

Accidental vaginal parasitism by oligochaete worms (Annelida: Oligochaeta)

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Abstract. Two independent cases of oligochaete worms recovered from Korean women's vaginas are reported. Both specimens were non-parasitic cosmopolitan exotics identified as: microdrile tubificid *Limnodrilus hoffmeisteri* Claparède, 1862 (Tubificidae) and megadrile dichogastrid *Dichogaster bolau* (Michaelsen, 1891) (Octochaetidae) – a new record for Korea. The tubificid is a freshwater euryhaline species that may reach high numbers in organically rich water e.g. in a paddy field, whereas the earthworm is commonly intercepted by quarantine in plant or vegetable cargos and also appears in bathtubs when it inhabits drainage systems. Thus, bathing/douching, field working or picnicking without a blanket are suggested as possible modes of ingress. Oligochaetes rarely occur in live human bodies but the few previous historical records are reviewed.

Keywords. Vagina, pseudo-parasitism, gynecology, medical, free-living, exotic worms.

INTRODUCTION

Terrestrial oligochaetes (earthworms and others) are diverse (~10,000 named species) and vitally important for primary production as their burrowing and saprophagic habits maintain healthy soil structure and fertility; furthermore, they form the basis of all terrestrial, and aquatic, trophic food-chains. Occasionally such worms are obtained from humans as accidental pseudo-parasites. Aside from helminths and parasitic nematodes, a few reports of incidental infections by non-parasitic worms are provided by Savignac (1910), Friend (1916a), Heymons (1926), Michaelsen (1926), Stiles & Hassall (1926), Müller (1927), Stephenson (1930, 1931), Stolte (1962) and Gates (1972, 1982). Species involved are sometimes relatively ineffectual enchytraeid “pot worms” [Enchytraeidae, e.g. *Enchytraeus sp.* in urine of a soldier, *Lumbricillus lineatus* (Müller, 1774) in a Mainz gentleman's excrement pot, etc.]. Other small, aquatic microdriles (Oligochaeta: Microdrilacea) have no previous data (T. Timm pers. comm.).

Larger, terrestrial earthworms (Oligochaeta: Megadrilacea) are beneficial and free-living, only rarely obtained from live human bodies. Summaries from historical records are:

1. *Eisenia fetida* (Savigny, 1826): as cited by Gates (1972: 103), this lumbricid compost-worm was identified by Dr D. Rosa from Italy as passed in urine of a female patient. An obscure Japanese report is of a male farmer supposedly coughing up a dozen or so *E. fetida* with (bloody?) phlegm over the course of three days and thus interpreted as a likely case of lung parasitism (Ryujin 1952).

2. “*Lumbricus melitensis*” an unknown entozoa, possibly a nematode, from arm of a Russian woman after it entered through her thumb (Duncan and Duncan 1798: 396).

3. *Lumbricus terrestris* Linnaeus, 1758: reports mentioned by Stephenson (1930: 644 ex Stiles and Hassall 1926) from vomitus and an ulcerated ankle are dismissed as almost certainly mistaken identity for this large, deep-burrowing European species with a false epithet of ‘the common earthworm’ (see Blakemore 1997).

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4. *Octolasion cyaneum* (Savigny, 1826): also cited by Gates (1972: 125) in a medical literature report of a specimen lodging in a woman's vagina for more than a year.

5. *Microscolex phosphoreus* (Dugès, 1837): a cosmopolitan bioluminescent acanthodrilid, reported by Stephenson (1930) as *Microscolex modestus* in a fistula.

6. *Dichogaster bolau* (Michaelsen, 1891): Stephenson (1931: 38, 64) obtained two specimens of this octochaetid from the Australian Institute of Tropical Medicine from Kavieng, New Ireland (PNG), "washed out of the vagina of a native woman" but he found "no reason to assume a prolonged sojourn of the worms in the vagina". Gates (1982: 68–69) notes a case from Bulawayo "Southern Rhodesia" (= Zimbabwe) on 1st January, 1962 "found by Dr. D. A. Parker, as reported by Miss I. M. Bennie, in litt., to R. W. Sims [British Natural History Museum], in relation to the corpus callosum of a five year old African female who had died the previous day. No cysts were seen in the brain section and no other evidence of parasitic infestation was seen".

MATERIAL AND METHODS

Medical specimens and photos were provided to the senior author for identification. Species were keyed using Blakemore (2000, 2010) and

identification of the aquatic species compared to Brinkhust (1971). Small tissue samples were taken for DNA analysis although it was noted that formalin preservation was used for at least one specimen that may preclude results. If successful, data will be provided to GenBank (<http://www.ncbi.nlm.nih.gov/genbank/>). Specimens deposited in NIBR invertebrate collection have prefix INV. Discussion is confined to Remarks after the species accounts.

TAXONOMIC RESULTS

Annelida Lamarck, 1802

Oligochaeta Grube, 1850

Microdrilacea Benham, 1890

Naididae Ehrenberg, 1828

(alternatively known as Tubificidae Vejdovský, 1876)

Limnodrilus Claparède, 1862.

Limnodrilus hoffmeisteri Claparède, 1862

(Figure 1)

Material examined. NIBR.INV000249940, specimen flattened but complete "2012 April 18, collected from menstrual blood, live worm was fixed in 100% alcohol". Provided by Professor J.-S. Ryu. Small tissue samples were taken for mtDNA COI barcoding (codes WO38, W15, W60).



Figure 1. *Limnodrilus hoffmeisteri* photo

Remarks. This specimen was keyed using Brinkhurst (1971) to Tubificidae, an aquatic microdrile worm, with the closest morphological genus *Limnodrilus* and the specimen identified as *Limnodrilus hoffmeisteri* Claparède, 1862. Widespread and abundant, it is often found with ubiquitous *Tubifex tubifex* (Müller, 1774) and both species are already known from Korea (Brinkhurst *et al.* 1994, Timm 1999). Note that these early described species have extensive synonymies, for example, *Limnodrilus socialis* Stephenson, 1912 is a junior synonym of *L. hoffmeisteri*. mtDNA COI gene barcodes, thus far unsuccessful, should help confirm this tentative identification if obtained.

No previous account of such a microdrile obtained from a human could be found.

Megadrilacea Benham, 1890
Octochaetidae Michaelsen, 1900
(sub-family Benhamiinae Michaelsen, 1897 or
Trigastrinae Michaelsen, 1900)
Dichogaster Beddard, 1888.

***Dichogaster bolau* (Michaelsen, 1891)**

(Figure 2)

Material examined. NIBR.INV000261269, adult worm provided in two halves “2012.4.13, 91114, 117072 Cho-Rong Hwang, Iwon Medical Foundation”. A small tissue sample was taken for DNA (W58).

Remarks. This specimen was readily identified with *Dichogaster bolau*. A full synonymy and description of the species is provided by Blakemore (1994, 2010).

D. bolau is presumed to be a native to eastern Africa (Csuzdi *et al.* 2008) but often transported to the Caribbean, this possibly relating to the ‘slave trade’ or other commerce. It now has the wide tropical and subtropical distribution of a cosmopolitan species and is frequently found in greenhouses in temperate countries. Its type-locality was a tannery in Hamburg, Germany, by introduction, where it was found in fermenting bark.

Gates (1982) catalogued plant quarantine interceptions to the USA and gave this species’ recorded distributions as: “Australia (1 state), Bolivia, Borneo, Brasil, Burma (25 districts), Cameroons, Ceylon, Colombia, Congo, Dominica, Germany, Guyana, Haiti, India, Jamaica, Java, Madagascar, Malay Peninsula, Mexico, Mozambique, New Caledonia, New Hebrides, Nigeria, Pakistan, Panama, Philippines, South Africa, Sumatra, Trinidad, Uganda, United States (3 states), Cape Verde, Caroline, Christmas, Comoro, Easter, Hawaiian, Loyalty, Marianna, Palau and Solomon Islands.” He seemingly overlooked his earlier (Gates 1972: 279) records from Bangladesh, Hainan, Krakatau, New Hebrides, Pakistan and Togo.

To this distribution Blakemore (1994, 2010) added reports from Australia e.g. NSW and Qld. including from a beach and “Domus” composting toilet septic tank (pers. obs.), plus further reports from Kenya, Oman, China, Venezuela, Paraguay, Argentina, El Salvador, Honduras, Belize, Costa Rica, Cuba, Dominican Republic, Honduras, Jamaica, Santa Cruz (Galapagos Islands, Ecuador – confirmation of Csuzdi (2000)), Papua New Guinea (PNG as noted above) and Europe. These latter European reports were from sewage systems in several towns of Finland (Terhivuo 1991) and in Stockholm, Sweden (Erséus *et al.* 1994) and from drains of a heated indoor swimming pool in Cork, Ireland (Rota & Schmidt 2006). The latter authors claimed first record of *D. bolau* from Ireland but were incorrect to say this was the first from the British Isles since Friend (1916b) had already recorded it from Botanic Gardens at Oxford, England.

Reports in baths/toilet bowls and drains in Allahabad, Uttar Pradesh in India (Gates 1972: 280) and more recently in such fixtures in Scandinavia, as well as in bathtubs, showers, and sewer pipes in Hungary and Israel led Csuzdi *et al.* (2008) to suggest it as a first ‘domicole’ species, i.e., adapted to inhabit houses, and further provides a possible means of entry into the patients, viz. during ablutions. Ingestion is obviously excluded as a mode of access, but at least one of the current patients douched daily which may be a source of such opportunistic infection.

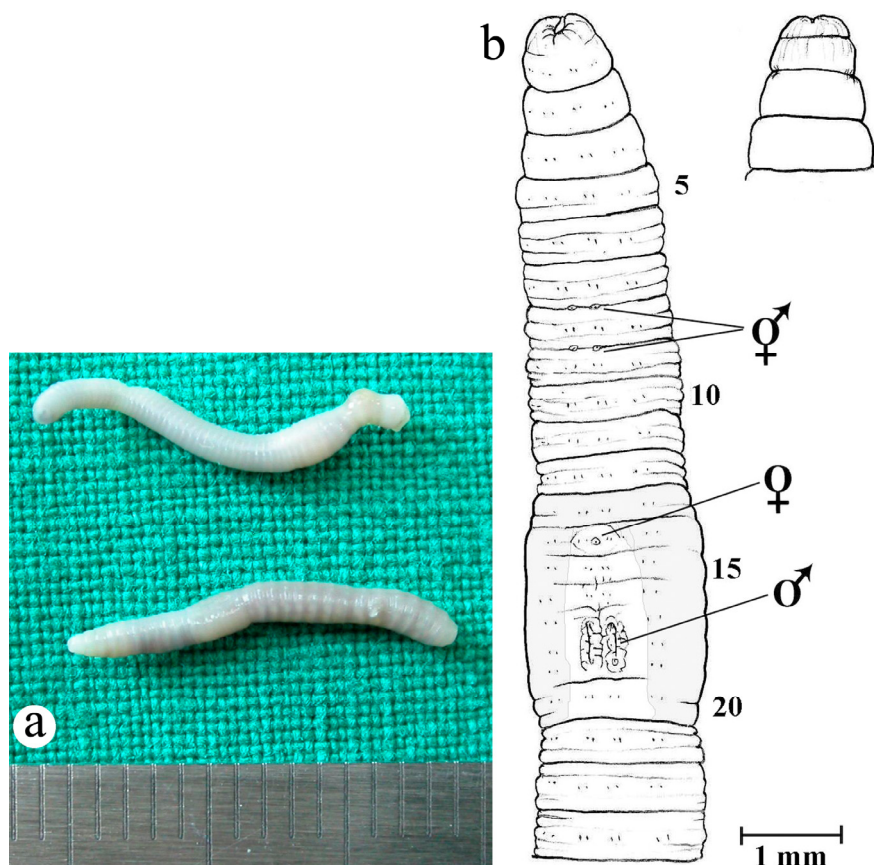


Figure 2. a = *Dichogaster bolau* photo, b = camera lucida sketch of habitus and anterior dorsum (scale 1 mm).

The current paper, whilst providing the first record of *Dichogaster bolau* for Korea, also confirms earlier reports of it as an adventitious pseudo-parasite of humans. Residence by these worms is presumably benign – apart from anxiety or embarrassment induced in the patient upon initial discovery – albeit earthworms host their own diverse parasitic and symbiotic burdens (Stephenson 1930, Gates 1972, Poinar 1978, Yeates *et al.* 1998).

Such intimate pseudo-parasitic encounters, if more frequent, may resemble behavioural events precursory to the parasitic lifestyle as adopted by the earthworm's cousin, the blood-feeding leech (Hirudinea) and as indicated by Michaelsen (1926).

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REFERENCES

- BLAKEMORE, R. J. (1994): Earthworms of south-east Queensland and their agronomic potential in brigalow soils. PhD. Thesis, University of Queensland, pp 605.
- BLAKEMORE, R. J. (1997): First 'common earthworm' found in Tasmania. *Invertebrata*, 9: 5.
- BLAKEMORE, R. J. (2010): Cosmopolitan Earthworms – an Eco-Taxonomic Guide to the Peregrine Species of the World. (4th Edition). VermEcology, Yokohama, Japan, pp. 850+ ~350 Figs.
- BLANCHARD, R., SAVIGNAC, R. (1910): Pseudo-parasitisme des Oligochètes chez l'homme. A propos d'un cas nouveau. *Archives de Parasitologie, Paris*, 14: 40–53.

- BRINKHURST, R. O. (1971): A Guide for the Identification of British Aquatic Oligochaeta. Freshwater Biological Association. Scientific Publication No. 2. pp. 55.
- BRINKHURST, R. O., RODRIGUEZ, P., CHON, T.-S. & KWON, T.-S. (1994): A new genus of Lumbriculidae (Oligochaeta) from Korea. *Canadian Journal of Zoology*, 72(11): 1960–1966.
- CSUZDI, CS. (2000): A review of Benhamiinae earthworms in the collection of the Natural History Museum, London (Oligochaeta: Acanthodrilidae: Benhamiinae). *Opuscula Zoologica Budapest*, 32: 51–80.
- CSUZDI, CS., PAVLIČEK, T. & NEVO, E. (2008): Is *Dichogaster bolau* (Michaelsen, 1891) the first domicole earthworm species? *European Journal of Soil Biology*, 44: 198–201.
- DUNCAN, M. D. & DUNCAN, M. D. JR. (1798): Annals of Medicine for the year 1798. Vol. III. Pillans & Sons, Edinburgh, pp. 556.
- ERSÉUS, C., OMODEO, P. & ROTA, E. (1994): First records of the allochthonous species *Dichogaster saliens* and *D. bolau* (Oligochaeta: Octochaetidae) from Sweden. *Megadrilologica*, 6(2): 17–20.
- FRIEND, H. (1916a): The bionomics of English Oligochaeta. II. British Enchytraeids: the role of *Pachydriulus*. *Science Progress*, 11: 12–22.
- FRIEND, H. (1916b): Alien Oligochaets in England – XI. *Journal of the Royal Microscopical Society London*, 1916: 262–271.
- HEYMONS, R. (1926): Ein Borstenwurm (Oligochät) als angeblicher Insasse des menschlichen Körpers. *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, I. Abteilung Originale. Reihe A*, 99: 153–156.
- GATES, G. E. (1972): Burmese Earthworms, an introduction to the systematics and biology of Megadrile oligochaetes with special reference to South-East Asia. *Transactions of the American Philosophical Society*, 62(7): 1–326.
- GATES, G. E. (1982): Farewell to North American megadriles. *Megadrilologica*, 4: 12–77.
- MICHAELSEN, W. (1926): Schmarotzende Oligochäten nebst Erörterungen über verwandtschaftliche Beziehungen der Archiologochäten. *Mitteilungen aus dem Zoologischen Staatsinstitut und Zoologischen Museum in Hamburg*, 42: 91–103.
- MÜLLER, R. (1927): Borstenwürmer in menschlichen Körper. *Zentralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten, I. Abteilung Originale. Reihe A*, 101: 151–155.
- POINAR, G. O. (1978): Association between nematodes (Nematoda) and Oligochaetes (Annelida). *Proceeding of the Helminthological Society, Washington*, 45: 202–210.
- ROTA, E. & SCHMIDT, O. (2006): *Dichogaster bolau* (Oligochaeta: Octochaetidae), an unusual invader in a swimming pool in Ireland. *Journal of Natural History*, 40(3–4): 161–167.
- RYUJIN, M. (1952): Case report on a parasitism of earthworms in human. *Japanese Journal of Sanitary Zoology*, 3(3&4): 98–99. (in Japanese).
- STEPHENSON, J. (1930): The Oligochaeta. Clarendon Press, Oxford. pp. 978.
- STEPHENSON, J. (1931): Oligochaeta from Burma, Kenya and other parts of the world. *Proceedings of the Zoological Society of London*, 1931: 33–92.
- STILES, C. W. & HASSALL, A. (1926): Key-Catalogue of the worms reported for man. *Hygienic Laboratory Bulletin*, 142: 69–196.
- STOLTE, H.-A. (1962): *Oligochaeta*. In: BRONN, H. G. (Ed.) *Klassen und Ordnungen des Tierreichs*, Akademische Verlagsgesellschaft Geest & Portig, Leipzig, 4(3): 891–141.
- TERHIVUO, J. (1991): *Dichogaster bolau* (Michaelsen) (Octochaetidae) – an allochthonous oligochaet invading urban sewer system. *Memoranda Societatis Fauna et Flora Fennica*, 67: 61–65.
- TIMM, T. (1999): Distribution of freshwater oligochaetes in the west and east coastal regions of the North Pacific Ocean. *Hydrobiologia*, 416: 67–81.
- YEATES, G. W., SPIRIFONOV, S. E. & BLAKEMORE, R. J. (1998): *Plesioungella kathleenae* gen. n. et sp. n. (Nematoda: Drilonematoidea) from the Australian endemic megascolecoid earthworm *Fletcherodrilus unicus* (Fletcher, 1889). *New Zealand Journal of Zoology*, 25 (2): 205–212.