

New records of earthworms from Guadeloupe with description of a new species (Oligochaeta: Glossoscolecidae, Acanthodrilidae, Megascolecidae and Eudrilidae)

CS. CSUZDI¹ and T. PAVLÍČEK²

Abstract. A small earthworm material from Guadeloupe Islands (French West-Indies) was studied. Altogether 14 earthworm species were collected, 12 of which are common tropical peregrine. On the other hand, two seem to be endemic in the islands. One of these native species, *Eutrigaster (Graffia) muscipila* (James, 1996) is reported for the first time after the original description, the other, *Periscolex nevoi* sp. nov. is proved to be new to science.

Earthworms are low disperser animals and due to their intolerance of salt water they were thought to be lacking from real volcanic islands (Michaelsen, 1903; Omodeo, 1963; Sims 1980), such as the Lesser Antilles including Guadeloupe. This widely held view has been challenged by James (1996) who described a quite rich earthworm fauna from Guadeloupe including nine species new to science and recently by Csuzdi (2005) recording a highly endemic earthworm fauna on São Tomé Island (Gulf of Guinea). It seems that small scale over-water dispersal could not be excluded even in the case of earthworms. This possibility is further corroborated by the present material which, apart from numerous introduced peregrine worms, contains also a *Periscolex* Cognetti, 1905 species proved to be new to science.

TAXONOMY

Family Glossoscolecidae Michaelsen, 1900

Periscolex nevoi sp. nov.

(Figs. 1–3)

Material examined. **Holotype.** Hungarian Natural History Museum (HNHM) AF/5265, Guadeloupe, Mt. Caraïbes, rain forest. Leg. T. Pavlíček & P. Cardet, 23.09.2007. **Paratype.** HNHM AF/5371, 1 ex. Guadeloupe, Mt. Caraïbes,

Etymology. The new species is dedicated in honour of Prof. Dr. Eviatar Nevo, the renowned evolutionary biologist, to mark his eightieth birthday.

Diagnosis. Length: 42–43 mm, diameter: 2.5–3 mm, setae perichaetin cca. 30 per segment. Pigmentation greenish-brown on dorsum paler on ventrum. Clitellum on *xiv–xxii*, tubercles on *xviii–xxii*. Spermathecae drop-shaped, open in 6/7, 7/8, 8/9.

Description. **Holotype:** length 43 mm, diameter just after the clitellum 3 mm. Number of segments 175. **Paratype:** 42 mm long and 2.5 mm wide. Number of segments 202. Colour greenish-brown, intensive on dorsum and pale on ventrum. Head with a small proboscis, first two segments small, the others are of normal size. Setal arrangement perichaetin with about 30 setae per segment. Nephridiopores lateral cca. ½ circumference apart. Clitellum circular on segments *xiv–xxii*. Tubercula pubertatis on segments *xviii–xxii*. Male pore minute on the tubercles in intersegmental furrow 18/19, female pores paired on the posterior rim of segment *xiv*. Spermathecal pores three pairs in 6/7, 7/8, 8/9 just above the line of nephridiopores. Genital setae lacking, normal setae smooth, sigmoid with a small nodulus, cca. 310 µm long.

¹Dr. Csaba Csuzdi, Systematic Zoology Research Group of the Hungarian Academy of Sciences, and Department of Zoology, Hungarian Natural History Museum, 1088 Budapest, Baross u. 13, Hungary. E-mail: csuzdi@nhmus.hu.

²Dr. Tomás Pavlíček, Institute of Evolution, University of Haifa, Haifa 31905, Israel. E-mail: contact@tomas-pavlicek-biologie.net

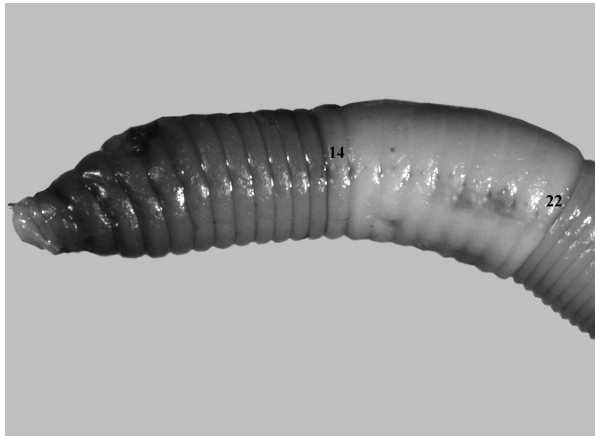


Figure 1. *Periscollex nevoi* sp. nov.

Internal characteristics: All septa membranous, muscular gizzard large in *vi*. Calciferous glands large with small ventral heads in segment *vii*. The structure of the glands simple with several small trabecules and a large central lumen (“Leistentaschen”). Intestine begins in 16/17, typhlosole large lamellar. Testes and funnels paired in segments *x–xi*, enclosed in oesophageal testis sacs. These sacs unite on both sides and continue in a pair of long seminal vesicles stretching back to segment *xxv–xxviii*. Three pairs of small drop-shaped spermathecae in segment 7–9.

Remarks. The new species resembles *Periscollex yuya* Righi & Römbke, 1987 by having perichaetin setae and three pairs of spermathecae, but differs from it in the position of the tubercles, in the shape of spermathecae and in lacking the hairy ornamentation of the normal setae.

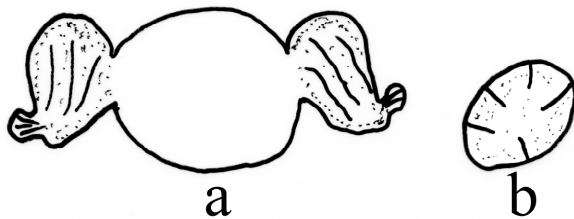


Figure 2. *Periscollex nevoi* sp. nov. a = calciferous glands in segment 7; b = cross section of a calciferous gland

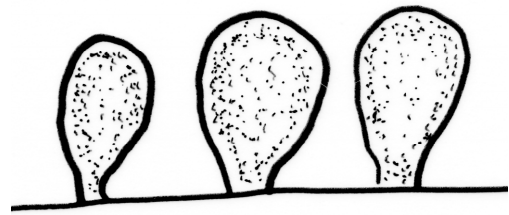


Figure 3. *Periscollex nevoi* sp. nov. Spermathecae

***Pontoscollex (Pontoscollex) corethrurus* (Müller, 1857)**

- Lumbricus corethrurus* Müller, 1857: 113.
- Urochaeta hystrix* Perrier, 1872: 142.
- Urochaeta dubia* Horst, 1885: 7.
- Urochaeta australiensis* Beddard, 1891: 278.
- Pontoscollex corethrurus*: Beddard 1892b: 127.
- Pontoscollex hawaiiensis* Beddard, 1895: 660.
- Pontoscollex corethrurus*: Michaelsen 1918: 234.
- Pontoscollex (Pontoscollex) corethrurus*: Righi 1984: 163.
- Pontoscollex corethrurus*: Blakemore 2002: 238. (for complete synonymy)

Material examined. HNHM AF/5285, 1 ex. Guadeloupe, Basse Terre, La Soufrière. Leg. T. Pavlíček & P. Cardet, 16.10.2007., HNHM AF/5264, 3 ex. Guadeloupe, Mt. Caraïbes, rain forest. Leg. T. Pavlíček & P. Cardet, 23.09.2007., HNHM AF/5271, 1 ex. Guadeloupe, Marie-Galante island, Grand-Bourg forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007. HNHM AF/5277, 4 ex. Guadeloupe, Basse-Terre, Lézarde River, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007., HNHM AF/5280, 1 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5283, 4 ex. Guadeloupe, Grande-Terre, near of Baillargent river. Leg. T. Pavlíček & P. Cardet, 17.10.2007., HNHM AF/5285, 3 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5288, 1 ex. Guadeloupe, Basse-Terre, Lézarde River, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007., HNHM AF/5291, 2 ex. Guadeloupe, Basse-Terre, Grand Étang, forest. Leg. T. Pavlíček & P. Cardet, 15.10.2007., HNHM AF/5293, 2 ex. Guadeloupe, Basse-Terre, Vieux-Bourg, mangrove. Leg. T. Pavlíček & P. Cardet, 27.09.2007.

Remarks. This is the most widely distributed peregrine glossoscolecoid species. It occurred almost in every sample in the present material as well.

Acanthodrilidae Claus, 1880

Dichogaster (Diplothecondrilus) affinis (Michaelsen, 1890)

Benhamia affinis Michaelsen, 1890: 9.
Benhamia mexicana Rosa, 1891: 394.
Benhamia crassa Beddard, 1893: 681.
Benhamia floresiana Horst, 1893: 34.
Dichogaster affinis: Michaelsen 1900: 345.
Dichogaster sinuosa Stephenson, 1931c: 74.
Dichogaster sinica Chen, 1938: 420.
Dichogaster sinensis Chen, 1938: 421. (nomen nudum).
Dichogaster affinis: Csuzdi & Zicsi 1989: 135.
Dichogaster (Diplothecondrilus) affinis: Csuzdi 1995: 112.

Material examined. HNHM AF/5269, 1 ex. Guadeloupe, Marie-Galante island, Grand-Bourgh forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5281, 3 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007.

Remarks. This is a widely distributed peregrine species of East African origin. It occurs mainly in tropical and subtropical countries. Its northernmost field record is from the Dade County, Florida, USA (Csuzdi, 1997).

Dichogaster (Diplothecondrilus) annae (Horst, 1893)

Benhamia annae Horst, 1893: 32.
Benhamia parva Michaelsen, 1896: 31.
Benhamia travancorensis Fedarb, 1898: 433.
Dichogaster annae: Michaelsen 1900: 347.
Dichogaster curgensis Michaelsen, 1921: 54.
Dichogaster curgensis var. *unilocularis* Stephenson, 1931: 69.
Dichogaster cheranganiensis Černosvitov, 1938: 298.
Dichogaster silvestris cacaois Righi, 1968: 376.
Dichogaster servi Righi & Ayres, 1975: 311.
Dichogaster (Diplothecondrilus) annae: Csuzdi 1995a: 112.

Material examined. HNHM AF/5261, 1 ex. Guadeloupe, Mt. Caraïbes, in Bromeliads. Leg. T. Pavlíček & P. Cardet, 26.09.2007., HNHM AF/5276, 3 ex. Guadeloupe, Basse-Terre, Colas river. Leg. T. Pavlíček & P. Cardet, 14-30.09.2007.

Dichogaster (Diplothecondrilus) bolau (Michaelsen, 1891)

Benhamia bolavi Michaelsen, 1891: 9.
Benhamia malayana Horst, 1893: 35.
Benhamia octonephra Rosa, 1895: 137.
Benhamia palmicola Eisen, 1896: 132.
Benhamia rugosa Eisen, 1896: 136.

Benhamia bolavi pacifica Eisen, 1900: 209.
Dichogaster bolau: Michaelsen 1900: 340.
Dichogaster bolau decanephra Michaelsen, 1915: 191.
Benhamia lageniformis Friend, 1916: 262.
Dichogaster bolau malabaricus Stephenson, 1920: 257.
Dichogaster (Diplothecondrilus) bolau: Csuzdi 1995: 112.

Material examined. HNHM AF/5255, 1 ex. Guadeloupe, Marie-Galante island, Grand-Bourg forest. Leg. T. Pavlíček & P. Cardet, 30.09.2007., HNHM AF/5270, 1 ex. Guadeloupe, Marie-Galante island, Grand-Bourg forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5275, 3 ex. Guadeloupe, Basse-Terre, Colas river. Leg. T. Pavlíček & P. Cardet, 14-30.09.2007.

Remarks. This is the most frequent introduced peregrine *Dichogaster* species all over the tropics and subtropics. In Europe and possibly other temperate regions *D. (Dt.) bolau* occurs in greenhouses and even invades the sewer systems. This is the only known domicole earthworm species so far (Rota & Schmidt, 2006; Csuzdi *et al.*, 2008).

Eutrigaster (Graffia) muscipila (James, 1996)

Dichogaster muscipila James, 1996: 30.

Material examined. HNHM AF/5259, 6 ex. Guadeloupe, Basse-Terre, La Soufrière. Leg. T. Pavlíček & P. Cardet, 16.10.2007.

Remarks. Our specimens agree well with the description of James (1996), except for the dimensions of the penial setae which are the following: length 500 µm, diameter 9 µm.

Megascolecidae Rosa, 1891

Amyntas corticis (Kinberg, 1867)

Perichaeta corticis Kinberg, 1867: 102.
Megascolex diffringens Baird, 1869: 40.
Amyntas corticis (sic lapsus): Sims and Easton 1972: 234.
Amyntas corticis: Easton 1981: 49.
Amyntas corticis: Easton 1982: 726.
Amyntas corticis: Blakemore 2003: 6 (for complete synonymy).

Material examined. HNHM AF/5256, 4 ex. Guadeloupe, Basse-Terre, La Soufrière. Leg. T. Pavlíček & P. Cardet, 16.10.2007., HNHM AF/5292, 1 ex. Guadeloupe, Basse-Terre, Grand Étang, forest. Leg. T. Pavlíček & P. Cardet, 15.10.2007.

***Amyntas rodericensis* (Grube, 1879)**

Perichaeta rodericensis Grube, 1879: 554.
Perichaeta dyeri Beddard, 1892a: 157.
Perichaeta sinensis Beddard, 1892a: 158.
Perichaeta trinitatis Beddard, 1896: 206.
Perichaeta monilicystis Michaelsen, 1892: 251.
Pheretima rodericensis: Michaelsen 1900: 299.
Amyntas rodericensis: Sims and Easton 1972: 235.
Amyntas rodericensis: Blakemore 2002: 186.

Material examined. HNHM AF/5254, 1 ex Guadeloupe, Marie-Galante island, Grand-Bourg forest. Leg. T. Pavlíček & P. Cardet, 30.09.2007., HNHM AF/5257, 1 ex. Guadeloupe, Basse-Terre, La Soufrière. Leg. T. Pavlíček & P. Cardet, 16.10.2007., HNHM AF/5260, 1 ex. Guadeloupe, Mt. Caraïbes, in Bromeliads. Leg. T. Pavlíček & P. Cardet, 26.09.2007., HNHM AF/5263, 6 ex. Guadeloupe, Mt. Caraïbes, rain forest. Leg. T. Pavlíček & P. Cardet, 23.09.2007., HNHM AF/5266, 4 ex. Guadeloupe, Basse-Terre, Colas river. Leg. T. Pavlíček & P. Cardet, 04.10.2007., HNHM AF/5264, 3 ex. Guadeloupe, Marie-Galante island, Grand-Bourg forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5273, 2 ex. Guadeloupe, Basse-Terre, Colas river. Leg. T. Pavlíček & P. Cardet, 14-30.09.2007., HNHM AF/5282, 2 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5284, 3 ex. Guadeloupe, Grande-Terre, near of Baillargent river. Leg. T. Pavlíček & P. Cardet, 17.10.2007., HNHM AF/5294, 2 ex. Guadeloupe, Basse-Terre, Vieux-Bourg, mangrove. Leg. T. Pavlíček & P. Cardet, 27.09.2007.

***Metaphire houlleti* (Perrier, 1872)**

Perichaeta houlleti Perrier, 1872: 99.
Perichaeta campanulata Rosa, 1890: 115.
Perichaeta udekemi Michaelsen, 1892: 240.
Perichaeta guillelmi Michaelsen, 1895: 32.
Pheretima houlleti: Michaelsen 1900: 273.
Pheretima wimberleyana Stephenson, 1925: 62.
Pheretima houlleti tortuosa Gates, 1926: 454.
Metaphire houlleti: Sims & Easton 1972: 238.
Metaphire houlleti: Blakemore 2002: 201.

Material examined. HNHM AF/5274, 3 ex. Guadeloupe, Basse-Terre, Colas river. Leg. T. Pavlíček & P. Cardet, 14-30.09.2007., HNHM AF/5272, 1 ex. Guadeloupe, Marie-Galante island, Grand-Bourg forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007.

***Perionyx excavatus* Perrier, 1872**

Perionyx excavatus Perrier, 1872: 126.
Perionyx gruenewaldi Michaelsen, 1891: 33.
Perionyx koboensis Stephenson, 1914: 391.
Perionyx fulvus Stephenson, 1916: 322.
Perionyx turaensis Stephenson, 1920: 216.

Perionyx excavatus: Gates 1972: 141.

Material examined. HNHM AF/5287, 1 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007.

***Pithemera bicincta* (Perrier, 1875)**

Perichaeta bicincta Perrier, 1875: 1044.
Perichaeta bicincta: Michaelsen 1900: 419.
Perichaeta violacea Beddard, 1895: 407.
Pheretima bicincta: Gates 1972: 170.
Pithemera bicincta: Sims & Easton, 1972: 202.

Material examined. HNHM AF/5278, 1 ex. Guadeloupe, Basse-Terre, Lézarde river, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007., HNHM AF/5289, 3 ex. Guadeloupe, Basse-Terre, Lézarde river, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007.

***Polypheretima elongata* (Perrier, 1872)**

Perichaeta elongata Perrier, 1872: 124.
Perichaeta biserialis Perrier, 1875: 1044.
Perichaeta acystis Beddard, 1895: 423.
Pheretima elongata: Michaelsen, 1900: 265.
Metapheretima elongata: Sims & Easton, 1972: 252.
Polypheretima elongata: Easton 1979: 53.

Material examined. HNHM AF/5253, 3 ex. Guadeloupe, Marie-Galante Island, Grand-Bourg forest. Leg. T. Pavlíček & P. Cardet, 30.09.2007., HNHM AF/5267, 1 ex. Guadeloupe, Marie-Galante island, Grand Bourgh forest grazing area. Leg. T. Pavlíček & P. Cardet, 19.10.2007., HNHM AF/5286, 1 ex. Guadeloupe, Grande-Terre, Les Grands-Fonds, forest. Leg. T. Pavlíček & P. Cardet, 19.10.2007.

***Pontodrilus litoralis* (Grube, 1855)**

Lumbricus litoralis Grube, 1855: 127.
Pontodrilus litoralis: Michaelsen 1900: 180.
Pontodrilus litoralis: Blakemore 2002: 129 (for complete synonymy)
Pontodrilus litoralis: Blakemore 2007: S4.

Material examined. HNHM AF/5262, 14 ex. Guadeloupe, Vieux-Bourg, mangrove. Leg. T. Pavlíček & P. Cardet, 29.09.2007.

Remarks. This species is widely distributed in the Mediterranean and on shorelines of the tropics. Its circummundane distribution has long been disputed, recently by Blakemore (2007), who favours a dual mechanism of distribution; overwater dispersal and human transportation.

Eudrilus eugeniae (Kinberg, 1867)

Lumbricus eugeniae Kinberg, 1867: 98.

Eudrilus decipiens Perrier, 1871: 1176.

Eudrilus lacazii Perrier, 1872: 75.

Eudrilus boyeri Beddard, 1886: 302.

Eudrilus sylvicola Beddard, 1887: 372.

Eudrilus julieni Horst, 1890: 225.

Eudrilus roseus Michaelsen, 1892: 224.

Eudrilus erudiens Ude, 1893: 71.

Eudrilus eugeniae: Michaelsen, 1900: 402.

Eudrilus eugeniae: Sims 1987: 386.

Material examined. HNHM AF/5273, 1 ex. Guadeloupe, Basse-Terre, Lézarde river, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007., HNHM AF/5290, 6 ex. Guadeloupe, Basse-Terre, Lézarde river, waterfall. Leg. T. Pavlíček & P. Cardet, 20.10.2007.

Remarks. The presence of this African peregrine worm in Guadeloupe is not surprising. It has been introduced overall in the tropics for vermicomposting as "African nightcrawler".

REFERENCES

- BAIRD, W. (1869): Description of a new species of earthworms (*Megascolex diffringens*) found in North Wales. *Proceedings of the Zoological Society of London*, 1869: 40–43.
- BEDDARD, F.E. (1886): Descriptions of some new or little-known earthworms, together with an account of the variations in structure exhibited by *Perionyx excavatus*. *Proceedings of the Zoological Society of London*, 1886: 298–314.
- BEDDARD, F.E. (1887): Contributions to the anatomy of earthworms. Nos. I., II., III. *Proceedings of the Zoological Society of London*, 1887: 372–392.
- BEDDARD, F.E. (1891): The classification and distribution of earthworms. *Proceedings of the Royal Physical Society Edinburgh*, 10: 235–290.
- BEDDARD, F.E. (1892a): On some species of the genus *Perichaeta* (sensu stricto). *Proceedings of the Zoological Society of London*, 1892: 153–172.
- BEDDARD, F.E. (1892b): The earthworms of the Vienna Museum. *Annals and Magazine of Natural History*, 9: 113–134.
- BEDDARD, F.E. (1893): On some new species of earthworms from various parts of the world. *Proceedings of the Zoological Society of London*, 1892: 666–706.
- BEDDARD, F.E. (1895): *A monograph of the Order of Oligochaeta*. Clarendon press, Oxford, pp. 769.
- BEDDARD, F.E. (1896): On some earthworms from the Sandwich Islands collected by Mr. R. L. Perkins, with an appendix on some new species of *Perichaeta*, etc. *Proceedings of the Zoological Society of London*, 1896: 194–211.
- BLAKEMORE, R.J. (2002): *Cosmopolitan Earthworms an Eco-Taxonomic Guide to the Peregrine Species of the World*. VermEcology, PO BOX 414 Kippax, ACT 2615, Australia. Pp. 426 + 80 figs.
- BLAKEMORE, R.J. (2003): Japanese Earthworms (Annelida: Oligochaeta): A Review and Checklist of Species. *Organisms, Diversity and Evolution*, 3 (suppl. 11): 1–43.
- BLAKEMORE, R.J. (2007): Origin and means of dispersal of cosmopolitan *Pontodrilus litoralis* (Oligochaeta: Megascolecidae). *European Journal of Soil Biology*, 443: S3–S8.
- ČERNOSVITOV, L. (1938): Mission scientifique de l'Omo, Oligochaeta. *Mémoires du Muséum national d'Histoire naturelle*, 8: 255–318.
- CHEN, Y. (1938): Oligochaeta from Hainan, Kwantung. *Contributions from the Biological Laboratory of the Science Society of China (Zoology) Nanking*, 12(10): 375–427.
- CSUZDI, CS. (1995): A catalogue of Benhamiinae species (Oligochaeta, Acanthodrilidae). *Annalen des Naturhistorischen Museums in Wien*, 97B: 99–123.
- CSUZDI, CS. (1997): Neue und bekannte Regenwürmer aus dem Naturhistorischen Museum, London (Oligochaeta: Acanthodrilidae). *Opuscula Zoologica Budapest*, 29-30: 35–47.
- CSUZDI, CS. & ZICSI, A. (1989): Neue *Dichogaster*-Arten aus der Kongo-Region (Oligochaeta, Octochaetidae). – *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut*, 86: 133–152.
- 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.
- EASTON, E.G. (1979): A revision of the 'acaecate' earthworms of the *Pheretima* group (Megascolecidae: Oligochaeta): *Archipheretima*, *Metapheretima*, *Planapheretima*, *Pleinogaster* and *Polypheretima*. *Bulletin of the British Museum (Natural History) Zoology*, 35(1): 1–128.

- EASTON, E.G. (1981): Japanese earthworms, a synopsys of the Megadrile species (Oligochaeta). *Bulletin of the British Museum (Natural History) Zoology*, 40(2): 33–65.
- EASTON, E.G. (1982): Australian Pheretimid Earthworms (Megascolecidae, Oligochaeta), A Synopsis with the Description of a New Genus and Five New Species. *Australian Journal of Zoology*, 30: 711–735.
- EISEN, G. (1896): Pacific Coast Oligochaeta. *Memoires of the California Academy of Sciences*, 2(5): 123–198.
- EISEN, G. (1900): Researches in American Oligochaeta with especial reference to those of the Pacific Coast and adjacent islands. *Proceedings of the Californian Academy of Sciences*, 2: 85–276.
- FEDARB, S.M. (1898): On some Earthworms from British India. *Proceedings of the Zoological Society of London*, 1898: 445–450.
- FRIEND, H. (1916): Alien Oligochaets in England. *Journal of the Royal Microscopical Society London*, 1916: 262–271.
- GATES, G.E. (1926): Notes on Rangoon earthworms. The peregrine species. *Annals and Magazine of Natural History*, (9)17: 439–473.
- 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.
- GRUBE, E. (1855): Beschreibungen neuer oder wenig bekannter Anneliden. *Archiv für Naturgeschichte, Berlin*, 21: 81–136.
- GRUBE, E. (1879): Annelida. In: An account of the petrological, botanical and zoological collections made in Kerguelen's Land and Rodriguez during Transit of Venus Expeditions carried out by order of Her Majesty's Government in the years 1874–75. *Philosophical Transactions of the Royal Society*, 168: 554–556.
- HORST, H. (1885): Vermes. *Midden Sumatra*, 4(12): 1–11.
- HORST, H. (1890): Sur quelques Lombriciens exotiques appartenant au genre *Eudrilus*. *Mémoires de la Société Zoologique Française*, 3: 223–240.
- HORST, H. (1893): Earthworms from the Malay Archipelago. *Zoologische Ergebnisse einer Reise in Niederländisch-Ost-Indien*, 3: 28–77.
- JAMES, S.W. (1996): Nine new species of *Dichogaster* (Oligochaeta, Megascolecidae) from Guadeloupe (French West Indies). *Zoologica Scripta*, 25: 21–34.
- KINBERG, J.G. (1867) Annulata nova (Continuatio). *Öfversigt af Kongliga Vetenskaps-Akademiens Förhandlingar Stockholm*, 23: 97–103.
- MICHAELSEN, W. (1890): Beschreibung der von Herrn Dr. Franz Stuhlmann im Mündungsgebiet des Sambesi gesammelten Terricolen. *Mitteilungen aus dem Naturhistorischen Museum in Hamburg*, 7: 1–30.
- MICHAELSEN, W. (1891): Oligochaeta des Naturhistorischen Museums in Hamburg. IV. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten, Hamburg*, 8: 3–42.
- MICHAELSEN, W. (1892): Terricolen der Berliner Zoologischen Sammlung (II). *Archiv für Naturgeschichte, Berlin*, 57(2): 209–261
- MICHAELSEN, W. (1895): Zur Kenntnis der Oligochaeten. *Abhandlungen und Verhandlungen des Naturwissenschaftlichen Vereins in Hamburg*, 13: 1–37.
- MICHAELSEN, W. (1896): Die Regenwürmer Ost-Afrikas. *Die Tierwelt der Deutsch-Ost-Afrika Berlin*, 4: 1–48.
- MICHAELSEN, W. (1900): Oligochaeta. *Das Tierreich*, 11: 1–575.
- MICHAELSEN, W. (1903): *Die geographische Verbreitung der Oligochäten*. Friedländer & Sohn, Berlin, pp. 186.
- MICHAELSEN, W. (1915): Zentralafrikanische Oligochäten. *Ergebnisse der Zweiten Deutschen Zentral-Afrika Expedition 1910-1911*, 1: 185–317.
- MICHAELSEN, W. (1921): Oligochäten vom westlichen Vorderindien und ihre Beziehungen zur Oligochätenfauna von Madagaskar und den Seychellen. *Mitteilungen aus dem Naturhistorischen Museum in Hamburg*, 38: 27–68.
- MÜLLER, F. (1857): *Lumbricus corethrurus*, Bürstenschwanz. *Archiv für Naturgeschichte*, 23: 113–116.
- OMODEO, P. (1963): *Distribution of the terricolous Oligochaetes on the two shores of the Atlantic*. In: North Atlantic Biota and their History. Pergamon Press, London. p. 127–151.
- PERRIER, E. (1871): Description of *Eudrilus* and *Eu. decipiens*. *Les Comptes Rendus de l'Académie des Sciences, Paris*, 73: 1175–1176.

- PERRIER, E. (1872): Recherches pour servir à l'histoire des Lombriciens terrestres. *Nouvelles Archives du Muséum d'Histoire Naturelle de Paris*, 8: 5–198.
- PERRIER, E. (1875): Sur les vers de terre des îles de Philippines et de la Cochinchine. *Les Comptes Rendus de l'Académie des Sciences, Paris*, 81: 1043–1044.
- RIGHI, G. & AYRES, I. (1975): Alguns Oligochaeta sul Brasileiros. *Revista Brasileira de Biologia, Rio de Janeiro*, 35: 309–316.
- RIGHI, G. (1968): Sobre alguns Oligochaeta do Brasil. *Revista Brasileira de Biologia*, 28: 369–382.
- RIGHI, G. (1984): *Pontoscolex* (Oligochaeta, Glossoscolecidae) a new evaluation. *Studies on Neotropical Fauna and Environment*, 19: 159–177.
- ROSA, D. (1890): Viaggio di Leonardo Fea in Birmania e Regioni Vicine. - XXVI. Perichetidi. *Annali del Museo Civico di Storia Naturale di Genova*, 30: 107–122.
- ROSA, D. (1891): Die exotischen Terricolen des K.K. Naturhistorischen Hofmuseums. *Annalen des k.k. Naturhistorischen Hofmuseums, Wien*, 6: 379–406.
- ROSA, D. (1895): Contributo alla Studio dei Terricoli Neotropicali. *Memoire della Reale Accademia Delle Scienze di Torino*, 45: 89–152.
- 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.
- SIMS, R.W. (1987): A review of the Central African earthworm family Eudrilidae (Oligochaeta). In Pagliani & Omodeo (eds.) *On earthworms, Selected symposia and Monographs* 2 (Modena: Mucchi), pp. 359–388.
- SIMS, R.W. (1980): A classification and the distribution of earthworms, suborder Lumbricina (Haplotaxida: Oligochaeta). *Bulletin of the British Museum (Natural History) Zoology*, 39: 103–124.
- SIMS, R.W. & EASTON, E.G. (1972): A numerical revision of the earthworm genus *Pheretima* auct. (Megascolecidae: Oligochaeta) with the recognition of new genera and an appendix on the earthworms collected by the Royal Society North Borneo Expedition. *Biological Journal of the Linnean Society*, 4: 169–268.
- STEPHENSON, J. (1914): Zoological results of the Abor Expedition, 1911–12. XXIX. Oligochaeta. *Records of the Indian Museum*, 8: 365–410.
- STEPHENSON, J. (1916): On a collection of Oligochaeta belonging to the Indian Museum. *Records of the Indian Museum*, 12: 299–354.
- STEPHENSON, J. (1920): On a collection of Oligochaeta from the lesser known parts of India and from Eastern Persia. *Memoirs of the Indian Museum*, 7(3): 191–261.
- STEPHENSON, J. (1925): On some Oligochaeta mainly from Assam, South India and the Andaman Islands. *Records of the Indian Museum*, 27: 43–73.
- STEPHENSON, J. (1931): Oligochaeta from Burma, Kenya and other parts of the World. *Proceedings of the Zoological Society of London*, 1931: 33–92.
- UDE, H. (1893): Beiträge zur Kenntnis ausländischer Regenwürmer. *Zeitschrift für Wissenschaftliche Zoologie*, 57: 57–75.
- ZICSI, A. (1989): Über zwei *Periscolex*-Arten aus dem Andengebiet Kolumbiens und Ekuadors (Oligochaeta: Glossoscolecidae). (Regenwürmer aus Südamerika 10.). *Revue suisse de Zoologie*, 96: 19–24.
- ZICSI, A. (1992): Über weitere neue und bekannte Arten der Gattung *Periscolex* (Oligochaeta: Glossoscolecidae). Regenwürmer aus Südamerika 16. *Revue suisse de Zoologie*, 99(1): 211–217.