linnaeus, 1758; *Aporrectodea caliginosa* (Savigny, 1826); *Aporrectodea tuberculata* (Eisen, 1874); *Lumbricus rubellus* Hoffmeister, 1843; *Octolasion cyaneum* (Savigny, 1826), a new NZ record of *Dendrobaena attemsi* (Michaelsen, 1903) (Fig. 1), plus exotic *Anisochaeta kiwi* **sp. nov.** (AMNZ 5270-5272) (remarkably, these latter two species found also at Golden Springs noted below). Although the actual crater was impenetrable due to red scoria boulders, on the outer grassy slopes and especially under rocks and logs were many unidentified Enchytraeidae and several flatworm planarian predators some a deep royal-blue colour. Moreover, the worm burrows were like 'subterranean highways' for Collembola and Protura and/or Diplura. This biodiversity, plus all the attendant predators and parasites (e.g. Yeates *et al.*, 1998), attesting to the ecological health and food-web complexities of this small habitat that was but briefly surveyed. The seven earthworm taxa, collected in about an hour, show possible pasture assemblage diversity higher than the two or three species that most reports claim, as was noted by Lee (1985). Nevertheless, Sch-

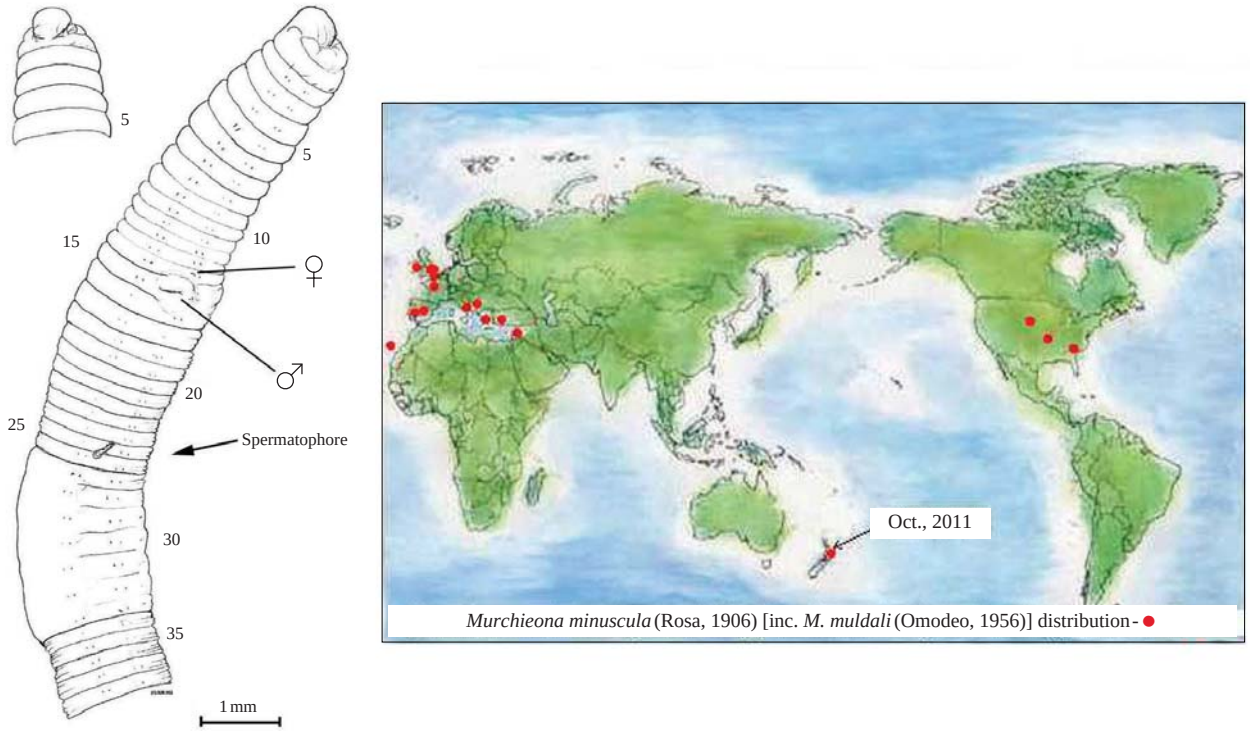

Fig. 2. *Murchieona minuscula* (Rosa, 1906) *muldali* (Omodeo, 1956) (NZ specimen AMNZ 2579) and its known distribution (full details in Blakemore, 2010b).

marda's *Megascolides orthostichon* was not rediscovered.

2/. Golden Springs Holiday Park, Mihi-Reporoa near Taupo (coll. RJB, 11th Sept., 2011) earthworms were identified as lumbricids: *Aporrectodea caliginosa* species-complex *s.* Blakemore (2002) (macerated specimens not kept); *Dendrobaena attemsi* (AMNZ 5258)-as found at Mt Wellington-a new record for New Zealand/Australasia (cf. its previous false "Downunder" records noted by Blakemore, 1999); *Dendrodrilus rubidus tenuis* (Eisen, 1874) (AMNZ 5259); and *Octolasion cyaneum* (specimens not kept); plus exotic *Anisochaeta kiwi mihi* **subsp. nov.** (AMNZ 5260-5261)-this a newly recorded introduction as yet unknown in its Australian homeland, that is described below.

3/. Wairakei Geothermal Station at Taupo (38°37′37″ S 176°06′19″E) near to original well WK44/0 (coll. RJB, 13th Sept., 2011) earthworms found were: *Anisochaeta macleayi* (Fletcher, 1889) (AMNZ 5262-5263)-a new record for NZ of a known Australian species; *Aporrectodea trapezoides* (Dugès, 1828) (AMNZ 5264)-the same as those found in Australia and Asia and different in appearance to Mokai morphs mentioned later; and a specimen of *Octolasion cyaneum* that was released after field identification.

4/. Mokai near Taupo had *Eisenia fetida* (Savigny, 1826) confirmed (pers. obs. 15th Sept., 2011) from a vermicomposting operation of Tuaropaki geothermal glasshouse facility; (this species also observed in a garden at Grafton Halls, Auckland). In a later Mokai survey, morphs of "*Aporrectodea caliginosa* species-complex" and a darker morph initially labeled "*A.* cf. *trapezoides*" were shown by mtDNA results to be *A. tuberculata* and *A. caliginosa*, respectively (AMNZ 5276, AMNZ 5273-5274), the latter predominant in a cattle paddock (coll. RJB+BW, 19-20th Oct., 2011) with mean population estimated at 7.16 million worms ha^{-2} and 1.6 tha^{-2} (detailed in Blakemore, 2011a).

5/. The Domain *en route* to the Museum, near the stream outlet that was Auckland's original water supply (coll. RJB, 27th Oct., 2011) sourced *Murchieona muldali* (Omodeo, 1956) morph or subspecies of *Murchieona minuscula* (Rosa, 1906) (AMNZ 5279) (Fig. 2)-yet another new record for New Zealand of an introduced European lumbricid. Many authors combine these as parthenogenetic morphs, yet Csuzdi & Pavlíček (2002) advocate maintaining both species and discuss their taxonomy and distributions.

6/. Mangamingi Station at Mihi, near Taupo, lumbricids *L. rubellus* and *L. terrestris* plus two new natives species as described below.

7/. Waiotapu-Ngapouri (coll. RJB, 28th Nov. 2011) yielded *Lumbricus rubellus*, *Amynthas corticis* (Kinberg, 1867) species-complex *s.* Blakemore, 2002 (AMNZ

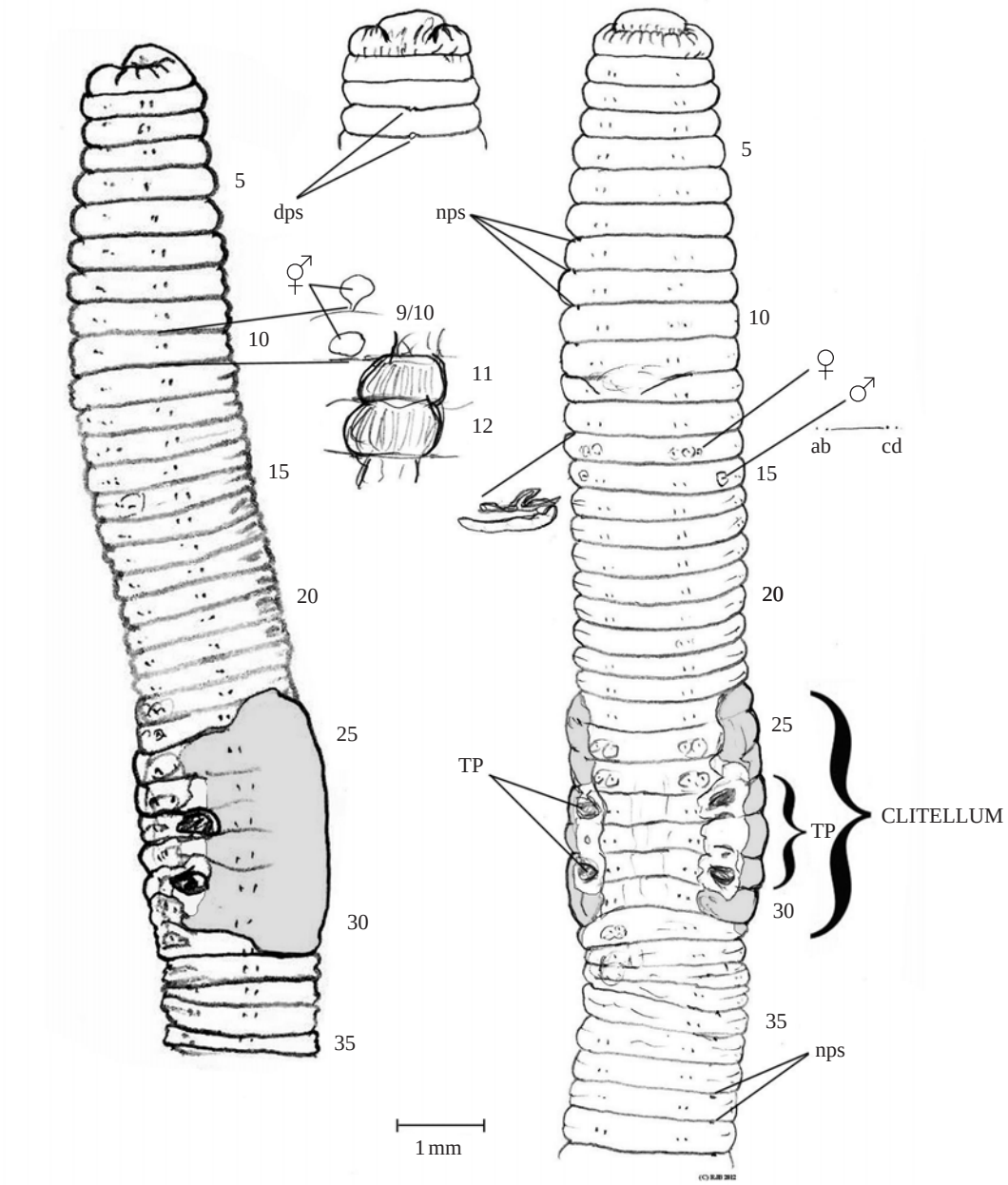

Fig. 3. *Eisenia japonica* (Michaelsen, 1892) Aarataki specimen (AMNZ86031) from Waiotapu-Ngapouri site, NZ. Figure shows its lateral and ventral *habitus* aspects, with dorsal view of prostomium, spermathecae exiting in setal c lines, calciferous glands and a nephridium *in situ*, plus actual setal ratios.

86030 and AMNZ86033-a total of three specimens-see mtDNA in Appendix I) and *Eisenia japonica* (Michaelsen, 1892) (AMNZ86031) that is a further new Australasian record for an Asian lumbricid, as noted in its following account.

Taxonomy of new *Eisenia japonica* sub-spp.

Family LUMBRICIDAE Rafinesque-Schmaltz, 1815
Genus *Eisenia* Malm, 1877

***Eisenia japonica japonica* (Michaelsen, 1892) [Fig. 3]**

This taxon and its sub-species are reviewed in detail by Blakemore (2003, 2010b) and in Blakemore & Grygier (2011) based on German types and fresh Japanese material. The NZ specimen is described below for comparison.

Distribution. Possibly endemic to Japan (Hokkaido to Kyushu) and Korea, or to China and Siberia where it is

listed in a Red Data Book of the Russian Federation from Sakhalin Island; introduced to Taiwan, there is a single record from Germany plus an unconfirmed report from Slovakia. No previous records are from Australasia.

Material examined. Specimen (AMNZ86031) from Waiotapu-Ngapouri, immediately behind the Arataki Honey processing yards in a midgy, waterlogged paddock (S38° 20.447 E176°21.654; Grid ref. ca. NZtopo50 BF37934511, 400 m AMSL, from www.waikatoregion.gov.nz/PageFiles/20544/1.3Waiotapu.pdf: pg 108 with vegetation data) adjacent to a geothermal pool (soil pH 4.7, 23.5°C). Collector, RJB, 28th Nov. 2011. Sample also contains an unidentified immature lumbricid (AMNZ86032) for which DNA is pending.

Description of NZ specimen. Body circular in section, 41 mm long with 121 segments (11/12 and 33-34 slightly irregular/damaged); unpigmented and transparent in posterior and ventrum, pink anteriorly and puce dorsally, clitellum buff, saddle-shaped in ½23,24-31 with TPs prominent on 27 & 29. Prostomium open epilobous. Setae lumbricine with ventrally tumidity around ab on 14, 21, 25, 26, and slightly in 29-31. Dorsal pores minute in 3/4, open from 4/5. Nephropores in mid-bc in 8-12, 15-16rhs, 19-21 and above d in other segments (especially obvious on clitellum). Spermathecae in 9/10/11 in setal c lines. Female pores on 14 lateral to b setae. Male pores small on 15 in mid-bc.

Internally, septa are not especially thickened. Commissurals are in 7 (and 8?), hearts in (8),9-10 but not clearly found in 11. Holandric with testis iridescent and free in 10 & 11, seminal vesicles small in 9 and 10 and larger in 12. Spermathecae are lateral in 9 & 10. Ovaries and funnels are in 13; no ovisacs noted in 14. Annular calciferous glands are in 11 & 12. The intestinal crop is in 15-16, the muscular gizzard occupies 17-18 with a low typhlosole developing soon after. Nephridia are vesiculate, the bladders sausage shaped.

mtDNA results. Unfortunately, results for syntypes failed and the Arataki sample WM6 was contaminated (resamples as WO8 and WO9 also failed), but data for Japanese topotypic and other specimens of *E. japonica* from National Museum of Nature & Science, Tokyo (hereafter NSMT) An-415 & An-417 (detailed in http://ibol.org) are given in Appendix I.

Remarks. Albeit manifestly different in other regards, the markings when prominent in 27 & 29 in *E. japonica* sub-species are reminiscent to those in 28 & 30 in *Allolobophora cupulifera* Tétry, 1937. The Arataki specimen from NZ complies with previous descriptions of *A. japonica japonica* (its DNA sample was contaminated or mixed up).

A distinct specimen (NSMT An-415) from Hodogaya shows molecular similarity no better than 93% with (NSMT An-417) topotype from Enoshima, confirming my initial reservation of its inclusion and indicating, moreover, that speciation and divergence has already occurred within native (or introduced?) populations in Japan. The opportunity is here taken to formally name and briefly describe this specimen, comparing it to the Arataki specimen of *E. japonica* and to *E. anzac* Blakemore, 2011, as follows.

***Eisenia japonica hiramoto* sub-sp. nov.**
[Fig. 4]

Eisenia japonica (part.): Blakemore & Grygier, 2011: 270, fig. 4.

Material examined. Holotype, H, (Tokyo NSMT An-415) from under *Eucalyptus* sp. gum tree in park next to the Commonwealth War Graves Commission Cemetery in Hodogaya-ku (ca. 35°27′36″N 139°35′46″E), Yokohama-shi, Kanagawa-ken, Japan. Collected by RJB and Yuko Hiramoto, Anzac Day, 25th April, 2010.

Etymology. In honour of its co-collector's family name.

Diagnosis. Defined on its clitellum in 24-31 and TP in 27 & 29 as in *E. japonica japonica* and other sub-species, plus a pair of distinctive setal tumescences around ab of segment 25. Unique mtDNA COI barcode sequence definitive (presented in Appendix I).

mtDNA results. BLASTn of Holotype An-415 shows alignment no better than 93% (Identities=414/445) with Enoshima *E. japonica* topotype An-417. megaBLAST similarity is $<84\%$ with some pre-existing European lumbricid vouchers sequences on GenBank.

Remarks. Newly named *E. japonica hiramoto* appears to differ from other sub-species morphologically (as noted above also cf. Figs. 3 & 4) only in its pronounced markings found around setae ab in segment 25 while lacking those that typically occur around ventral setae on segments 21 and/or 22. Its recently-available COI barcode data is unequivocal. Possibly it merits specific status as indicated by divergence of its COI gene, but superficial similarity to *E. japonica* is compelling and, moreover, it may be endemic.

Found simultaneously was Japanese *Eisenia anzac* Blakemore, 2011 (cf. its mtDNA COI data in Appendix I) and an *Amynthas* sp. nov. to be detailed elsewhere.

Taxonomy of new and of known exotic *Anisochaeta* (sub-)spp.

Family MEGASCOLECIDAE Rosa, 1891 *sensu* Blakemore, 2000
Genus *Anisochaeta* Beddard 1890

Pertinent background information is that the Australian genus *Anisochaeta* Beddard, 1890 was for a long time overlooked, mostly subsumed in *Spenceriella* Michael-

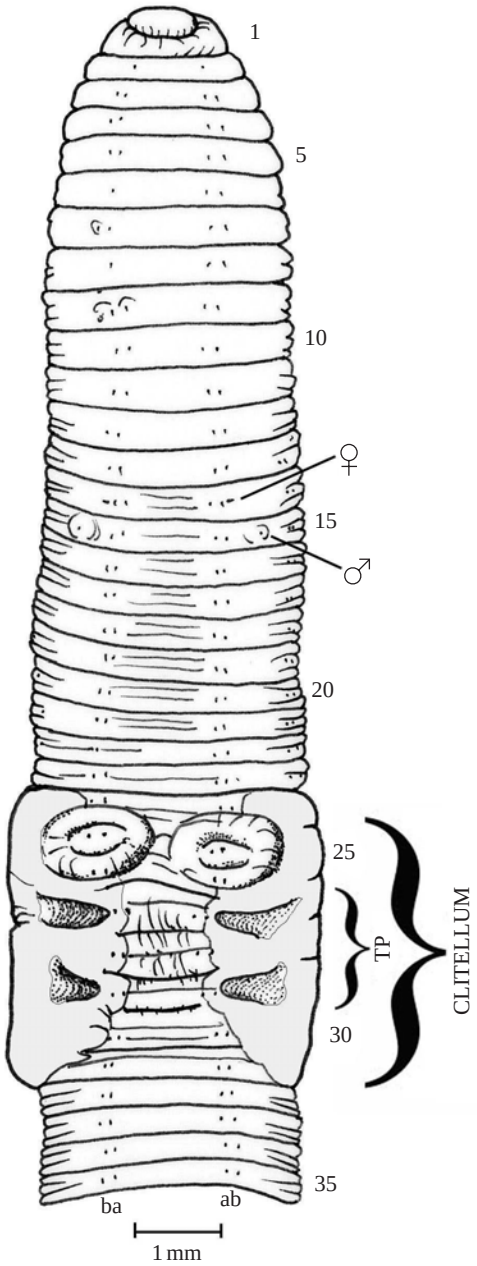

Fig. 4. *Eisenia japonica hiramoto* Blakemore, sub-sp. nov. Holotype (Tokyo An-415) from near Commonwealth Graves Cemetery, Hodogaya-ku, Yokohama, Japan.

sen, 1907 while accruing a few other genera, until formally restored by Blakemore (1997). *Megascolex* Templeton, 1872 (objective synonym *Pleurochaeta* Beddard, 1883) is a similar genus restricted to Indian species. Gates' (1965) synonymy of what was then *Megascolex laingii* Benham, 1903 in prior *Perichaeta newcombei* Beddard, 1887, now both in *Anisochaeta*, was questioned then revived by Blakemore (1994: 515; 1997: 1842) despite the original species description being based on fragments lacking clitella and with types now lost (Fig. 5). Initially only reported from Norfolk Island, a part of the Commonwealth of Australia, *A. laingii* was retained on NZ lists due to later reports (e.g. Gates, 1965) from Hamilton and from Raoul Island, albeit these are probable misidentifications especially in view of the number of other *Anisochaeta* species now known hereabouts (*vide infra*). Sometimes yet misplaced in genus *Megascolex* Templeton, 1844 it is, moreover, most likely on present knowledge that *Anisochaeta laingii* is a species introduced from the Australian mainland to its type-locality by (recent?) human activity, hence it is neither a Norfolk Island neoendemic (*sensu* Blakemore, 1999) nor a direct translocation from New Zealand proper.

Anisochaeta laingii (Benham, 1903) (Fig. 5) from Norfolk Island (Australia) and Australian *Anisochaeta macleayi* (Fletcher, 1889) from Wairakei, NZ are comparable to *Anisochaeta minor* (Spencer, 1900) from Queensland, Australia-see Blakemore (1994; 1997; 2000a; 2010b) and Blakemore & Elton (1994). These references show that representatives of native genus *Anisochaeta* are particularly widespread in Australia and appear resilient to agricultural cultivation/habitat disturbance (e.g. specimens lodged and registered at ANIC, Canberra, as noted in Introduction). *Anisochaeta* sp were found in abundance by the author in January, 2011 in the grounds of New South Wales (NSW) Department of Environment & Climate Change facility in Sydney suburb of Lidcombe, further indication they would be suitable native monitor-species for eco-toxological studies.

Anisochaeta kiwi sp. nov. [Fig. 6]

Material Examined. Holotype, H (AMNZ 5270), a complete specimen, sketched and dissected, plus paratype P1 (AMNZ 5271) also sketched and dissected, paratypes P2-P16 (AMNZ 5272) 14 mostly mature specimens, including two juveniles and an anterior "head" regenerate specimen that lacks markings (regressed?). From SW face of Mt Wellington, Auckland (ca. 36˚892990S 174˚ 845545E, 120 m). Collector RJB, 14th Oct., 2011.

Etymology. Nominal taxon after "Kiwi", the colloquial name for New Zealanders.

Diagnosis. *Anisochaeta* having spermathecal pores in bc lines in 7/8/9; markings absent from anterior but variously near male pores, strong gizzard in 5, last hearts in 12 and oesophagus dilated in 13; ovisacs typically present in 14. COI barcode in Appendix I.

Behaviour. Vigorous and rapid escape to disturbance (more so than lumbricids).

Length. Holotype (H) (AMNZ 5270) ca. 90 mm; mature paratypes 85-95 mm **Widths.** ca. 1-1.5 mm. **Body/segments.** (H) 95; body tapers and flattens to tail end.

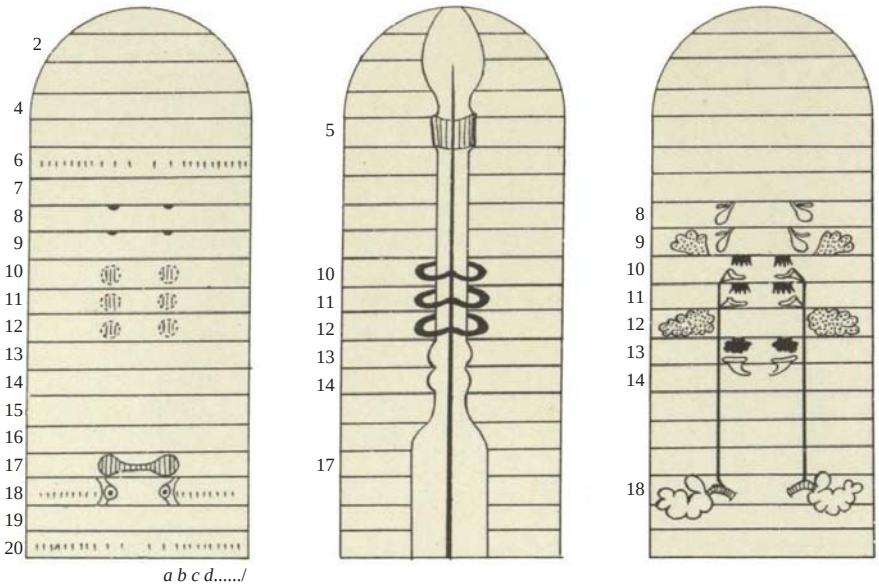

Fig. 5. *Anisochaeta laingii* (Benham, 1903) from Norfolk Island (Australia) the only previous *Anisochaeta* questionably reported from NZ. Its markings in segments 10-12 and 17 differ, but internal organization is somewhat similar to the new *Anisochaeta* spp. herein (After Benham's original with copy permission from Royal Society NZ; Oct., 2011).

Colour. A brick brown-red or puce dorsum with iridescent sheen, with a darker mid-dorsal line; pale ventrally; clitella buff.
Prostomium. Open epilobous; ventrally cleft peristomia.
First dorsal pore. From 5/6.
Setae. Perichaetine with 28-36 per segment increasing further posteriorly.
Nephropores. Not found (meroic).
Clitellum. Annular ½13-16, sometimes slightly encroaching into 17 (e.g. P1).
Male pores. Superficial and small eye-shaped on low papillae insunk on 18 in setal b lines.
Female pores. Single mid-ventral on 14.
Spermathecal pores. 7/8 and 8/9 in line with setal interval bc.
Genital markings. Holotype (H) has small disc-like markings paired posteriorly in 17 and anteriorly in 19 lining up with the male pores; its P1 paratype has them narrower in 17 and in 17/18, rather than 19, where they are wider; other mature paratypes (AMNZ 5272) have various combinations including marking on 16 in some or near 17/18 and 18/19, the last location more usual; one specimen with no marking was also an anterior regenerate.
Septa. None especially thickened.
Blood vessels. Dorsal vessel single, connects to supraoesophageal as seen in 9-½14.
Hearts. Commissurals in 7-9, hearts in 10-12 from supraoesophageal vessel.
Gizzard. Compact and muscular in 5 preceded in 4 by pharyngeal mass.
Calciferous glands. Oesophagus only slightly dilated in 13; valvular in 15.
Intestine. Origin in 16; caeca absent; typhlosole not found.
Nephridia. Meroic, with large tufted peptonephridia anteriorly in 4.
Testis/seminal vesicles. Holandric, paired testis in 10 and 11 free but invested in mucus; seminal vesicles paired, racemose in 9 and larger in 12.
Ovaries. In 13; ovisacs in 14.
Prostates and penial setae. Tubuloracemose gland with short duct; penial setae not found but their presence anticipated, possibly as small setae implicated with the male pores, since setae a are most often occluded or displaced on 18.
Spermathecae. In 8 and 9 with globular ampullae each with a shorter, curved diverticulum not especially dilated terminally, opening by its own duct into short main duct.
Gut contents. Organic mixed soil.
mtDNA results. BLASTn analysis of COI results (Appendix I) shows that *A. kiwi* holotype (H) and paratype (P1) are 100% identical despite their apparent differences in genital markings (cf. *A. macleayi* outlined below). mega BLAST has no close matches-the nearest at 85% max identity is an unidentified GenBank "Megascolecidae sp." from the Philippines.
Remarks. A species introduced from Australia, where its origin and nearest relations may be sought (possibly

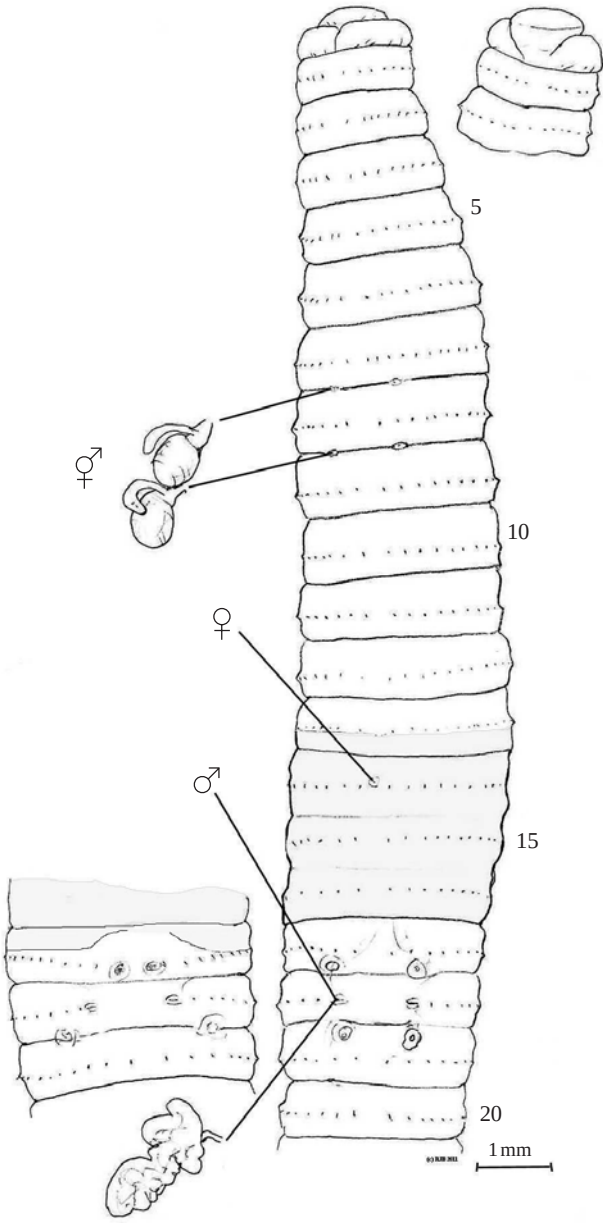

Fig. 6. *Anisochaeta kiwi* Blakemore sp. nov. Holotype (AMNZ 5270) from Mt Wellington. Ventral aspect with dorsal view of epilobous prostomium, spermathecae and 18 lhs prostate *in situ*; male field of Paratype P1 (AMNZ 5271) shown for comparison (also cf. Fig. 7). Superficially differing, mtDNA COI agrees 100% for H and P1, i.e., same species (see Appendix I).

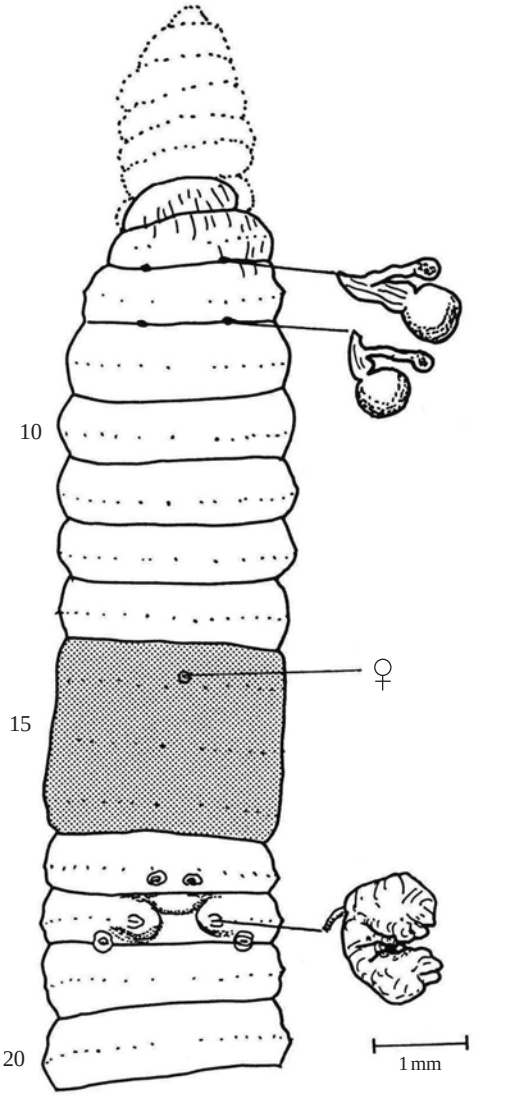

Fig. 7. "*Spenceriella decapita*" unpublished Queensland taxon from Blakemore (1994). This damaged specimen (ANIC RB.95. 5.19) is remarkably similar to Mt Wellington paratypes, especially P1, of *A. kiwi kiwi* (Fig. 6).

with different provenances of its sub-species, *A. kiwi mihi* below). It differs from *Anisochaeta minor* (Spencer, 1900) from Queensland which is usually just 50-60 mm long, with paired female pores (always?), and often distinctive genital markings paired in 10, 11 (and 16 or 17) and 20 that, although varying between its specimens, are the usual locations. Distinction of the current species from the rather inadequate description of *Anisochaeta laingii* (Benham, 1903) (Fig. 5) is mainly due to its lack of markings on 10-12 and the characteristically con-joined pair in 17; instead, *A. kiwi* most consistently displays a pair of small papillae in or near 18/19 below its male pores and other combinations as noted.

Anisochaeta kiwi is somewhat reminiscent of *A. sebastiani* (Blakemore, 1997) that is widely distributed in Eastern Australia and Tasmania, but which has a vestigial gizzard and typically lacks genital markings entirely. Remarkably, the current species-and especially specimen P1 from Mt Wellington (Fig. 6)-resemble almost exactly one described 20 yrs earlier under the provisional name "Spenceriella decapita" (Fig. 7) from the 80 or so species in a PhD Thesis (Blakemore, 1994). This specimen

(ANIC RB.95.5.19-see www.annelida.net/earthworm/Australian%20Earthworms/Register.xls) was collected by C.H. Thompson, 24th May, 1992 from a rural-residential garden at Brookfield, Brisbane, Queensland-the possible state of origin of the current stock. The only significant difference is that I recorded its last hearts as in segment 13. For that unpublished species, Blakemore (1994: 542) noted:

"*The endemic genus* Spenceriella [now=*Anisochaeta*] *has many unnamed and morphologically similar species, often differing intraspecifically* [I meant to say 'inter-specifically'] *in the distribution of genital markings. The damaged individual described here is insufficient for definite classification, but appears very similar in form to* S. sebastianae *and* S. stephanie [eventually published as *Anisochaeta sebastiani* (Blakemore, 1997) and *A. stephanieae* (Blakemore, 1997)]."

***Anisochaeta kiwi mihi* sub-sp. nov.**
[Fig. 8]

Material Examined. Holotype (AMNZ 5260), a single complete specimen, dissected, plus paratypes, P1-20 (AMNZ 5261) comprising 20 specimens, several posterior amputees, of various life stages; (one was abnormal with marking 17/18 lhs but spermathecal pores in 6/7/8/9 and spiraling segments around 14). From Golden Springs Holiday Park (GPS E2798840.N6298535 300 m) at Mihi-Reporoa in Broadlands district central North Island near Taupo (38°37′1″S.176°2′36″E), beside pools of tepid creek (33°C) feeding from local Golden Springs source that flows into the Waikato River via the Waiotapu Stream; the soil was slightly black and sulphurous (low pH?) and the garden included exotic plants such as bamboo (*Pseudosasa japonica*?) as well as native trees (details: http://www.waikatoregion.govt.nz/PageFiles/20544/1.10Reporoa.pdf). Collector RJB, 11th Sept., 2011.

Etymology. Mihi after district location of the sub-species with "mihi" meaning "to greet".

Diagnosis. *Anisochaeta* as for *A. kiwi kiwi* but with dorsal pores from 4/5 and markings typically paired in 18/19, and rarely (in only one specimen with a rhs analogue) in 17/18, i.e., not found in 17 or 19 as typically seen in *A. kiwi kiwi*, or markings completely absent. mtDNA COI barcodes in Appendix I help define this sub-species.

Behaviour. Rapid escape response with autotomy of tail, and ejection of yellow coelomic fluid through (anterior) dorsal pores-all typical prey defensive responses of a superficial, litter-dwelling species.

Length. Holotype (H) (AMNZ 5260) 88 mm, paratypes 60-80 mm for complete specimens. **Widths.** ca. 1-1.5 mm. **Body/segments.** (H) 98; body narrows and flattens to tail end that is often missing through autotomy/predation.

Colour. A brick brown-red dorsum with iridescent sheen, with a darker mid-dorsal line; pale ventrally; clitella buff.

Prostomium. Open epilobous; ventrally cleft peristomia.

First dorsal pore. From 4/5.

Setae. Perichaetine with ca. 32 on segment 12.

Nephropores. Not found (meroic).

Clitellum. Annular, ½13-16.

Male pores. Superficial and small eye-shaped on low papillae insunk on 18 in setal b lines.

Female pores. Single mid-ventral on 14.

Spermathecal pores. 7/8 and 8/9 in line with setal interval b or bc; an abnormal *A. k. mihi* paratype 65 mm long with markings in 18/19 had an extra segment spiral at 14 and an additional spermathecal pore in 6/7 lhs as well as those in 7/8/9.

Genital markings. Markings are most often paired in or near 18/19 wider than male pores, or markings may be unilateral in 17/18 or 18/19, or absent (e.g. in one paratype 80 mm long); one *A. k. mihi* paratype 75 mm long had marking unilateral in 17/18 rhs and another pair anteriorly on 19 below male pores. Some variation is thus apparently permissible. No glands were found internally in position of these markings.

Septa. None especially thickened, 12/13/14 are slightly stronger but still translucent.

Blood vessels. Dorsal vessel single, connects to supra-oesophageal in 9-½14.

Hearts. Commissurals in 7-8, hearts in 9-12 from supra-oesophageal vessel.

Gizzard. Compact and muscular in 5 preceded by pharyngeal mass to segment 4.

Calciferous glands. Oesophagus only slightly dilated in 13; valvular in 15.

Intestine. Origin in 16; caeca absent; typhlosole not found.

Nephridia. Meroic, forests of tubules equatorially with large tufted peptonephridia anteriorly in 4.

Testis/seminal vesicles. Holandric, paired testis in 10 and 11 free but invested in mucus; seminal vesicles paired, racemose in 9 and larger in 12.

Ovaries. Large and conglomerated egg mass in 13 with funnels posteriorly; small pseudo-vesicles in 14 anteriorly may actually be elongate ovisacs.

Prostates and penial setae. Small, paired S-shaped tubuloracemose gland with short duct; penial setae not found.

Spermathecae. Two pairs in 8 and 9 with globular ampullae each with a medium, elongate diverticulum not especially dilated terminally, opening by its own duct into short main duct.

Gut contents. Dark organic matter from their rich soil/litter habitats.

mtDNA results. BLASTn alignment shows *A. kiwi mihi* H vs. *A. k. kiwi* H Identities=647/652 (99%) with no gaps; unlike the 100% agreement of *A. kiwi kiwi* H and

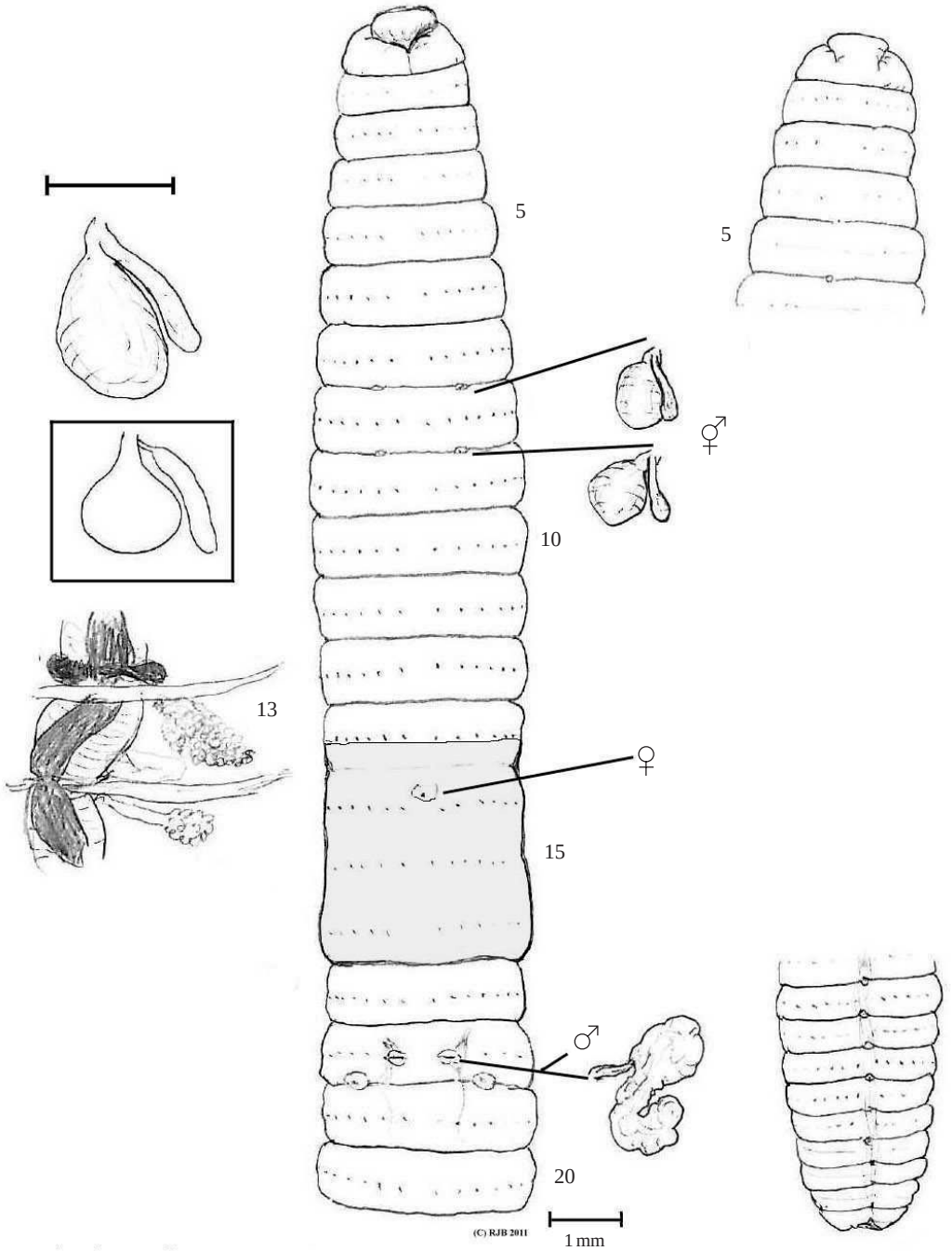

Fig. 8. *Anisochaeta kiwi mihi* Blakemore sub-sp. nov. Holotype (AMNZ 5260) from Golden Springs. Ventral aspect with dorsal view of epilobous prostomium, spermathecae, prostate and oesophageal gland in 13 *in situ*; plus tail end. [Boxed spermatheca (near enlargement of 8 rhs) is *Anisochaeta laingii* (Benham, 1903) from Lee (1959: fig. 305) for comparison].

P1 (and of *A. macleayi* S1 and S2).

Remarks. Acuity of COI gene appears to vary, at least for this genus, with fine intraspecific concordance, but wide interspecific gap (cf. *A. macleayi* differing by 86%). Despite variation apparent in genital markings, *Anisochaeta kiwi kiwi* typically has markings in 17 and *A. kiwi mihi*, which may have fewer markings overall, does not. Possibly it merits combination, but mtDNA data gives tenuous molecular support to the conclusion from slight differences observed in makings and other morphological features that they represent discrete but potentially or actually interbreeding populations (i.e., sub-species) in their original homeland (s). Transportation to NZ (in plant pots?) is assumed to be recent (ca. 150 yrs or less?), as for

A. kiwi kiwi and it is interesting that no translocated populations are yet known intervening between Auckland and Taupo. Further survey is obviously required.

***Anisochaeta macleayi* (Fletcher, 1889)**
[Fig. 9]

This species is fully described by Blakemore (1994; 1997; 2000a; 2010b), and in Blakemore & Elton (1994) but under its prior name, *Spenceriella macleayi*.
Distribution. Australia, these two specimens from Wairakei are a new record for NZ. Possible mechanisms for transportation are as discussed in Blakemore (1999, 2010b).
mtDNA. Whereas, BLASTn of *Anisochaeta macleayi* specimens AMNZ 5262 and 5263 (S1 & S2) show 100% agreement, surprisingly they show similarity no better than 86% with congeneric *A. kiwi*. megaBLAST matches no better than 87% with Asian megascolecids.
Remarks. Further work is required to investigate the molecular boundaries of these taxa.

Description of new native species

Family ACANTHODRILIDAE Claus, 1880 *sensu* Blakemore, 2000
Genus *Rhododrilus* Beddard, 1889

***Rhododrilus mangamingi* sp. nov.**
[Fig. 10]

Material Examined. Holotype (H) AMNZ86028 (mature, sketched, dissected). From fenced remnant scrubland above and to NE of Te Kopia geothermal field features on sheep paddock at Mangamingi Station (ca. S38˚5.535 E176˚12.996; Atiamuri region NZTM E1880782 N5742 165 AMSL 630 m pg. 223 of www.waikatoregion.govt.nz/PageFiles/20544/1.6TeKopia.pdf that provides ecological and vegetative data). Collected by RJB 28th Nov., 2011. Fixed in 80% ethanol and small tissue sample removed for DNA analysis (WM5).
Etymology. After type locality.
Diagnosis. Acanthodrilid with microscolecine reduction of male and prostatic pores to 17. Penial setae present. Muscular gizzard in 5. Spermathecal pores near b lines in 7/8/9. Markings on 19. Holoic nephridia avesiculate. mtDNA COI barcode as provided.
External characters. Body circular. Pale unpigmented; clitellum buff. Length 60 mm with 100 segments (broken in half during dissection). Prostomium epilobous. Setae lumbricine, evenly spaced. Clitellum annular, 13-16. Neither dorsal pores nor nephropores found; however there are a few small mid-dorsal dots present after clitellum and minute perforations were detected in c lines in excised cuticle. Spermathecal pores near b lines in 7/8 and 8/9. Female pores on 14 above setae a. Male and prostatic pores combined at ab on 17; ab setae replaced with penial setae. Genital markings as faint indistinct pads in 19 posterior to ab setae (no glands internally). Setae ab in 18 and 19 appear unmodified.
Internal morphology. Septa all thin. Gizzard large in 5. Dorsal blood vessel single. The last pair of hearts detected in 12. Nephridia holoic, avesiculate in c lines throughout. Spermathecae in 8 and 9 each a spherical ampulla on short duct with a thumb-like diverticulum. Testes flat and iridescent in 10 and 11. Seminal vesicles large, racemose posteriorly in 9 and anteriorly in 11 and 12. Small pseudo-vesicles on posterior of 12/13 and 13/14. Ovaries in 13 with several egg strings. Prostates tubular in 17 with a flaccid duct and long penial setae. Oesophagus not noticeably modified, with intestinal origin somewhat indeterminate after 16 (possibly in 17). Intestinal typhlosole absent. Gut contains fine soil (selective topsoil dweller rather than detritivore).
Ecology. Dug from loose soil under scrub near paddock fenceline with *Lumbricus rubellus*, *L. terrestris* (specimens not kept) and with *Deinodrilus orcus* sp. nov. nearby.
mtDNA results. megaBLAST match no closer than 84% max identity with various worms, i.e., nothing similar yet sequenced on GenBank.
Remarks. *Rhododrilus* is one of the larger genera with 30 New Zealand members (Lee, 1952a; 1959; 1962). The present species lacks dorsal pores (not mentioned by Lee) and has minute nephropores presumed to exit in setal c lines where avesiculate nephridia attach. Vesiculate *Rhododrilus benhami* Lee, 1952 is superficially similar with faint markings in 19, but it has a tanylobous prostomium and spermathecal pores in setal a lines. Especially similar avesiculate species are *Rhododrilus aquaticus* Lee, 1959 from Caswell Sound in the SW Fiordland that is smaller (30-40 mm) with male pores at the end of a transverse ridge, amongst other differences, or *R. cockaynei* Benham, 1905 from Auckland, Campbell and Snares Islands that has a saddle-shaped clitellum and spermathecal pores at anterior margins of 8 and 9 (or 7, 8 and 9). Species with spermathecal pores in 7/8/9 and annular clitella in 13-16,17 are *R. huttoni* (Benham, 1901) and *R. dobsoni* Lee, 1959 that also lack nephridial vesicles but both have prostatic pores in setal a lines; while vesiculate *R. microgaster* Lee, 1959 and *R. papaensis* Lee, 1952 additionally have reproductive pores that are mid-ventral or in ab lines, respectively. All four latter species also have different seminal vesicle arrangements.

The long, thin penial setae of the current species are distinctive, but their minutae are purposefully omitted for reasons cogently explained by Blakemore (2002; 2010a; 2010b), viz.: the microscopic details reported for these

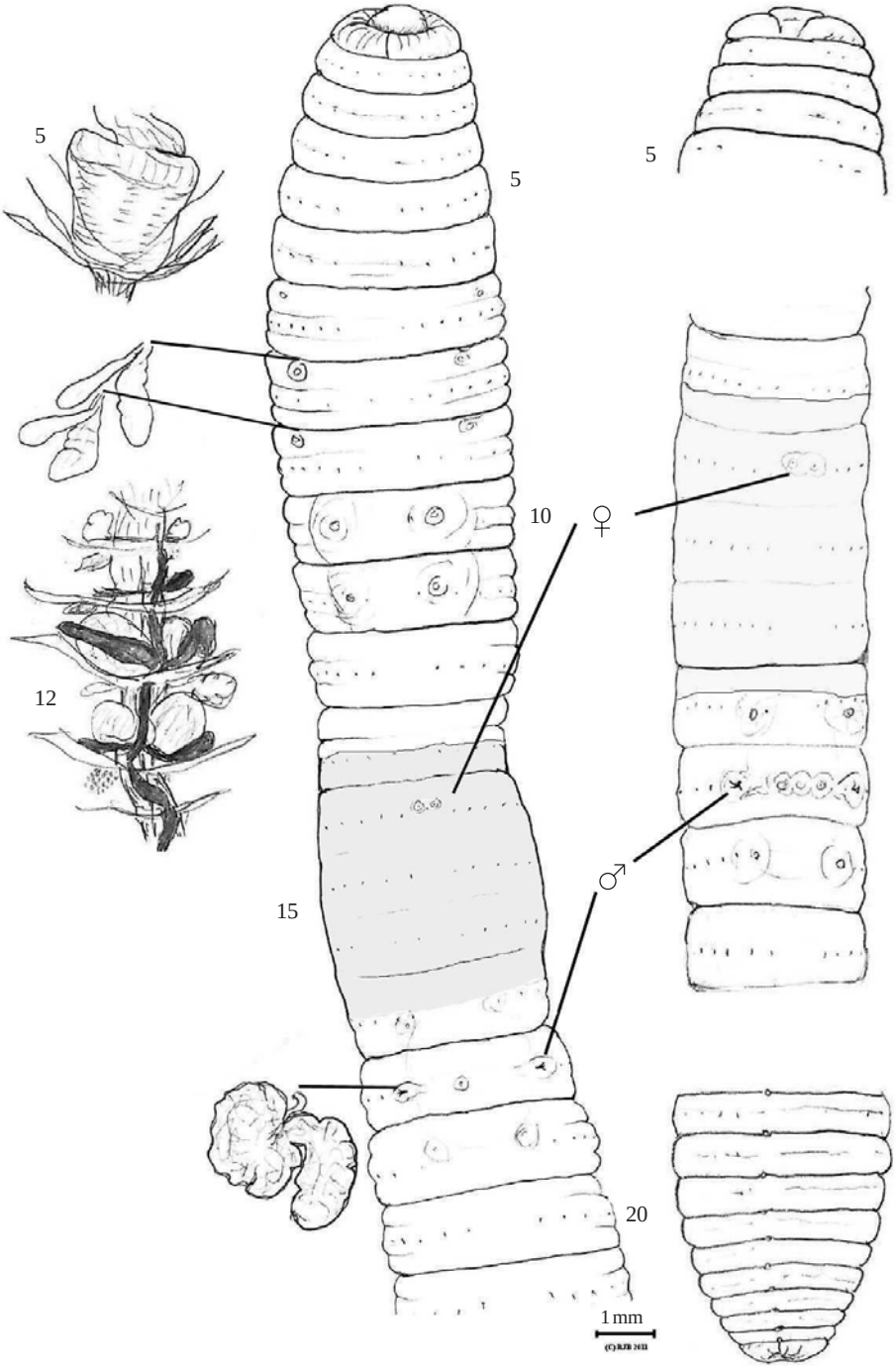

Fig. 9. *Anisochaeta macleayi* (Fletcher, 1889), Wairakei Steamfield near original Geothermal well WK 44/0 (central specimen "S1" AMNZ 5262, rhs specimen "S2" AMNZ 5263). Specimens differ slightly but mtDNA COIs 100% identical.

are of debatable value for some such taxa as they vary individually, even within a bundle, are damaged or worn by age and use, and may be similar if not the same in several species. For example, Lee (1962: 170) found details of penial setae of *Rhododrilus minutus* Beddard, 1889 to differ intraspecifically. And, as Gates (1972: 23) observed: "*The systematic importance claimed for differences of shape, sculpturing, and ornamentation in those kinds of setae in the classical system, may have been too great. Penial setae may show considerable intraspecific variation or may be similar if not the same in several species*."

Moreover, even when present, the reliance on penial setal detail for specific characterization requires these be

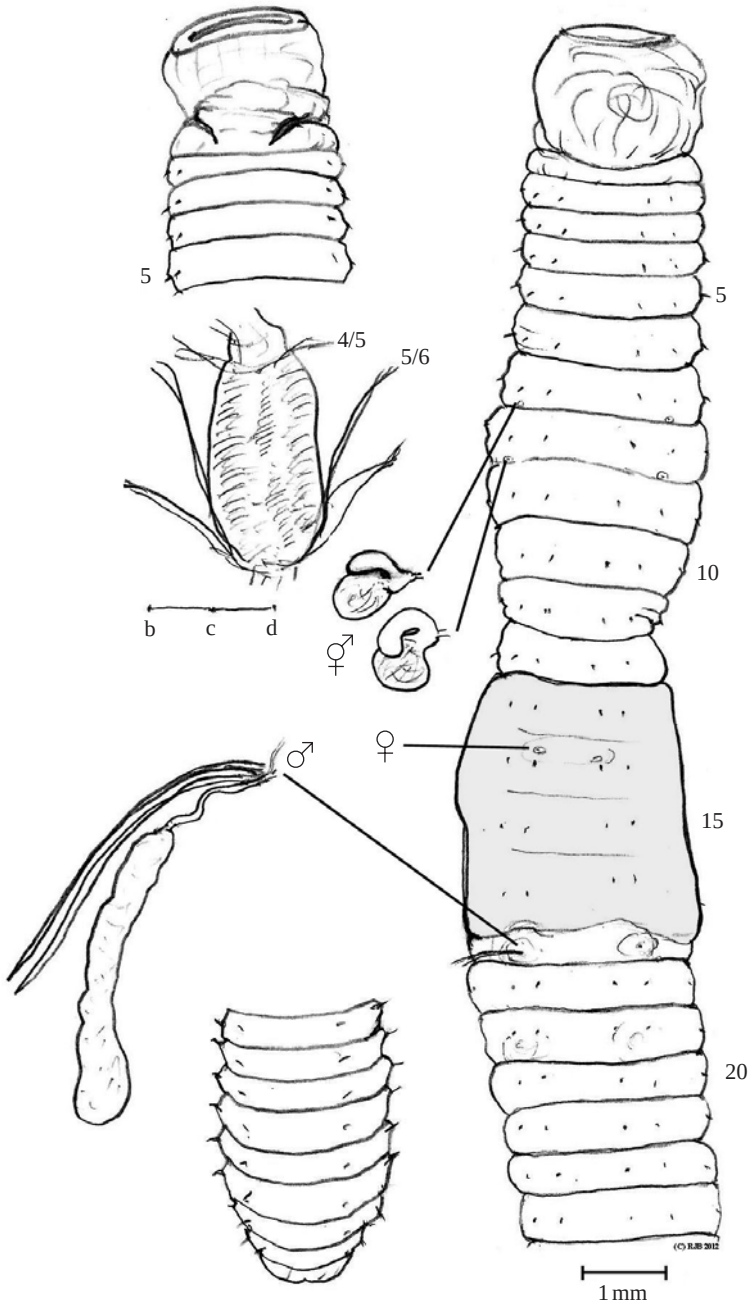

Fig. 10. *Rhododrilus mangamingi* Blakemore, sp. nov. Holotype AMNZ86028 showing dorsal views of prostomium (pharynx everted) and pygidium; ventral aspect of body with gizzard, spermathecae in 8 rhs & 9 rhs and prostate in 17 lhs with penial setae *in situ*, plus actual setal ratios in 9 rhs.

elucidated for all specimens under consideration (which is not always the case), and is impracticable for the majority of field workers who lack access to high-powered or scanning electrode microscopes (SEM) or for taxonomists pressed for time. Finally, their importance to determine specific affinities is rendered irrelevant when replaced by compelling DNA data (preferably from types), as used here.

Family OCTOCHAETIDAE Michaelsen, 1900 *sensu* Blakemore, 2000
Genus *Deinodrilus* Beddard, 1889

***Deinodrilus orcus* sp. nov.**
[Fig. 11]

Material Examined. Holotype (H) AMNZ86029 (mature,

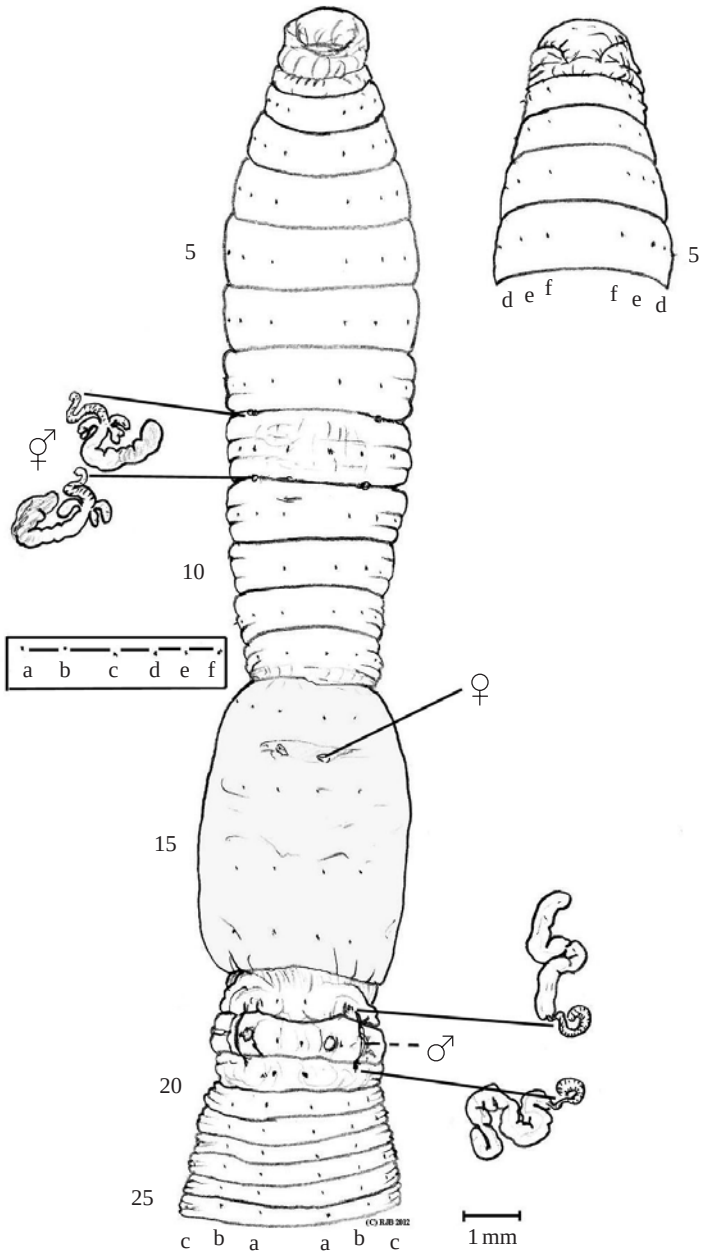

Fig. 11. *Deinodrilus orcus* Blakemore, sp. nov. Holotype AMNZ86029 showing dorsal view of prostomium and ventral aspect of body with spermathecae in 8 rhs & 9 rhs and prostates in 17 rhs & 19 rhs *in situ.* [Paratype setal ratios of 12 rhs boxed].

sketched and dissected, in ethanol 80% and small tissue sample removed for DNA analysis, code WM4), Paratype (P), Te Papa W.002928 (mature that self-fragmented by autolysis into three bits induced by heat rather than handling; its anterior here dissected). Both specimens with same Mangamingi collection details as *Rhododrilus mangamingi*, but slightly deeper in scrub.

Etymology. After Roman god of the underworld and punisher of oath breakers (whence author J.R.R. Tokien partly derived the name for Orcs).

Diagnosis. Octochaetid with acanthodriline male and prostatic pores plus spermathecal pores in 7/8/9, all in b lines. Markings on 18 not pronounced. Gizzard in 6; calciferous glands lacking. Spermathecal diverticula four on each. mtDNA COI barcode as provided.

External characters. Anterior of the body circular. In life appears mottled white/red; preserved colour a delicate pastel pink-grey only slightly pigmented dorsally with faintly darker mid-dorsal line; clitellum paler buff. Length 88 mm with 150 segments (H); Paratype in three

fragments that combined add up to 80 mm and ca. 144 segments. Prostomium epilobous faintly closed (H) or open (P). Setae perichaetine, 12 per segment, evenly spaced. Clitellum, annular, pale, tumid in 13-16 encroaching on adjacent segments slightly (H, P). Dorsal pores from 10/11 (H, P). Nephropores not found (meroic). Spermathecal pores in b lines in 7/8 and 8/9, small but gaping. Female pores on 14 mid-way between setae a on 13 and 14 in common field. Prostatic pores approximately in position of setae b on 17 and 19 conjoined by seminal grooves shortly transecting intersegments 17/18 and 18/19. Male pores within concave seminal grooves lateral to position of b setae on 18. Segments 17-19 are tumid and setae are obscured in raised rectangular rim of male field. Genital markings not pronounced, although segment 8 is puckered ventrally (due to copulation) and there are distinct circular papillae just median to b setae on 18 (H and P). Genital and penial setae not found.

Internal morphology. Cerebral ganglion in 2. Septa all thin except perhaps 10/11 and 11/12. Crop in 5 (it appears that weak septum 5/6 goes just below), strong muscular gizzard occupies 6-8 but seems actually in 6 (weak septum 6/7 can be carefully teased off past mid-point at least). Dorsal blood vessel doubled in 6-18, at least. Heart paired in 10-13 (in P, unclear in H). Nephridia meroic; large equatorial clusters from 4 at least centred approximately in c-d lines, smaller on and after clitellum. Spermathecae in 8 and 9 each with a long, thin duct to multiple, finger-like diverticula (inseminated with mostly four per spermatheca in H and P but 9 lhs in H has three and this plus some are bifid), surrounding duct from where it thickens before reaching yellowish, slightly dilated ampulla. Testes free, posterio-ventrally in 10 and 11. Seminal vesicles large, racemose anteriorly in 11 and 12 from septa 10/11 and 11/12. Ovaries flattened fan-shaped in 13 with several strings; no ovisacs seen in 14. Prostates tubular in 17 and 19 exiting through muscular ducts, no penial setae found. Oesophagus thin in 8 and 9, slightly dilated and vascularized in 10,11-15 but not construed as calciferous glands, with intestinal origin somewhat indeterminate but after 16 (this region mascerated in H). Intestinal typhlosole from around 19 (H and P) thin, lamellar becoming deeper further back. Intestine has masses of white 'lipid' sacs dorsally. Gut contains colloidal soil and organic matter (topsoil dweller/detritivore).

Ecology. Found in friable topsoil further into dense scrub than *Rhododrilus mangamingi*.

mtDNA results. megaBLAST highest max identity (95%) on GenBank is observed with *D. gorgon* Blakemore, 2010 which is here considered sufficient divergence for specificity.

Remarks. Of the ten currently known *Deinodrilus* species, *D. orcus* comes morphologically closest to *D. agilis* Lee, 1952 from Waiotapu that is located nearby. The main differences are its seminal groves and male pores in mid-ab rather than in b-lines as here, it further has five pairs of calciferous glands in 9-13 and dorsal pores from 16/17. Similar species are *D. montanus* Lee, 1952 from Rimutaka Range *en route* to Featherstone, also *D. gorgon* Blakemore, 2010 and *D. medusa* Blakemore, 2010 from Happy Valley on the South Island that, however, all have genital markings on 10, at least. Despite Lee's (1952b) description of these markings in *D. montanus* they are not shown in his plate 119 figure; but other differences are that dorsal pores are also given as from 16/17 and, furthermore, it lacks a typhlosole. In all these species, spermathecal diverticula number five except *D. medusa* that has four (or three) as here. Amongst other differing characteristics, *D. medusa* has seminal vesicles in 9-12. Molecular support for the current species is provided by its unique mtDNA COI barcode data in Appendix I.

Revival of genus *Tokea* Benham, 1904

Family MEGASCOLECIDAE *s. stricto* (Blakemore, 2000c)
Genus *Tokea* Benham, 1904

A chequered history of the genus was summarized by Benham (1942: 224) like this:

"*As an illustration of this uncertainty, mention may be made of my genus Tokea (1905) [1904?]. In 1907 Michaelsen (p. 161) regarded this genus as really included in Megascolides. In 1916 (according to Stephenson (1923, p. 193, and 1930, p. 835), for I have not access to the original paper, Michaelsen includes it in the genus Notoscolex on the ground of the microscopic structure of the prostate. Again, in 1910, Michaelsen (p. 36), in discussing the geographical distribution of these and related genera, refers repeatedly to the occurrence of Megascolides in New Zealand and Ceylon, but in 1916 comes to the conclusion that New Zealand earthworms formerly attributed to Megascolides must be removed from that genus to Notoscolex. Consequently New Zealand must be excluded from the geographical distribution of Megascolides. And so my Tokea has been shifted about, first as a subgenus of Megascolides in 1907 (p. 161), and then to Notoscolex in 1916. Now when our greatest authority on the Oligochaeta (unfortunately deceased) is so uncertain as to the limitation of the two genera, refers repeatedly to the occurrence, it is not surprising that Stephenson (who is likewise defunct), and who was, as his Monograph reveals, the next authority on the group, but who had followed Michaelsen, should have presented two opinions as to Tokea, for in 1930, p. 658, he refers to the edibility of 'Tokea (Megascolides),' while on p. 837 he wrote: 'Tokea must now go into Notoscolex.' Confusion worse confounded!*"

Lee (1952: 26) concluded that Tokea belonged in *Megascolides*, explaining:

"*Benham (1904) established a genus, Tokea, for several species from the North Island of New Zealand which had all the characters of Megascolides, but differed from that genus in one respect. The prostate had a simple central canal, but when sections of the gland were examined, it was found that the gland cells were grouped into small clusters which discharged their secretion into a slight evagination of the central duct. Benham called these small evaginations of the central duct 'canalicules'. It was unfortunate that he chose this term, since it really means a small canal and was taken as such by other workers, who placed Benham's species in Notoscolex. However, reference to the figures in Miss Sweet's paper on the structure of prostatic glands (1900), or to Benham's paper (1941) on Megascolides napierensis, in which he figures a cross-section of the prostate of Megascolides (Tokea) esculenta and details of the 'canalicules', will show what Benham meant by the term. I have examined sections of the prostatic gland of other genera of the family Megascolecidae and have found that these 'canalicules' are present in the prostates of other genera which have tubular prostates, e.g. in Neodrilus they are present in large numbers*."

Benham (1904) did not explicitly select a type-species for his genus, however the exemplar he described first and in greater detail was *Tokea esculenta*, an edible native identified as "*kurekure*": a food reserved for Māori chiefs, and Michaelsen (1907: 161), if we accept he acted as 'First Reviser', seemingly accepted this as type-species. With no opportunity to inspect the type-specimen, Blakemore (2011) transferred it to genus *Aporodrilus* from *Notoscolex* where it had resided following my revisions in 1999 (Blakemore, 2000a) on the assumption that its prostates were tubuloracemose because, having missed Lee's (1952) clarification above, I had taken Benham's original characterization of "*tongue-shaped*" glands having "*canalicules*" to mean they were non-tubular. This action inadvertently made *Aporodrilus* a temporary junior synonym of prior *Tokea*, albeit the remainder of the genus was still mostly subsumed in *Notoscolex*. Referring to information from Benham and Lee quoted above clarifies that, since the prostates actually qualify as tubular, *Tokea* indeed complies with *Megascolides*. However, lack of dorsal pores in the type, *T. esculenta*, gives precedent for restoration of the genus on the basis of this feature that, as it similarly separates *Aporodrilus* from *Notoscolex* (both with non-tubular prostates), now separates *Tokea* from *Megascolides* (both with tubular prostates).

In the appended checklist (Appendix II), those NZ species formerly qualifying for *Tokea* are restored having key characteristics of: lumbricine setae, avesiculate meroic nephridia, tubular prostates and being shown (or presumed) to lack dorsal pores. *Tokea maorica* Benham, 1904 (at least) has dorsal pores and is therefore returned as *Megascolides maoricus* (Benham, 1904), whilst *Megascolides parvus* Lee, 1952 lacks them so is newly transferred as *Tokea parva* (Lee, 1952).

Summary knowledge of *M. orthostichon*

Genus *Megascolides* M'Coy, 1878

***Megascolides orthostichon* (Schmarda, 1861) [Fig. 12]**

Synonymy. *Hypogaeon orthostichon* Schmarda, 1861a: 12, Plate 18, fig. 159.

Lumbricus orthostichon: Hutton, 1883: 586; Fletcher, 1886: 534.

Megascolides orthostichon: Beddard, 1892: 130; 1895: 496; Lee, 1959: 349; Lee, 1962: 175-176, figs. 11, 12 (of midriff and 9rhs spermatheca of non-type specimens, possibly of a different species); Blakemore, 2000c: 261-263, fig. 105; 2001: 5.

Notoscolex orthostichon: Michaelsen, 1900: 189; Benham, 1904a: 284, 1904b: 256.

Type Material. Listed by Reynolds & Cook (1976: 148) as Hamburg Museum: 8615, although Beddard (1892a) inspected type material in the Vienna Museum, dissecting one specimen, and Beddard (1895: 496) later noted "*I had only the type of SCHMARDA, which it was necessary to respect*." Cole (1981) reports: firstly, that Beddard (1892) re-inspected *Megascolides orthostichon* (Schmarda, 1861) Vienna Museum type specimens of *Hypogaeon orthostichon* [4 specimens (=syntypes?)]; and secondly, that he found *Perichaeta vitiensis* Beddard, 1892 [=*Pheretima* (*Pheretima*) *montana* Kinberg, 1867] had a single specimen in the Vienna Museum mislabelled as "*Hypogeon orthostichon Schm. Viti Ins*. [=Fiji]".

Other material. London BM:1904:10:5:488/490, of unknown provenance from the British Museum 'Beddard Collection', (two clitellate matures, one entire and one dissected along the dorsal mid-line, plus three aclitellate specimens); these specimens were inspected by Lee (1962), but whether they were the correct taxon is uncertain. Furthermore, as non-type material, they would have no ICZN name-bearing function.

Remarks. The synonymy given above details available information on this species, as summarized in Blakemore (2000c), with its similarities discussed by Benham (1904b) and by Lee (1962: 176) who thought the non-type BM specimens he inspected resembled *Tokea kirki* Benham, 1904 (originally and currently in *Tokea* after a sojourn in *Notoscolex* or, at the time Lee was writing, in *Megascolides*-see Appendix II).

Since *Megascolides orthostichon* (Schmarda, 1861)

Fig. 12. *Megascolides orthostichon* (Schmarda, 1861) from his Plate XVIII, fig. 159.

was not relocated at its type-locality during the present brief survey, and neither is it known to have been reported on site for 150 years, it may thus qualify under DoC NZTCS (Molloy *et al.*, 2002) classification as 'Nationally Critical', if not tagged 'Possibly Extinct' or even 'Extinct' under IUCN (2011) Redbook List Categories. No native earthworms were found at Mt Wellington thus it seems that pastoral cultivation particularly favours exotics. Further combined ecological and taxonomic (ecotaxonomic) survey is required to confirm or disconfirm this status and these conclusions.

Acknowledgements

Appreciation to staff of the University of Auckland (UA) Geothermal Energy team, especially Dr Sadiq Zarrouk and Dr Juliet Newson, along with Katherine Luketina of Waikato Regional Council, who helped facilitate some of these surveys on the ground. Curation of specimens is by John Early and Dhahara Ranatunga of Auckland Museum under the auspices of Research Chief, Dr Tom Trnski who kindly provided bench space and funded the DNA analyses. These most ably expedited (when Landcare declined the samples) by Ramon Gallego, a doctoral candidate in the Marine and Molecular Ecology Laboratories of UA. Te Papa curation is by Dr Bruce Marshall, and at National Museum of Nature and Science, Tokyo by Dr Toshiaki Kuramochi. Ancillary DNA data courtesy of TaeSeo Park at NIBR. Thanks to Dominic Bowden and *Contact Energy* staff for induction to Wairakei Geothermal steamfield; to the Tuaropaki trust Mokai, managers at Mangamingi, Hans & Valerie van der Heiden at Golden Springs and to the Berry family (Russell, Annette and Mark) of Arataki Honey for kindly allowing access to their lands.

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Submitted: July 11, 2012, Accepted: August 24, 2012

Appendix I. -mtDNA COI barcode FASTA data for species of concern.

Sample codes: 'RJBxx' courtesy of Dr T. Trnski AMNZ and Ramon Gallego UA (after Landcare declined); 'WMyy' courtesy T.S. Park, NIBR; and 'JETzz' courtesy of S. Prosser, N. Ivanova & P. Hebert of iBOLD program at University of Guelph, Canada.

>RJB07 AMNZ 5253 ***Notoscolex repanga*** Blakemore, 2011 H-old material nil result.
>RJB09 AMNZ 5254 ***Aporodrilus aotea*** Blakemore, 2011 H-old material nil result.
>RJB10 AMNZ 5255 ***Aporodrilus ponga*** Blakemore, 2011 H-old material nil result.

>RJB11_consensus_sequence ***Anisochaeta kiwi mihi*** H Golden Springs AMNZ 5260
AACCCTTTACTTTATTTTAGGAGTATGAGCCGGTATAATTGGTGCTGGCATAAGACTTCTTATTCGAATTGAATTAAGACAAC
CTGGAGCATTTCTAGGAAGAGATCAATTATATAACACCATTGTTACTGCACATGCATTCTTAATAATTTTTTTCTTGGTAATA
CCTGTATTTATTGGGGGATTTGGAAATTGACTGCTACCTCTTATACTAGGTGCTCCAGACATAGCATTCCCACGCCTTAATAA
CATAAGATTTTGACTACTGCCCCCGTCACTAATTCTCCTAGTATCTTCTGCTGCAGTAGAAAAAGGAGCAGGAACAGGATGA
ACAGTTTACCCACCCCTAGCAAGAAACATTGCTCATGCCGGGCCTTCGGTAGATCTAGCAATTTTCTCCCTTCATTTAGCTGG
AGCATCATCAATTCTTGGCGCTATTAATTTTATTACAACAGTAATTAATATGCGGTGAACAGGACTACGCTTAGAGCGTATT
CCCCTATTTGTATGGGCTGTAGTAATTACAGTTGTTCTTCTTCTCCTATCCCTACCAGTTCTAGCTGGAGCAATTACAATACT
ACTAACAGATCGAAATCTAAATACATCATTCTTCGACCCTGCTGGAGGAGGTGATCCCATTCTATACCAACACCTATTT -
BLASTn alignment *A. kiwi mihi* H vs. *A. k. kiwi* H Identities=647/652 (99%).

>RJB12_consensus_sequence ***A. macleayi*** "S1" Wairakei AMNZ 5262
AACCCTATATTTCATTTTAGGAGTTTGAGCCGGTATAATTGGAGCCGGTATAAGGCTACTTATTCGAATTGAGTTAAGACAG
CCAGGAGCATTTCTTGGAAGAGATCAACTATATAACACAATTGTAACTGCACATGCTTTCTTAATAATTTTTTTTCTAGTAAT
ACCAGTATTTATTGGTGGTTTTGGAAATTGGCTTCTCCCACTCATACTAGGTGCACCAGATATAGCATTCCCACGACTTAATA
ACATAAGATTTTGATTACTACCACCATCACTAATTTTACTTGTGTCGTCTGCTGCTGTGGAAAAAGGAGCTGGTACAGGATG
AACAGTTTACCCCCCCCTTGCAAGAAACATTGCCCACGCTGGACCATCAGTAGACTTAGCAATTTTCTCACTTCACTTAGCTG
GTGCCTCATCAATTCTAGGAGCTATCAACTTTATTACTACAGTAATTAATATACGATGAGCTGGACTACGTCTAGAACGAAT
CCCACTATTTGTATGAGCTGTAGTAATTACAGTAGTTCTACTACTTCTATCTTTACCTGTACTTGCTGGGGCTATTACAATACT
CCTAACAGATCGAAATCTAAATACTTCATTCTTTGACCCTGCCGGAGGAGGAGATCCAATTTTATATCAACACTTATTT

>RJB13_consensus_sequence ***A. macleayi*** "S2" Wairakei AMNZ 5263
AACCCTATATTTCATTTTAGGAGTTTGAGCCGGTATAATTGGAGCCGGTATAAGGCTACTTATTCGAATTGAGTTAAGACAG
CCAGGAGCATTTCTTGGAAGAGATCAACTATATAACACAATTGTAACTGCACATGCTTTCTTAATAATTTTTTTTCTAGTAAT
ACCAGTATTTATTGGTGGTTTTGGAAATTGGCTTCTCCCACTCATACTAGGTGCACCAGATATAGCATTCCCACGACTTAATA
ACATAAGATTTTGATTACTACCACCATCACTAATTTTACTTGTGTCGTCTGCTGCTGTGGAAAAAGGAGCTGGTACAGGATG
AACAGTTTACCCCCCCCTTGCAAGAAACATTGCCCACGCTGGACCATCAGTAGACTTAGCAATTTTCTCACTTCACTTAGCTG
GTGCCTCATCAATTCTAGGAGCTATCAACTTTATTACTACAGTAATTAATATACGATGAGCTGGACTACGTCTAGAACGAAT
CCCACTATTTGTATGAGCTGTAGTAATTACAGTAGTTCTACTACTTCTATCTTTACCTGTACTTGCTGGGGCTATTACAATACT
CCTAACAGATCGAAATCTAAATACTTCATTCTTTGACCCTGCCGGAGGAGGAGATCCAATTTTATATCAACACTTATTT -
BLASTn shows 100% match of *A. macleayi* S2 to S1 despite slight superficial differences.

>RJB18_consensus_sequence ***Anisochaeta kiwi kiwi*** H Mt Wellington AMNZ 5270
TTACTTTATTTTAGGAGTATGAGCCGGTATAATTGGTGCTGGCATAAGACTTCTTATTCGAATTGAATTAAGACAACCTGGA
GCATTTCTAGGAAGAGATCAACTATATAACACCATTGTTACTGCACATGCATTCTTAATAATTTTTTTCTTGGTGATACCTGT
ATTTATTGGGGGATTTGGAAATTGACTGCTACCTCTTATACTAGGTGCTCCAGACATAGCATTCCCACGCCTTAATAACATA
AGATTTTGACTACTGCCCCCATCACTAATTCTCCTAGTATCTTCTGCTGCAGTAGAAAAAGGAGCAGGAACAGGATGAACAG
TTTACCCACCCCTAGCAAGAAACATTGCTCATGCCGGGCCTTCGGTAGATCTAGCAATTTTCTCCCTTCATTTAGCTGGAGCA
TCATCAATTCTTGGTGCTATTAATTTTATTACAACAGTAATTAATATGCGGTGAACAGGACTACGCTTAGAGCGTATTCCCCT
ATTTGTATGAGCTGTAGTAATTACAGTTGTTCTTCTTCTCCTATCCCTACCAGTTCTAGCTGGAGCAATTACAATACTACTAA
CAGATCGAAATCTAAATACATCATTCTTCGACCCTGCTGGAGGAGGTGATCCCATTCTATACCAACACCTATTT

>RJB19_consensus_sequence ***Anisochaeta kiwi kiwi*** P1 Mt Wellington AMNZ 5271
AACCCTTTACTTTATTTTAGGAGTATGAGCCGGTATAATTGGTGCTGGCATAAGACTTCTTATTCGAATTGAATTAAGACAAC
CTGGAGCATTTCTAGGAAGAGATCAACTATATAACACCATTGTTACTGCACATGCATTCTTAATAATTTTTTTCTTGGTGATA
CCTGTATTTATTGGGGGATTTGGAAATTGACTGCTACCTCTTATACTAGGTGCTCCAGACATAGCATTCCCACGCCTTAATAA
CATAAGATTTTGACTACTGCCCCCATCACTAATTCTCCTAGTATCTTCTGCTGCAGTAGAAAAAGGAGCAGGAACAGGATGA
ACAGTTTACCCACCCCTAGCAAGAAACATTGCTCATGCCGGGCCTTCGGTAGATCTAGCAATTTTCTCCCTTCATTTAGCTGG
AGCATCATCAATTCTTGGTGCTATTAATTTTATTACAACAGTAATTAATATGCGGTGAACAGGACTACGCTTAGAGCGTATT
CCCCTATTTGTATGAGCTGTAGTAATTACAGTTGTTCTTCTTCTCCTATCCCTACCAGTTCTAGCTGGAGCAATTACAATACT
ACTAACAGATCGAAATCTAAATACATCATTCTTCGACCCTGCTGGAGGAGGTGATCCCATTCTATACCAACACCTATTT -
BLASTn shows 100% match of *A. kiwi kiwi* H to P1 despite superficial differences (cf. *A. k mihi*).

[>WM6 NZ Arataki "***Eisenia japonica***" specimen AMNZ86031-shown to be mixed or contaminated.
AAATAGGTGCTGATATAGAATAGGGTCTCCCCCGCCTGCAGGATCGAAGAATGATGTATTTAGGTTTCGGTCTGTTAGAAGT
ATTGTAATAGCCCCAGCCAGTACGGGCAATGAGAGCAATAGAAGTACTACGGTAATAACCACTGCTCATACAAATAGGGGA
ATTCGTTCTAATCGTAGTCCCGATCAGCGTATATTAATTACTGTGGTGATGAAGTTGATAGCCCCTAGAATTGAGGATGCTC
CGGCTAAGTGGAGTGAGAAAATTGCTAGATCCACAGAAGGTCCAGCATGTGCAATATTTCTTGCTAGGGGTGGATATACCG
TTCACCCGGTTCCTGCCCCCTTCTCTACTGCTGCTGAGGATACTAGTAAAATTAGAGACGGCGGTAGTAGTCAGAATCTTAT
GTTATTTAGTCGTGGGAATGCTATGTCTGGTGTCCCCAATATAAGAGGTAGTAGCCAATTTCCAAAGCCCCCAATAAATACT
GGTATAACTAAGAAAAAGATTATTAGAAATGCGTGTGCAGTAACAATTGTGTTGTATAGTTGATCGCTCCCTATAAAGGACC
CGGGCTGCCTTAGCTCAATCCGAATAAGTAATCTTATCCCGGCACCCACCATGCCGGCCCAAATTCCTAAGATAAAATATAA

Appendix I. Continued.

AGTTCC-BLASTn shows different to *E. j. japonica* (Identities=527/657 or 80%) despite its morphological similarity and megaBLAST is <85% similar to various megascolecids, thus this sample is considered contamination (Resamples as WO8/9 unsuccessful)].

>WM7 NZ Arataki ***Amynthas corticis*** specimen that provided DNA- AMNZ86033.
GGTGTTGATATAAAATTGGGTCTCCCCCTCCTGCTGGATCAAAGAATGATGTATTAAGGTTTCGATCTGTTAATAGTATTGTG
ATAGCACCGGCTAGTACTGGTAATGATAGAAGTAGTAGAACTACGGTAATTACTACTGCTCATACAAATAGGGGAATTCGT
TCTAGTCGTAGGCCTGATCATCGTATATTAATTACTGTAGTAATAAAATTGATTGCACCTAGAATTGATGATGCCCCTGCTAA
GTGTAGTGAGAAAATTGCCAGATCTACTGATGGTCCAGCATGCGCAATGTTACTTGCTAGTGGTGGGTAAACTGTTCATCCT
GTTCCTGCACCTTTTTCCACTGCTGCAGAAGAGACTAGTAAGATGAGTGAGGGGGGTAATAGTCAGAATCTTATATTATTTA
GGCGTGGAAATGCTATATCTGGAGTCCCCAATATAAGTGGTAATAGTCAATTACCAAAACCACCAATAAATACTGGTATTAC
TAGAAAAAAAATTATTAAGAATGCATGTGCTGTTACAATTGTGTTATAAAGTTGGTCACTTCCCAGGAATGACCCAGGTTGT
CTTAATTCGATTCGAATAAGAAGACTTATTCCAGCCCCAATTATTCCGGCTCAAATTCCTAAAATGAAGTATA - megaBLAST conforms 100% to *A. corticis* from Taiwan and "*A. diffringens*" from China; also with some of author's currently unpublished *A. corticis* spp-complex NIBR samples from Korea (Blakemore in prep.).

>JET10-17 Hamburg V119, 121 and Berlin Nr 2177 ***Eisenia japonica*** historical types-nil results.

>JET170-11|An-417|Enoshima Japan topotype ***Eisenia japonica japonica*** |COI-5P
AACTTTATACTTTATCCTCGGAGTCTGAGCCGGGATAGTGGGTGCTGGTATAAGACTTCTCATTCGAATTGAATTGAGCCAG
CCGGGAGCCTTCCTAGGAAGAGATCAACTATATAACACAATTGTAACAGCCCATGCATTTGTAATAATTTTCTTCTTAGTTAT
ACCTGTATTCATTGGGGGTTTCGGAAACTGGCTACTTCCCTTAATACTAGGAGCCCCCGATATAGCCTTTCCACGACTTAACA
ATATAAGATTCTGACTACTGCCCCCATCCCTTATCCTACTAGTATCCTCCGCCGCAGTAGAAAAAGGTGCAGGTACAGGATG
AACGGTATATCCTCCTCTATCAAGAAATCTAGCACACGCAGGTCCTTCAGTTGATCTAGCCATTTTCTCACTTCATTTAGCGG
GAGCTTCCTCAATTCTTGGGGCTATTAATTTTATCACTACAGTTATTAATATACGCTGAAGAGGACTACGATTAGAACGAAT
CCCTTTATTCGTATGAGCTGTAGTAATTACAGTAGTTCTTTTACTTTTATCCCTCCCAGTACTTGCAGGAGCCATTACCATACT
ACTAACAGATCGAAACTTAAATACTTCATTCTTCGATCCCGCAGGTGGTGGAGATCCAATTTTATACCAACATCTTTTC

>JET173-11|An-415| Hodogaya-ku Japan holotype ***Eisenia japonica hiramoto*** sub-sp. nov.|COI-5P
GGGGTTTCGGAAACTGGTTACTTCCTTTAATACTAGGTGCCCCCGATATGGCCTTTCCACGACTCAACAATATAAGATTCTG
GCTACTACCCCCATCCCTCATCCTACTCGTATCCTCCGCTGCAGTAGAAAAAGGGGCAGGTACGGGATGAACAGTATACCCT
CCCCTATCAAGAAATCTAGCACACGCAGGTCCTTCAGTAGATCTAGCCATCTTTTCACTTCACTTAGCAGGAGCTTCCTCAAT
TCTTGGAGCTATTAATTTTATCACTACAGTTATCAATATACGCTGAAGAGGCCTACGATTAGAACGAATTCCTTTATTCGTAT
GAGCTGTAGTAATTACAGTAATTCTATTACTTCTATCCCTTCCAGTACTTGCAGGAGCCATTACCATATTACTAACAGATCGA
AACTTAAATACCTCATTCTTCGATCCTGCAGG - BLASTn shows similarity no better than 93% (Identities=414/445) with Enoshima *E. japonica* topotype An-417. megaBLAST shows similarity no better than 84% for lumbricids from Europe.

>JET174-11|HNHM-15529|***Eisenia anzac*** Blakemore, 2011 Holotype from Japan, H|COI-5P
AACTTTATATTTTATTCTCGGTGTTTGAGCTGGTATAGTTGGTGCCGGTATAAGACTTCTAATTCGAATTGAACTAAGACAGC
CGGGAGCCTTCCTAGGAAGAGATCAACTATACAATACAATTGTAACAGCTCATGCATTTGTTATAATTTTCTTTTTAGTAATA
CCTGTATTTATTGGGGGATTTGGAAATTGATTACTTCCCCTAATACTAGGAGCCCCTGACATAGCCTTCCCACGACTAAACA
ATATAAGATTCTGGTTACTTCCCCCGTCACTTATCCTCTTAGTATCTTCCGCTGCTGTAGAAAAAGGTGCAGGTACAGGATGA
ACAGTATACCCCCCCTTATCAAGAAACCTTGCACATGCAGGTCCATCAGTAGATTTAGCCATCTTTTCTCTTCACCTGGCAGG
AGCTTCTTCAATTCTGGGAGCTATTAACTTTATCACCACAGTTATCAACATACGTTGAAGAGGATTACGACTAGAACGAATT
CCCCTATTTGTATGAGCTGTAGTTATTACAGTAGTCCTACTTCTTCTATCCCTCCCAGTGCTCGCAGGAGCCATTACCATGCT
ACTTACAGATCGAAACTTAAATACTTCATTTTTCGACCCTGCCGGTGGTGGAGACCCTATCCTATACCAACATCTTTTC - BLASTn *E. anzac* vs. *E. j. hiramoto* H Identities=384/445 (86%); *E. anzac* vs. *E. japonica* An-417|Enoshima Japan topotype Identities=569/658 (86%).

>WM5 ***Rhododrilus mangamingi*** Holotype (H) AMNZ86028
TAAGTGTTGATATAAAATAGGGTCTCCTCCTCCTGAGGGATCGAAGAACGAGGTATTAAGGTTTCGATCTGTTAGTAGTATC
GTAATAGCCCCAGCTAAAACTGGTAATGATAAAAGTAATAATACTACAGTAATAATAACGGCTCATACAAATAAGGGTACC
CGTTCTAGGCGCATACCAGTTGATCGCATGTTGACAACTGTGGTAATAAAGTTAATTGCCCCTAAAATTGAGGAGGCACCAG
CTAGGTGTAATGAGAAAATGGCAAGATCTACAGATGGCCCTGCATGGGCTATATTTCTAGCTAGTGGGGGATATACGGTTC
ACCCAGTTCCAGCACCTTTTTCTACGGCAGCAGAGGATACTAGAAGGATTAGCGATGGGGGTAAAAGTCAAAATCTTATGTT
ATTTAGTCGTGGAAATGCTATATCTGGTGCACCGAGTATTAAAGGTAGGAGTCAGTTTCCGAATCCACCAATAAATACTGGT
ATTACTAAGAAGAAGATTATTAAAAATGCATGTGCTGTTACAATTGTATTATATAGTTGATCACTTCCTAGAAATGCTCCCG
GCTGTCTTAATTCAATTCGAATTAAAAGTCTTATGCCGGCTCCAATTATTCCTGCCCACACTCCTAAGATAAAATA - megaBLAST no closer than 84% for various worms, i.e., nothing similar yet sequenced on GenBank.

>WM4 ***Deinodrilus orcus*** Holotype (H) AMNZ86029
TGTTGATATAGAATAGGATCTCCTCCACCCGGAAGGATCAAAGAATGAGGTATTTAGATTTCGGTCTGTAAGGAGTATGGTA
ATGGCACCAGCTAGTACTGGTAGGGATAGAAGAAGAAGTACTACTGTAATTAATACAGCTCATACAAATAAAGGAACTCGC
TCTAGTCGTAGACCTGTCCACCGTATATTGATTACAGTTGTAATAAAGTTGATCGCTCCTAAAATAGATGATGCACCTGCTA
GATGGAGTGAGAAAATTGCTAGATCTACTGATGGCCCAGCATGTGCAATATTTCTAGCTAGGGGAGGGTATACTGTTCACCC
TGTTCCAGCTCCTTTTTCGACGGCTGCAGAGGATACTAGAAGAATTAGAGATGGAGGCAACAGTCAGAATCTTATGTTATTC
AGTCGTGGGAATGCTATGTCTGGCGCTCCTAGTATTAATGGAAGGAGTCAGTTTCCAAACCCCCCAATAAATACCGGCATTA
CTAAAAAGAAGATTATTAGAAATGCGTGCGCTGTAACAATTGTATTATATAGTTGATCGCTTCCTAGGAATGCCCCAGGTTG
GCTTAATTCGATTCGGATTAATAGTCTTATTCCTGCCCCAATTATACCTGCTCAAATTCCTAAGATAAAATA - megaBLAST closest match is 95% for *D. gorgon* Blakemore, 2010 here considered sufficient for specificity.

Appendix II. New Zealand Phylum Annelida, Subphylum Clitellata, Class Oligochaeta, Order Megadrilacea; families and genera after Blakemore (2000a; 2000b; 2000c; 2002; 2010a; 2010b), taxonomy following recommendations of ICZN (1999).

FAMILY/Genus	Species name	Species author, date (genus author **bold**)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
ACANTHODRILIDAE				
Acanthodrilus		**Perrier, 1872**		
Acanthodrilus	*kermadecensis*	Lee, 1953		**EK**
Acanthodrilus	*ravus*	(Lee, 1959)	**Comb. nov.** due to its J-shaped nephridial bladders	**E**
Decachaetus		**Lee, 1959**	*Eudinodriloides* Lee, 1959 **syn. nov. by Blakemore (2010a)**	
Decachaetus	*erici*	Blakemore, 2010		**E**
Decachaetus	*forsteri*	(Lee, 1959)	**Comb. nov. by Blakemore (2010a)**	**E**
Decachaetus	*minor*	Lee, 1959		**E**
Decachaetus	*violaceus*	Lee, 1959		**E**
Dinodriloides		**Benham, 1904**		
Dinodriloides	*beddardi*	Benham, 1904	*Dinodriloides annectens* Benham, 1906	**E**
Diplotrema		**Spencer, 1900**	*Eodrilus* Michaelsen, 1907	
Diplotrema	*annectens*	(Beddard, 1889)		**E**
Diplotrema	*bilboi*	Blakemore, 2010		**E**
Diplotrema	*fallax*	(Benham, 1909)		**E**
Diplotrema	*haplocystis*	(Benham, 1901)		**E**
Diplotrema	*micros*	(Lee, 1959)		**E**
Diplotrema	*montana*	(Lee, 1959)		**E**
Diplotrema	*pallida*	(Lee, 1959)		**E**
Diplotrema	*paludosa*	(Beddard, 1892)		**E**
Diplotrema	*parva*	(Lee, 1959)		**E**
Diplotrema	*rossi*	(Lee, 1959)		**E**
Maoridrilus		**Michaelsen, 1899**		
Maoridrilus	*alpinus*	Lee,1959		**E**
Maoridrilus	*carnosus*	Lee, 1959		**E**
Maoridrilus	*dissimilis*	(Beddard, 1885)	*Acanthodrilus neglectus* Beddard, 1886	**E**
Maoridrilus	*felix felix*	Blakemore, 2010		**E**
Maoridrilus	*felix vallis*	Blakemore, 2010		**E**
Maoridrilus	*fuscus*	Lee, 1959		**E**
Maoridrilus	*gravus*	Lee, 1959		**E**
Maoridrilus ?	*intermedius*	Michaelsen, 1924	*Species incertae sedis*	**E**
Maoridrilus ?	*mauiensis*	Benham, 1904	*Species incertae sedis*	**E**
Maoridrilus	*megacystis*	Benham, 1919		**E**
Maoridrilus	*michaelseni*	Ude, 1905		**E**
Maoridrilus	*minor*	Lee, 1959		**E**
Maoridrilus	*modestus*	Michaelsen, 1910		**E**
Maoridrilus	*montanus*	Lee, 1959		**E**
Maoridrilus	*nelsoni*	Lee, 1959		**E**
Maoridrilus	*pallidus*	Lee, 1959		**E**
Maoridrilus	*parkeri*	(Beddard, 1895)		**E**
Maoridrilus	*plumbeus*	(Beddard, 1895)		**E**
Maoridrilus	*purus*	Ude, 1905		**E**
Maoridrilus	*ruber*	Lee, 1959		**E**
Maoridrilus	*rubicundus*	Lee, 1959		**E**
Maoridrilus	*smithi*	(Beddard, 1892)		**E**
Maoridrilus	*suteri ama*	Blakemore, 2010		**E**
Maoridrilus	*suteri suteri*	Michaelsen, 1922		**E**
Maoridrilus	*tetragonurus*	Michaelsen, 1899		**E**
Maoridrilus ?	*thomsoni*	Benham, 1919	*Species incertae sedis*	**E**
Maoridrilus	*transalpinus*	Lee, 1959	**Redescribed by Blakemore, 2010a**	**E**
Maoridrilus	*uliginosus*	(Hutton, 1877)	*Acanthodrilus novaezelandicae* Beddard, 1885; *Acanthodrilus rosae* Beddard, 1889	**E**
Maoridrilus	*ultimus*	Lee, 1959		**E**
Maoridrilus	*volutus*	Lee, 1959		**E**
Maoridrilus	*wilkini*	Lee, 1959		**E**
Microscolex		**Rosa, 1887**	*Photodrilus* Giard, 1887, *Deltania* Eisen, 1893, *Notiodrilus* Mich., 1899	
Microscolex	*aucklandicus auklandicus*	(Benham, 1903)	From sub-Antarctic Auckland Isls.	**E**
Microscolex	*aucklandicus bollonsi*	(Benham, 1909)	(Synonym of nominal subspecies?)	**E**
Microscolex	*aucklandicus pallidus*	(Benham, 1909)	(Synonym of nominal subspecies?)	**E**

Appendix II. Continued.

FAMILY/Genus	Species name	Species author, date (genus author bold)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
Microscolex	*campbellianus*	(Benham, 1905)		**E**
Microscolex	*dubius*	(Fletcher, 1887)	Lee (1962: 170, 179) though it doubtful	**?A**
Microscolex	*phosphoreus*	(Dugès, 1837)	*Microscolex novazelandiae* Beddard, 1894 (corr. *novaezelandiae*)	**A**
Neochaeta		**Lee, 1959**		
Neochaeta	*forsteri*	Lee, 1959		**E**
Neochaeta	*salmoni*	Lee, 1959		**E**
Neodrilus		**Beddard, 1887**		
Neodrilus	*agilis*	Lee, 1949		**E**
Neodrilus	*campestris*	(Hutton, 1877)	*Neodrilus monocystis* Beddard, 1887	**E**
Neodrilus	*dissimilis*	Lee, 1959		**E**
Neodrilus	*edwardsi*	Lee, 1959		**E**
Neodrilus	*polycystis*	Lee, 1959		**E**
Perieodrilus		**Michaelsen, 1910**		
Perieodrilus	*lateralis*	(Benham, 1903)		**E**
Perieodrilus	*montanus*	(Benham, 1903)		**E**
Perieodrilus	*plunketi*	(Benham, 1909)		**E**
Perieodrilus	*ricardi*	(Benham, 1903)		**E**
Plagiochaeta		**Benham, 1891**		
Plagiochaeta	*lineata*	(Hutton, 1877)		**E**
Plagiochaeta	*stewartensis*	Michaelsen, 1924		**E**
Plagiochaeta	*sylvestris*	(Hutton, 1877)	*Plagiochaeta punctata* Benham, 1891; sometimes dated 1892 (valid synonym?)	**E**
Rhododrilus		**Beddard, 1889**	*Leptodrilus* Benham 1909; *Kayarmacia* Jamieson, 1997	
Rhododrilus	*aduncocystis*	Lee, 1952		**E**
Rhododrilus	*agathis*	Lee, 1959		**E**
Rhododrilus	*albidus*	Lee, 1952		**E**
Rhododrilus	*aquaticus*	Lee, 1959		**E**
Rhododrilus	*attenuatus*	Lee, 1952		**E**
Rhododrilus	*benhami*	Lee, 1952		**E**
Rhododrilus	*besti*	Benham, 1904		**E**
Rhododrilus	*cockaynei*	Benham, 1905	(Corr. *R. cockayni*); syn. *Rhododrilus cockayni* var. *waterfieldi* Benham, 1909	**E**
Rhododrilus	*dobsoni*	Lee, 1959		**E**
Rhododrilus	*edulis*	Benham, 1904	Separate spermathecal openings as in *Hickmaniella classica* Blakemore, 2000	**E**
Rhododrilus	*huttoni*	(Benham, 1901)		**E**
Rhododrilus	*insularis*	Lee, 1959		**E**
Rhododrilus ?	*intermedius*	Lee, 1952	*Species incertae sedis* (meroic?)	**E**
Rhododrilus	*kermadecensis*	Benham, 1905	*Rhododrilus littoralis* Jamieson, 1974	**EK**
Rhododrilus	*leptomerus*	Benham, 1905	*Leptodrilus magneticus* Benham, 1909	**E**
Rhododrilus ?	*macroseptus*	Lee, 1952	*Species incertae sedis* (meroic?)	**E**
Rhododrilus	*mangamingi*	Blakemore, 2012	**Sp. nov.**	**E**
Rhododrilus	*microgaster*	Lee, 1959		**E**
Rhododrilus	*minimus*	Lee, 1952		**E**
Rhododrilus	*minutus*	Beddard, 1889		**E**
Rhododrilus	*monticolus*	(Beddard, 1895)	Previously *Microscolex monticola* was *species incertae sedis*, validated with gizzard in 6 not 8 by Lee (1962: 170)	**E**
Rhododrilus	*papaensis*	Lee, 1952		**E**
Rhododrilus	*parvus*	Benham, 1906		**E**
Rhododrilus	*robustus*	Lee, 1952		**E**
Rhododrilus	*rosae*	Lee, 1959		**E**
Rhododrilus	*sexpapillatus*	Dyne, 1980		**E**
Rhododrilus	*similis*	Benham, 1906		**E**
Rhododrilus	*subtilis*	Lee, 1959		**E**
Rhododrilus	*sutherlandi*	Lee, 1952		**E**
Rhododrilus	*tetratheca*	Lee, 1959		**E**
Sylvodrilus		**Lee, 1959**		
Sylvodrilus	*gravus*	Lee, 1959		**E**

Appendix II. Continued.

FAMILY/Genus	Species name	Species author, date (genus author bold)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
OCTOCHAETIDAE				
Deinodrilus		**Beddard, 1889**	*Dinodrilus* (illegal emend.) Michaelsen, 1900; *Conicodrilus* Benham, 1945	
Deinodrilus	*agilis*	Lee, 1952		**E**
Deinodrilus	*benhami*	Beddard, 1889		**E**
Deinodrilus	*gorgon*	Blakemore, 2010		**E**
Deinodrilus	*gracilis*	Ude, 1905		**E**
Deinodrilus	*kanieriensis*	(Benham, 1945)		**E**
Deinodrilus	*lateralis*	Lee, 1959		**E**
Deinodrilus	*medusa*	Blakemore, 2010		**E**
Deinodrilus	*montanus*	Lee, 1952		**E**
Deinodrilus	*orcus*	Blakemore, 2012	**Sp. nov.**	**E**
Deinodrilus	*parvus*	Lee, 1952		**E**
Deinodrilus	*suteri*	Benham, 1906		**E**
Dichogaster		**Beddard, 1888**		
Dichogaster	*modiglianii*	(Rosa, 1896)	Ude's (1905) record unconfirmed	**?A**
Hoplochaetina		**Michaelsen, 1920**		
Hoplochaetina	*durvilleana*	(Benham, 1919)		**E**
Hoplochaetina	*pallida*	Lee, 1952		**E**
Hoplochaetina	*polycystis*	Lee, 1952		**E**
Hoplochaetina	*robusta*	Lee, 1952		**E**
Hoplochaetina	*rossii*	(Benham, 1903)		**E**
Hoplochaetina	*rubra*	Lee, 1959		**E**
Hoplochaetina	*spirilla*	Lee, 1959		**E**
Hoplochaetina	*subtilis*	Lee, 1959		**E**
Leucodrilus		**Lee, 1952**		
Leucodrilus	*digitocystis*	Lee, 1952		**E**
Leucodrilus	*disparatus*	(Lee, 1952)	**Comb. nov. by Blakemore (2010a)**	**E**
Leucodrilus	*fuscus*	Lee, 1952		**E**
Leucodrilus	*robustus*	Lee, 1959		**E**
Octochaetus		**Beddard, 1893**	*Cryptochaeta* Benham, 1950 [preocc. non *Cryptochetum* Rondani 1876 (Diptera)] synonymy by Lee (1959: 104); *Adroitplema* Blakemore, 2006 (nom. nov. pro *Neodiplotrema* Dyne, 1997 non Yamaguchi, 1938)	
Octochaetus	*antarcticus*	(Beddard, 1889)		**E**
Octochaetus	*brucei*	Lee, 1952		**E**
Octochaetus	*diememoratio*	Blakemore, 2010		**E**
Octochaetus	*huttoni*	Beddard, 1892		**E**
Octochaetus	*kapitiensis*	Lee, 1959		**E**
Octochaetus	*kenleei*	Blakemore, 2010		**E**
Octochaetus ?	*levis*	(Hutton, 1877)	*Incertae sedis* (Lee, 1959; 1962: 178)	**?E**
Octochaetus	*michaelseni*	Benham, 1904		**E**
Octochaetus ?	*microchaetus*	(Benham, 1950)	*Incertae sedis*; ex-type of *Cryptochaeta*	**E**
Octochaetus	*multiporus*	(Beddard, 1885)	Michaelsen (1900: 319) put *O. thomasi* Beddard, 1893 in synonymy; cf. Lee (1959: 115; 1962: 173) who restored it	**E**
Octochaetus	*pelorus*	Lee, 1959		**E**
Octochaetus	*ravus*	Lee, 1959		**E**
Octochaetus	*sylvestris*	Lee, 1952		**E**
Octochaetus	*thomasi*	Beddard, 1893	*Incertae sedis*; sometimes dated "1892"; spermathecal diverticula lack is questioned (= syn. of *O. multiporus*?)	**E**
Octochaetus	*tricystis*	Lee, 1952		**E**
MEGASCOLECIDAE				
Amynthas		Kinberg, 1867		**A**
Amynthas	*corticis*	(Kinberg, 1867)	Syns. numerous (see Blakemore, 2010b) probably including *Pheretima clerica* Benham, 1946 and *P. campestris* Lee, 1952	**A+K**
Amynthas	*gracilis*	(Kinberg, 1867)		**AK**
Amynthas	*hupeiensis*	(Michaelsen, 1895)		**A**

Appendix II. Continued.

FAMILY/Genus	Species name	Species author, date (genus author bold)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
Anisochaeta		**Beddard, 1890**	*Trichaeta* Spencer, 1900; *Spenceriella* Michaelsen, 1907; *Gemascolex* Edmonds & Jamieson, 1973; *Pericryptodrilus* Jamieson 1977; *Propheretima* Jamieson, 1995	
Anisochaeta	*animae*	(Lee, 1959)	(Dorsal pores present > 4/5-pers. obs. Blakemore, 2011)	**E(?)**
Anisochaeta	*laingii*	(Benham, 1903)	Sometimes misspelt "langii"	**?A?K**
Anisochaeta	*macleayi*	(Fletcher, 1889)	**New record New Zealand**	**A**
Anisochaeta	*kiwi kiwi*	Blakemore, **sp. nov.**		**A**
Anisochaeta	*kiwi mihi*	**Sub-sp. nov.**		**A**
Anisochaeta	*novaezealandiae*	(Lee, 1952)	[Misspelt "novaezelandiae" in Reynolds & Cook (1979:146); and yet misformatted as originally "novae-zealandiae" on www.boldsystems.org/views/taxbrowser.php?taxid=258680 (Oct. 2011)]	**E**
Aporodrilus		**Blakemore, 2000**	Type: *A. dombrovskisi* Blakemore, 2000	
Aporodrilus	*aotea*	Blakemore, 2011		**E**
Aporodrilus	*equestris*	(Benham, 1942)	**Comb. nov. (Blakemore, 2011)**	**E**
Aporodrilus	*mortenseni*	(Michaelsen, 1924)	**Comb. nov. (Blakemore, 2011)**	**?E**
Aporodrilus	*ponga*	Blakemore, 2011		**E**
Celeriella		**Gates, 1958**		
Celeriella	*antarctica*	(Baird, 1871)	Type (BM 1845:6:18:1)-possibly first named worm specimen collected from NZ ~1841-1844 by Dr Andrew Sinclair; syn. *Diporochaeta shakespeari* Benham, 1906 by Lee (1962: 177)	**E**
Celeriella	*argillae*	(Lee, 1959)		**E**
Celeriella	*gigantea*	(Benham, 1906)		**E**
Celeriella	*pallida*	(Lee, 1959)	*Incertae sedis* (tubuloracemose?)	**E**
Didymogaster		**Fletcher, 1887**		
Didymogaster	*sylvatica*	Fletcher, 1887	NZ report of Australian sp doubted by Stephenson (1930) & Lee (1959: 261)	**?A**
Diporochaeta		**Beddard, 1890**		
Diporochaeta	*aquatica*	Benham, 1903		**E**
Diporochaeta	*brachysoma*	Benham, 1909		**E**
Diporochaeta	*caswelli*	Lee, 1959		**E**
Diporochaeta	*chathamensis*	Benham, 1901		**E**
Diporochaeta	*duodecimalis*	(Michaelsen, 1924)		**E**
Diporochaeta	*heterochaeta*	Benham, 1909		**E**
Diporochaeta	*intermedia*	Beddard, 1889: 380	*Perichaeta novae-zelandiae* Beddard, 1888: 434 (*nomen nudum*); *Diporochaeta novae-zelandia* Beddard, 1890:55; *Diporochaeta intermedia taipo* Jamieson, 1976 (see www.bugz.org.nz)	**E**
Diporochaeta	*minima*	Lee, 1959		**E**
Diporochaeta	*obtusa*	Lee, 1952		**E**
Diporochaeta	*pounamu*	Blakemore, 2010		**E**
Diporochaeta	*punctata*	Lee, 1959	"puctata" Reynolds & Cook (1976: 160)	**E**
Diporochaeta	*radula*	Blakemore, 2010	(Suggested as a new genus "*Radula*")	**E**
Graliophilus		**Jamieson, 1971**		
Graliophilus	*parvus*	(Lee, 1959)		**E**
Graliophilus	*stewartensis*	(Lee, 1959)		**E**
Megascolides		**M'Coy, 1878**	*Dinephrus* Spencer, 1900: 33; *Austrohoplochaetella* Jamieson, 1971; *Pseudocryptodrilus* Jamieson, 1972 (obj. syn.), syns. from Blakemore (2000c: 238), etc.	
Megascolides ?	*albus*	Lee, 1952	(*M. alba* Lee, 1952, corr.); dorsal pores?	**E**
Megascolides	*fuscus*	Lee, 1952		**E**
Megascolides ?	*irregularis*	Lee, 1952	Dorsal pores not noted	**E**
Megascolides	*maoricus*	(Benham, 1904)	**Restored as per Lee (1959).** Syn. *Tokea decipiens* Benham, 1905: 241	**E**
Megascolides	*neglectus*	Cognetti, 1909	Dorsal pores?	**E**
Megascolides	*orthostichon*	(Schmarda, 1861)	**Restored to NZ list.** Dorsal pores?	**E**

Appendix II. Continued.

FAMILY/Genus	Species name	Species author, date (genus author bold)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
Megascolides ?	*raglani*	Lee, 1952	Dorsal pores not noted	**E**
Megascolides	*reptans*	(Ude, 1905)	Dorsal pores?	**E**
Megascolides	*rubicundus*	Lee, 1959	Misspelt "ribicundus" in Reynolds & Cook, 1976: 165. Dorsal pores?	**E**
Megascolides	*unipapillatus*	(Ude, 1905)	Dorsal pores?	**E**
Notoscolex		**Fletcher, 1886**	?*Nelloscolex* Gates, 1939; ?*Lennoscolex* Gates, 1960; *Pseudonotoscolex* Jamieson, 1971; *Oreoscolex* Jamieson, 1973; *Araucaridrilus*, Jamieson, 2000; ?*Plutelloides* Jamieson, 2000 (but cf. *Megascolides*)	
Notoscolex	*hakeaphilus*	Benham, 1949		**?E**
Notoscolex	*napierensis*	(Benham, 1941)		**?E**
Notoscolex	*repanga*	Blakemore, 2011		**E**
Notoscolex	*tasmani*	(Lee, 1959)	**Comb. nov. (Blakemore, 2011)**	**E**
Perionychella		**Michaelsen, 1907**	*Terrisswankerius* Jamieson, 1994-for its putative type *Perichaeta canaliculata* Fletcher, 1887	
Perionychella	*egmonti*	(Lee, 1952)		**E**
Perionychella	*helophila*	(Benham, 1909)	Sic-originally *Diporochaeta helophila*	**E**
Perionychella	*ngakawau*	Blakemore, 2010		**E**
Perionychella	*perionychopsis*	(Benham, 1909)		**E**
Perionychella	*shoeana*	(Cognetti, 1912)	Sometimes miscited "*P. shoeanus*"	**E**
Pontodrilus		**Perrier, 1874**		
Pontodrilus	*lacustris*	(Benham, 1903)		**E**
Pontodrilus	*litoralis*	(Grube, 1855)	*Pontodrilus matushimensis chathamianus* Michaelsen, 1899; (for other synonyms, see Blakemore, 2007)	**A**
Perionyx		**Perrier, 1872**		
Perionyx	*excavatus*	Perrier, 1872	**New record Australia by Blakemore (1994) and NZ by Blakemore (2002)**	**A**
Tokea		**Benham, 1904**	**Newly revived**	
Tokea	*esculenta*	Benham, 1904	**Newly restored type** (no dorsal pores)	**E**
Tokea	*huttoni*	Benham, 1904	Dorsal pores not noted	**E**
Tokea	*kirki*	Benham, 1904	Dorsal pores not noted	**E**
Tokea	*parva*	(Lee, 1952)	**Comb. nov.** (no dorsal pores)	**E**
Tokea ?	*ruber*	(Lee, 1952)	**Comb. nov.** (dorsal pores?)	**E**
Tokea	*sapida*	Benham, 1904	Dorsal pores not noted	**E**
Tokea	*suteri*	Benham, 1904	Dorsal pores not noted	**E**
Tokea	*urewerae*	Benham, 1904	Dorsal pores not noted	**E**
Tokea	*viridis*	(Lee, 1952)	**Comb. nov.** (no dorsal pores)	**E**
Zacharius		**Blakemore, 1997**		
Zacharius	*aucklandicus*	(Benham, 1909)	**Comb. nov.** (prostates non-tubular)	**E**
Zacharius	*obo*	Blakemore, 2010		**E**
GLOSSOSCOLECIDAE				
Pontoscolex	*corethrurus*	(Müller, 1857)	**NZ records rediscovered by RJB** (see Michaelsen, 1900; Thomson, 1922)	**A**
LUMBRICIDAE				
Allolobophora	*chlorotica* sub-spp	(Savigny, 1826)		**A**
Allolobophoridella	*eiseni*	(Levinsen, 1884)		**A**
Aporrectodea	*caliginosa*	(Savigny, 1826)		**A**
Aporrectodea	*longa*	(Ude, 1885)		**A**
Aporrectodea	*rosea*	(Savigny, 1826)		**A**
Aporrectodea	*trapezoides*	(Dugès, 1828)		**A**
Aporrectodea	*tuberculata*	(Eisen, 1874)		**A**
Dendrobaena	*attemsi*	(Michaelsen, 1903)	**New record New Zealand/Australasia**	**A**
Dendrobaena	*veneta*	(Rosa, 1886)	**New record NZ by Blakemore (2002)**	**A**
Dendrodrilus	*rubidus rubidus*	(Savigny, 1826)	Possibly including *D. rubidus tenuis*; sometimes miscited as "*Deinodrilus rubidus tenuis*"!	**A**
Dendrodrilus	*rubidus subrubicundus*	(Eisen, 1874: 51)	Listed by Lee (1959) as *Dendrobaena subrubicunda*	**A**
Dendrodrilus	*rubidus tenuis*	(Eisen, 1874: 44)	Possibly a synonym of nominal species	**A**
Bimastos	*parvus*	(Eisen, 1874)	Not confirmed from New Zealand	**?A**

Appendix II. Continued.

FAMILY/Genus	Species name	Species author, date (genus author bold)	Synonyms for native species and (some) genera, plus specific status and occasional notes	Code*
Eisenia	*fetida* sub-spp	(Savigny, 1826)	(Claimed *E. fetida andrei* Bouché, 1972 is probably in synonymy of *E. fetida* and not confirmed from New Zealand, nor elsewhere-see Blakemore, 2010b)	**A**
Eisenia	*japonica*	(Michaelsen, 1892)	**New record New Zealand/Australasia**	**A**
Eiseniella	*tetraedra* sub-spp	(Savigny, 1826)	See Blakemore (2010b) for details	**A**
Lumbricus	*castaneus*	(Savigny, 1826)		**A**
Lumbricus	*rubellus*	Hoffmeister, 1843		**A**
Lumbricus	*terrestris*	Linnaeus, 1758		**A**
Murchieona	*minuscula* (Rosa, 1906) *muldali*	(Omodeo, 1956)	**New record New Zealand/Australasia** Sometimes combined or given separate species status (see Blakemore, 2010b)	**A**
Octolasion	*cyaneum*	(Savigny, 1826)		**A**
Octolasion	*tyrtaeum lacteum*	(Örley, 1881)		**A**
Octolasion	*tyrtaeum tyrtaeum*	(Savigny, 1826)	**New record NZ by Blakemore (2010a)**	**A**

*Codes: **A=alien/exotic (synonymies in Blakemore (2010b); E=endemic/native; K=Kermadec Isls; ?=questionable.**