New earthworm records from several Indian Ocean islands (Clitellata, Megadrili)

T. Szederjesi¹, T. Pavlíček² & Cs. Csuzdi³

¹Timea Szederjesi, Department of Zoology, Hungarian Natural History Museum, Budapest, Hungary. E-mail: t.szederjesi@gmail.com
²Tomáš Pavlíček, Institute of Evolution, University of Haifa, Israel.
³Department of Zoology, Eszterházy Károly University, Eger, Hungary.

Abstract. Elaboration of the earthworm material collected on the Seychelles, Mauritius, Réunion, Mayotte and Sri Lanka islands resulted in recording 20 species altogether. Among them, the oenocordrid Maheina braueri (Michaelsen, 1897) endemic to Mahé (Seychelles) and the megascolecid Nellogaster bahlii (Stephenson, 1925) endemic to Sri Lanka were reported for the first time since their original description. The material also contained some enigmatic juvenile specimens from Mayotte, most resembling the genus Diporochaeta.

Keywords. Oligochaeta, Ceylon, Seychelles, Mauritius, Reunion, Mayotte.

INTRODUCTION

The Indian Ocean is the third largest ocean on the globe bordered by Africa, Asia, Australia and Antarctica (Fatima & Jamshed 2015). It has numerous small and several larger islands of different origin from continental (e.g. Madagascar, Seychelles) to true oceanic ones (e.g. Reunion, Mauritius) (Walker et al. 2005). Madagascar, with the other Indian Ocean Islands, represents one of the Earth's 35 biodiversity hotspots (Mittermeier et al. 2011). However, except Madagascar of which the earthworm fauna has recently been intensively studied (Csuzdi et al. 2012, 2016, 2017a, Hong et al. 2018, Razafindrakoto et al. 2010, 2011, 2017) earthworms of the other islands of this hotspot are almost unknown. Apart from some sporadic records (Michaelsen 1897a, 1907a) there are just a few comprehensive publications from the region including the summary of the earthworms in the Seychelles Islands by Gerlach (2011) and that of Mauritius by Ljungström (1971).

Gerlach (2011) listed 11 earthworm species from the families Eudrilidae, Megascolecidae, Acanthodrilidae and Octochaetidae. Apart from the obviously erroneous placements of the megascolecid Lampito mauritii Kinberg, 1866 to Octochaetidae and the glossocolecid (now rhinodrilid) Pontoscolex corethrurus (Müller, 1857) to Acanthodrilidae he also listed several strange lumbricid species (with 20–25, 25–33 and 10–15 setae per bundle (sic!)). The native Maheina braueri (Michaelsen, 1897) described from Mahé Island was listed in Acanthodrilidae but have not been re-collected during the collections conducted in the early 1970s and 2000s.

Ljungstöm's (1971) checklist of the earthworms of Mauritius lists ten species; all are well-known peregrine ones with Amynthas species prevailing (listed in the genus Pheretima).

Sri Lanka, with its some 65,000 km² territory represents the second largest island in the region after Madagascar. It is a continental island lying on the Indian Plate and, together with the Western Ghats represents an independent biodiversity hotspot in the Indian Ocean region (Katz 2000, Mittermeier et al. 2011). Due to the works of Michaelsen (1897b, 1903, 1907b, 1908, 1910) and Stephenson (1913, 1915, 1923, 1925) its earth-
wormal fauna is quite well studied recording 63 earthworm species for the island including 48 endemics.

Here we provide new earthworm records collected in the early 2000's years in Mauritius, Mayotte, Réunion, Seychelles and Sri Lanka. A small collection by the USSR Zoological Expedition to Seychelles was also elaborated.

MATERIAL AND METHODS

Earthworms were collected with the diluted formalin method (Raw 1959) supplemented by digging and searching under stones, barks of fallen logs and mosses. The specimens collected were killed in 75% ethanol, fixed in 4% formalin and after several days transferred into 75% ethanol. The gathered specimens are deposited in the earthworm collection of the Hungarian Natural History Museum (HNHM).

TAXONOMY

Family Acanthodrilidae Claus, 1880

*Dichogaster* (*Diplothecodrilus*) *annae* (Horst, 1893)

*Benhamia annae* Horst, 1893: 32.  
*Dichogaster* (*Diplothecodrilus*) *annae*: Csuzdi 2010: 191. (for complete synonymy)

*Material examined.* HNHM/AF5171 5 ex., Mayotte, Grande Terre, along River Bandrani, S12°42'26" E45°05'36", 160 m, 07.10.2005, leg. T. Pavlíček. HNHM/AF5177 2 ex., Mayotte, Grande Terre, along Longoni River, S12°44' E45°10', 95 m, 05.10.2005, leg. T. Pavlíček. HNHM/AF5735 2 ex., Seychelles, Mahé, Copolia, the beginning of the road, under bark, 16.06.2000, leg. Cs. Csuzdi.

Family Eudrilidae Calus, 1880

*Eudrilus eugeniae* (Kinberg, 1867)

*Enterion eugeniae* Kinberg, 1867: 98.  
*Eudrilus eugeniae*: Blakemore 2008a: 272 (for complete synonymy).

*Material examined.* HNHM/AF5717 1 ex., Réunion, the bottom of the moss forest, ca. 1000 m, 22.06.2000, leg. Cs. Csuzdi. HNHM/AF5720 2 ex., Réunion, Forêt de Bébour, 1310 m, moss forest, 22.06.2000, leg. Cs. Csuzdi.

*Amynthas corticis* (Kinberg, 1867)

*Enterion corticis* Kinberg, 1867: 102.  
*Amynthas corticis*: Blakemore 2008a: 272 (for complete synonymy).

*Material examined.* HNHM/AF5717 1 ex., Réunion, the bottom of the moss forest, ca. 1000 m, 22.06.2000, leg. Cs. Csuzdi. HNHM/AF5720 2 ex., Réunion, Forêt de Bébour, 1310 m, moss forest, 22.06.2000, leg. Cs. Csuzdi.

*Amynthas gracilis* (Kinberg, 1867)

*Nitocris gracilis* Kinberg, 1867: 102.  
*Amynthas gracilis*: Blakemore 2008a: 284 (for complete synonymy).

*Material examined.* HNHM/AF5723 3 ex., Mauritius, Petrin, Brise Fer, forest reserve, behind the Gerald Durrell Endemic Wildlife Sanctuary, 625 m, S20°22’1” E57°26’5”, 26.06.2000, leg. Cs. Csuzdi.
**Amynthas minimus (Horst, 1893)**

Perichaeta minima Horst, 1893: 66.

*Amynthas minimus*: Blakemore 2008a: 302 (for complete synonymy).

**Material examined.** HNHM/AF5713 9 ex., Mauritis, Montagne Cocotte, moss forest, under moss, 750 m, S20°26’5” E57°28’3”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5721 1 ex., Mauritis, Petrin, Brise Fer, forest reserve, behind the Gerald Durrell Endemic Wildlife Sanctuary, 625 m, S20°22’1” E57°26’5”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5751 1 ex., Seychelles, Silhouette, 23.08.1984, USSR Zoological Expedition.

---

**Amynthas rodericensis (Grube, 1879)**

Perichaeta rodericensis Grube, 1879: 554.

*Amynthas rodericensis*: Blakemore 2008a: 319 (for complete synonymy).

**Material examined.** HNHM/AF5169 1 ex., Mayotte, Grande Terre, along River Bandrani, S12°42’26” E45°05’36”, 160 m, 07.10.2005, leg. T. Pavlíček. HNHM/AF5179 4 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 95 m, 05.10.2005, leg. T. Pavlíček. HNHM/AF5185 2 ex., Mayotte, Grande Terre, near Longoni, S12°43’43” E45°07’46”, 35 m, around mangrove forest, 04.10.2005, leg. T. Pavlíček. HNHM/AF5712 1 ex., Mauritis, Montagne Cocotte, moss forest, under moss, 750 m, S20°26’5” E57°28’3”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5716 1 ex., Réunion, the bottom of the moss forest, ca. 1000 m, 22.06.2000, leg. Cs. Csuzdi. HNHM/AF5727 1 ex., Mauritis, Black River Peak, 600-700 m, 27.06.2000, leg. Cs. Csuzdi.

---

**Amynthas robustus (Perrier, 1872)**

Perichaeta robusta Perrier, 1872: 112.

*Amynthas robustus*: Blakemore 2008a: 315 (for complete synonymy).

**Material examined.** HNHM/AF5711 3 ex., Mauritis, Montagne Cocotte, moss forest, under moss, 750 m, S20°26’5” E57°28’3”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5716 1 ex., Réunion, the bottom of the moss forest, ca. 1000 m, 22.06.2000, leg. Cs. Csuzdi. HNHM/AF5727 1 ex., Mauritis, Black River Peak, 600-700 m, 27.06.2000, leg. Cs. Csuzdi.

---

**?Diporochaeta sp.**

(Figures 1–3)

**Material examined.** HNHM/AF5172 4 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoumôngé, S12°41’58” E45°05’22”, 200 m, natural forest, 08.10.2005, leg. T. Pavlíček. HNHM/AF5193 1 ex., Mayotte, Grande Terre, along the river above the Gîtes de Kwalé, S12°48’30” E45°09’40”, 185 m, 06.10.2005, leg. T. Pavlíček.

**Description.** External characters. All specimens juvenile. Length around 60 mm, diameter 2.5 mm. Colour alive unknown, conserved pale. Prostomium epilobic, dorsal pores lacking. Segments simple, setae perichaetin in irregular rows with ventral and dorsal interruption, aa = 1.5 zz. Setal number on segment III = 22, VI = 26, X = 22, XIII = 20, XVII = 16, XXVI = 14. Spermathecal pores paired small slits in the inter-segmental furrows VII/VIII, VIII/IX in setal line b. Clitellum lacking. Female pores in XIV, pre-setal before setae a. One pair of combined male and prostatic pores on XVII in setal line b. Paired genital markings on XVIII outside of the prostatic pores and in XVII/XVIII and XVIII/XIX in setal line b, furthermore a single midventral papilla in XVIII between the prostatic pores (Fig. 1).

**Internal characters.** No septa notably thickened. Muscular gizzard lacking. Dorsal vessel single throughout, the last pair of hearts in XIII. Excretory system holoic, avesiculate. Calciferous glands lacking. Intestine begins in XVI, typhlosole lacking. Holandric. Two pairs of testes and iridescent male funnels in X, XI. Seminal vesicles two pairs in XI, XII. One pair of ovaries in XIII. One pair of small tubular prostates in XVIII,
slightly coiled and confined to its own segment (Fig. 2). Penial setae lacking. Two pairs of spermathecae in VIII and IX. Ampulla elongated sac-shaped, duct wide, ca. 1/3 as long as the ampoule. A small, unilocular, finger-shaped diverticulum joins to the ental part of the duct. (Fig. 3).

**Remarks.** We have several juvenile specimens from this interesting species. With its non-lumbricine setal arrangement, holocyclic vesiculate excretory system and tubular prostates, these specimens seem to be most close to the Australian genus *Diporochaeta* Beddard, 1890. However, our specimens do not fit clearly to *Diporochaeta* because they lack muscular gizzard. To clear the position of this interesting species further clitellate material is needed.

**Lampito mauritii** Kinberg, 1867

*Lampito mauritii* Kinberg, 1867: 103, Blakemore 2008a: 238 (for complete synonymy).

**Material examined.** HNHM/AF5748 3 ex., Sri Lanka, Colombo district, Dehiwala-Mount Lavinia, moist area, 09.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5749 1 ex., Sri Lanka, Kalutara district, Wadduwa, moist meadow near the city, 11.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5745 6 ex., Sri Lanka, Kalutara district, Moratuwa, near the shore of Bolgoda Lake, 10.03.2000, leg. S. Mahunka, L. Mahunka-Papp.

**Megascolex insignis** Michaelsen, 1910

*Megascolex insignis* Michaelsen, 1910: 78, Stephenson 1923: 250.

**Material examined.** HNHM/AF5737 7 ex., Sri Lanka, Kalutara district, Matugama, stream bank near the city, 12.03.2000, S. Mahunka, L. Mahunka-Papp. HNHM/AF5741 2 ex., Sri Lanka, Kalutara district, Wadduwa, moist meadow near the city, 11.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5745 6 ex., Sri Lanka, Kalutara district, Moratuwa, near the shore of Bolgoda Lake, 10.03.2000, leg. S. Mahunka, L. Mahunka-Papp.

**Metaphire bahli** (Gates, 1945)

*Pheretima bahli* Gates, 1945: 85.

**Metaphire bahli**: Blakemore 2008a: 338.

**Material examined.** HNHM/AF5740 2 ex., Sri Lanka, Kalutara district, Wadduwa, a moist meadow near the city, 11.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5743 1 ex., Sri Lanka, Kalutara district, Kalutara, bare, weedy area at the edge of the city, from cow droppings and soil, 06.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5746 1 ex., Sri Lanka, Colombo district, Dehiwala-Mount Lavinia, moist area, 09.03 .2000, leg. S. Mahunka, L. Mahunka-Papp.

**Metaphire californica** (Kinberg, 1867)

*Pheretima californica* Kinberg, 1867: 102.

**Metaphire californica**: Blakemore 2008a: 343 (for complete synonymy).

**Material examined.** HNHM/AF5719 1 ex., Réunion, the bottom of the moss forest, ca. 1000 m, 22.06.2000, leg. Cs. Csuzdi

**Nellogaster bahli** (Stephenson, 1925)

*Woodwardiella bahli* Stephenson, 1925: 888.
**Nellogaster bahli:** Gates, 1938: 428, 1945: 75.

**Material examined.** HNHM/AF5739 2 ex., Sri Lanka, Kalutara, 08.03.2000, leg. S. Mahunka, L. Mahunka-Papp.

**Remarks.** Gates (1938) separated *Woodwardiella bahli* Stephenson, 1925, into a new genus *Nellogaster* due to its lumbricine setal arrangement and presence of open enteric megamero nephridia in the postclitellar segments. Blakemore (2007) places this species into *Notoscolex* Fletcher, 1886 characterized by lumbricine setae and open exoic megameronephridia. Until a thorough revision of the Indian megascolecididae is done we retain Gates' (1938) combination.

**Pithecera bicincta** (Perrier, 1875)

*Perichaeta bicincta* Blakemore 2008a: 419 (for complete synonymy).

**Material examined.** HNHM/AF5167 1 ex., Mayotte, Grande Terre, along River Bandrani, S12°42’26” E45°05’36”, 160 m, 07.10.2005, leg. T. Pavliček. HNHM/AF5184 5 ex., Mayotte, Grande Terre, near Longoni, S12°43’43” E45°07’46”, 35 m, around mangrove forest, 04.10.2005, leg. T. Pavliček. HNHM/AF5189 5 ex., Mayotte, Grande Terre, along the river above the Gîtes de Kwalé, S12°48’30” E45°09’40”, 185 m, 06.10.2005, leg. T. Pavliček. HNHM/AF5738 1 ex., Sri Lanka, Kalutara district, Matugama, stream bank near the city, 12.03.2000, S. Mahunka, L. Mahunka-Papp. HNHM/AF5752 1 ex., Seychelles, tropical mist forest, on a ridge, above La Passe, 540-590 m, 23.08.1984, USSR Zoological Expedition.

**Polypheretima elongata** (Perrier, 1872)

*Perichaeta elongata* Perrier, 1872: 124.

**Polypheretima elongata:** Blakemore 2008a: 428 (for complete synonymy).

**Material examined.** HNHM/AF5160 2 ex., Mayotte, Grande Terre, along River Mroni Bé, N of Dapani, S15°57’57” E45°09’28”, 40 m, 08.10.2005, leg. T. Pavliček. HNHM/AF5162 5 ex., AF5163 3 ex., Mayotte, Grande Terre, Tsimgoura, fruit plantation, S12°55’50” E45°07’25”, 16.10.2005, leg. T. Pavliček. HNHM/AF5164 1 ex., Mayotte, Grande Terre, Kwalé, S12°47’42” E45°09’57”, 330 m, 20.10.2005, leg. T. Pavliček. HNHM/AF5168 3 ex., Mayotte, Grande Terre, along River Bandrani, S12°42’26” E45°05’36”, 160 m, 07.10.2005, leg. T. Pavliček. HNHM/AF5174 2 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoumony, S12°41’58” E45°05’22”, 200 m, natural forest, 08.10.2005, leg. T. Pavliček. HNHM/AF5178 3 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 95 m, 05.10.2005, leg. T. Pavliček. HNHM/AF5180 6 ex., Mayotte, Grande Terre, Dembéni, CIRAD station, 12.10.2005, leg. T. Pavliček. HNHM/AF5182 2 ex., AF5183 2 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoumony, S12°42’55” E45°06’06”, 115 m, natural forest, 11.10.2005, leg. T. Pavliček. HNHM/AF5186 1 ex., Mayotte, Grande Terre, near Longoni, S12°43’43” E45°07’46”, 35 m, around mangrove forest, 04.10.2005, leg. T. Pavliček. HNHM/AF5189 5 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 40 m, 05.10.2005, leg. T. Pavliček. HNHM/AF5191 1 ex., Mayotte, Grande Terre, along the river above the Gîtes de Kwalé, S12°48’30” E45°09’40”, 185 m, 06.10.2005, leg. T. Pavliček. HNHM/AF5715 2 ex., Mauritis, Yemen Grosse Roche, 270 m, grassy meadow, stream bank, 28.06.2000, leg. Cs. Csuzdi.

**Polypheretima taprobanae** (Beddard, 1892)

*Perichaeta taprobanae* Beddard, 1892: 163.

**Polypheretima taprobanae:** Blakemore 2008a: 435 (for complete synonymy).

**Material examined.** HNHM/AF5160 2 ex., Mayotte, Grande Terre, along River Mro, NE of Dapani, S15°57’57” E45°09’28”, 40 m, 08.10.2005, leg. T. Pavliček. HNHM/AF5162 5 ex., AF5163 3 ex., Mayotte, Grande Terre, Tsimgoura, fruit plantation, S12°55’50” E45°07’25”, 16.10.2005, leg. T. Pavliček. HNHM/AF5164 1 ex., Mayotte, Grande Terre, Kwalé, S12°47’42” E45°09’57”, 330 m, 20.10.2005, leg. T. Pavliček. HNHM/AF5168 3 ex., Mayotte, Grande Terre, along River Bandrani, S12°42’26” E45°05’36”, 160 m, 07.10.2005, leg. T. Pavliček. HNHM/AF5174 2 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoumony, S12°41’58” E45°05’22”, 200 m, natural forest, 08.10.2005, leg. T. Pavliček. HNHM/AF5178 3 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 95 m, 05.10.2005, leg. T. Pavliček. HNHM/AF5180 6 ex., Mayotte, Grande Terre, Dembéni, CIRAD station, 12.10.2005, leg. T. Pavliček. HNHM/AF5182 2 ex., Af5183 2 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoumony, S12°42’55” E45°06’06”, 115 m, natural forest, 11.10.2005, leg. T. Pavliček. HNHM/AF5186 1 ex., Mayotte, Grande Terre, near Longoni, S12°43’43” E45°07’46”, 35 m, around mangrove forest, 04.10.2005, leg. T. Pavliček. HNHM/AF5189 5 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 40 m, 05.10.2005, leg. T. Pavliček. HNHM/AF5191 1 ex., Mayotte, Grande Terre, along the river above the Gîtes de Kwalé, S12°48’30” E45°09’40”, 185 m, 06.10.2005, leg. T. Pavliček. HNHM/AF5715 2 ex., Mauritis, Yemen Grosse Roche, 270 m, grassy meadow, stream bank, 28.06.2000, leg. Cs. Csuzdi.
Family Ocnerodrilidae Beddard, 1891

*Maheina braueri* (Michaelsen, 1897)
(Figures 4–6)

*Acanthodrilus braueri* Michaelsen, 1897a: 22.
*Maheina braueri*: Michaelsen 1899: 237.
*Notiodrilus braueri*: Beddard, 1912: 78.

**Material examined.** HNHM/AF5710 1 clitellate adult (tail missing) 2 aclitellate adult ex. and one juvenile ex., Seychelles, Mahé, Congo Rouge, moss forest, under fallen log, stones and moss, 19.06.2000, leg. Cs. Csuzdi.

**Description.** **External characters.** Length of the aclitellate adult specimens 75–95 mm, diameter 3–3.5 mm, segment No. 215–253–192. Colour alive green, conserved reddish-grey. Prostomium epilobic, dorsal pores lacking. Segments simple, setae eight per segment in widely paired regular rows. Setal formula after clitellum ad:ab:bc:cd:dd = 4.5:1:3:2:5.5. Setae of XVII, XIX present, penial setae and genital setae lacking. Spermathecal pores paired, small slits in the intersegmental furrow VII/VIII, VIII/IX in setal line b. Clitellum saddle-shaped on XIV–XX. Female pores in XIV, presetal before setae b. Two pairs of prostatic pores on two pairs of glandular elevation in XVII, XIX just at the base of setae b, joined by curly braces-like seminal grooves, running in setal line b. Male pores minute, externally not visible on XVIII, within the seminal grooves. Genital marking are lacking (Fig. 4).

**Internal characters.** No septa notably thickened. One large oesophageal gizzard in VI. Dorsal vessel single throughout, the last pair of hearts in XI. Excretory system holoic, avesiculate. Two pairs of downward oriented, aubergine-shaped calciferous glands in IX, X (Fig. 5). Intestine begins in XIV, real typhlosole lacking, but a shallow bulging can be seen dorsally from segment XXIV. Metandric. One pair of testis and iridescent male funnel in XI. A single pair of seminal vesicles in XII. One pair of moderate-sized ovaries in XIII. Two pairs of small tubular prostates of similar size in XVII and XIX, slightly coiled and confined to their own segment. Penial

**Figure 4.** *Maheina braueri* (Michaelsen, 1897) ventral and ventro-lateral view. Prp = prostate pores, Cl = clitellum.

**Figure 5.** *Maheina braueri* (Michaelsen, 1897) G = gizzard, Cg = calciferous glands.
setae lacking. Two pairs of spermathecae in VIII and IX. Ampoule spherical, duct slightly curved, almost as long as the ampoule. Diver
ticum lacking. (Fig. 6).

Remarks. This is the first recollection of this interesting species described as Acanthodrilus braueri from Mahé (Seychelles). Later (Michael
sen 1899) relegated it into a new genus Maheina Michaelsen, 1899 of the subfamily Megascolecidae (Acanthodrilinae). After a thorough exa
mination of the paired calciferous glands in X, XI of Maheina Michaelsen (1922) proposed its close relationship to the ocnerodrilid Curgia Michael
sen, 1921 genus (now Curgiona Gates, 1941) possessing unpaired calciferous glands in the very same segments, and transferred Maheina to the subfamily Megascolecidae (Ocnerodrilinae). However, recently, the Drilobase database (http://taxo.drilobase.org) lists it in the family Acanthodrilidae as well as Blakemore (2008b, 2013) and Gerlach (2011). According to the vascular system (last pair hearts in XI) and the paired ocnerodrilid like calciferous glands in IX, X Maheina Michaelsen, 1899 belongs to Ocnerodrilidae and seems to be related to the metandric Southern Indian ocnerodrilid genera Aphanascus Stephenson, 1924 and Curgiona Gates, 1941p.

Material examined. HNHM/AF5161 5 ex., Mayotte, Grande Terre, near the road between Combani and Kahani, under a mango tree, S12°48’43” E45°07’35”, 16.10.2005, leg. T. Pavlíček. HNHM/AF5165 5 ex., Mayotte, Grande Terre, Kwalé, S12°47’42” E45°09’57”, 330 m, 20.10.2005, leg. T. Pavlíček. HNHM/AF5166 3 ex., Mayotte, Grande Terre, near road Combani-Kwalé, S12°46’59” E45°08’52”, 280 m, 20.10.2005, leg. T. Pavlíček. HNHM/AF5170 7 ex., Mayotte, Grande Terre, along River Bandrani, S12°42’26” E45°05’36”, 160 m, 07.10.2005, leg. T. Pavlíček. HNHM/AF5175 4 ex., Mayotte, Grande Terre, along River Mro, NE of Dzoum
onyé, S12°41’58” E45°05’22”, 200 m, natural forest, 08.10.2005, leg. T. Pavlíček. HNHM/ AF5176 2 ex., Mayotte, Grande Terre, lower station of the monte-charge to Mlìma Combani, forest reserve, S12°48’00” E45°09’14”, 440 m, 14.10.2005, leg. T. Pavlíček. HNHM/ AF5187 7 ex., Mayotte, Grande Terre, near Longoni, S12°43’43” E45°07’46”, 35 m, around mangrove forest, 04.10.2005, leg. T. Pavlíček. HNHM/ AF5188 1 ex., Mayotte, Grande Terre, along Longoni River, S12°44’ E45°10’, 40 m, 05.10.2005, leg. T. Pavlíček. HNHM/AF5190 5 ex., Mayotte, Grande Terre, along river above the Gîtes de Kwalé, S12°48’30” E45°09’40”, 185 m, 06.10.2005, leg. T. Pavlíček. HNHM/AF5714 7 ex., Mauritius, Montagne Cocotte, moss forest, under moss, 750 m, S20°26’5” E57°28’3”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5724 4 ex., Mauritius, Petrin, Brise Fer, forest reserve, behind the Gerald Durrell Endemic Wildlife Sanctuary, 625 m, S20°22’1” E57°26’5”, 26.06.2000, leg. Cs. Csuzdi. HNHM/AF5725 2 ex., Seychelles, Mahé, N side of Le Niol, along the road, under leaf litter, 16.06.2000, leg. Cs. Csuzdi. HNHM/AF5726 1 ex., Seychelles, Mahé, cloud forest, 500 m, under Pterocarpus indicus,
Table 1. Earthworm species found on the different Indian Ocean Islands

| Family              | Mayotte | Mauritius | Reunion | Seychelles | Sri Lanka |
|---------------------|---------|-----------|---------|------------|-----------|
| Acanthodrilidae     |         | +         |         | +          |           |
| Dichogaster (Dt.) annae (Horst, 1893) |         |           |         | +          |           |
| Eudrilidae          |         | +         |         |            |           |
| Eudrilus eugeniae (Kinberg, 1867) |         |           |         | +          |           |
| Lumbricidae         |         |           | +       |            |           |
| Aporrectodea caliginosa (Savigny, 1826) |         | +         |         |            |           |
| Bimastos rubidus (Savigny, 1826) |         | +         |         |            |           |
| Megascolecidae      |         |           |         |            |           |
| Amynthas corticis (Kinberg, 1867) |         |           | +       |            |           |
| Amynthas gracilis (Kinberg, 1867) |         | +         |         |            |           |
| Amynthas minimus (Horst, 1893) |         | +         |         |            |           |
| Amynthas rodericensis (Grube, 1879) | +       | +         | +       |            |           |
| Amynthas robustus (Perrier, 1872) | +       | +         |         |            |           |
| ?Diporochaeta sp.   | +       |           |         |            |           |
| Lampito mauritii Kinberg, 1867 |         | +         |         |            |           |
| Megascolex insignis Michaelsen, 1910 |         |           | +       |            |           |
| Metaphire bahlii (Gates, 1945) |         | +         |         |            |           |
| Metaphire californica (Kinberg, 1867) |         | +         |         |            |           |
| Nellogaster bahlii (Stephenson, 1925) |         |           | +       |            |           |
| Pithemera bicincta (Perrier, 1875) | +       | +         |         |            |           |
| Polypheretima elongata (Perrier, 1872) | +       | +         |         |            |           |
| Polypheretima taprobanae (Beddard, 1892) | +       |           |         | +          | +         |
| Ocnerodrilidae      |         |           |         |            | +         |
| Maheina braueri (Michaelsen, 1897) |         |           |         | +          |           |
| Rhinodrilidae       |         |           |         |            |           |
| Pontoscolex corethrurus (Müller, 1857) | +       | +         | +       | +          | +         |

16.06.2000, leg. Cs. Csuzdi. HNHM/af5729 1 ex., Mauritius, Black River Peak, 600-700 m, 27.06.2000, leg. Cs. Csuzdi. HNHM/5730 1 ex., Seychelles, Mahé, N side of Le Niol, along a small stream, 350 m, 16.06.2000, leg. Cs. Csuzdi. HNHM/AF5731 1 ex., Réunion, lowland rain forest, 24.06.2000, leg. Cs. Csuzdi. HNHM/AF5736 9 ex., Sri Lanka, Kalutara district, Matugama, stream bank near the city, 12.03.2000, S. Mahunka, L. Mahunka-Papp. HNHM/5742 6 ex., Sri Lanka, Kalutara district, Wadduwa, moist meadow near the city, 11.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5744 2 ex., Sri Lanka, Kalutara district, Moratuwa, near the shore of Bolgoda Lake, 10.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5747 3 ex., Sri Lanka, Colombo district, Dehiwala-Mount Lavinia, moist area, 09.03.2000, leg. S. Mahunka, L. Mahunka-Papp. HNHM/AF5750 1 ex., Seychelles, Mahé, Morne Blanc, 350 m, secondary tropical rain forest, 01.08.1984, USSR Zoological Expedition. HNHM/AF5753 1 ex., Seychelles, Silhouette, near La Passe, 22–25.08.1984, USSR Zoological Expedition.

**DISCUSSION**

This small scale survey resulted in recording 20 earthworm species on the investigated five islands (Table 1). According to our expectation, the peregrine earthworms dominated on both oceanic and continental islands. The three endemic species found were present only in the continental islands (*Maheina braueri* in Seychelles and *Megascolex insignis*, *Nellogaster bahlii* in Sri Lanka) in a contrast to the oceanic ones. Among the peregrine species the well-known pantropical pheretimoids were the most frequent (10 spp.). To our surprise, the only species occurring in all the investigated islands was the rhinodrilid *Pontoscolex corethrurus*. Amazingly, at higher elevations in Réunion two peregrine lumbricid species were also collected (*Aporrectodea caliginosa* and *Bimastos rubidus*).
The present survey resulted in recording the type species of the monotypic genera *Maheina* (*M. braueri*) and *Nellologaster* (*N. bahli*) for the first time since their original description and also an enigmatic *Diporochaeta* species. The genus *Diporochaeta* is mainly distributed in Australia and New Zealand (Jamieson 2000) with two doubted records in Southern India (Blakemore 2007). However, these two *Diporochaeta* species (*D. montanus* (Gates, 1940) and *D. pellucida* (Bourne, 1894)) differs markedly from our specimens having strong gizzard in segment V and last pair of hearts in XII (in our specimens there is no gizzard and the last pair of hearts are in XIII).

Acknowledgements – Our thanks are due to Prof. Barrie Jamieson for his comments on the possible *Diporochaeta* specimens. This research was supported by the grant EFOP-3.6.1-16-2016-00001 (“Complex improvement of research capacities and services at Eszterházy Károly University”)

REFERENCES

BEDDARD, F.E. (1892): On some species of the genus *Perichaeta* (sensu stricto). *Proceedings of the Zoological Society of London*, 1892: 153–172.

BLAKEMORE, R.J. (2007) Checklist of 505 earthworms species from India, Sri Lanka and the adjacent regions (excluding Myanmar) compiled from various sources [e.g. Stephenson (1923), *Gates* (1972), *Julka* (1988) etc.]. In: BLAKEMORE, R.J. (Ed.) *A Series of Searchable Texts on Earthworm Biodiversity, Ecology and Systematics from Various Regions of the World – 3rd Edition*. Available from: http://www.annelida.net/earthworm (accessed 11 September 2019)

BLAKEMORE, R.J. (2008a): *Cosmopolitan Earthworm*. (3rd Edition). *VermEcology*, Yokohama, Japan. 757 pp.

BLAKEMORE, R.J. (2008b): *Review of Southern Ocean, South Atlantic and Subantarctic species after Lee (1994)*. In BLAKEMORE, R.J. (Ed.) *A Series of Searchable Texts on Earthworm Biodiversity, Ecology and Systematics from Various Regions of the World – 3rd Edition*. Available at http://www.annelida.net/earthworm [accessed 10. September, 2019]

BLAKEMORE, R.J. (2013): The major megadrile families of the World reviewed again on their taxonomic types (Annelida: Oligochaeta: Megadrilacea). *Opuscula Zoologica*, Budapest, 44(2): 107–127.

CSUZDI, Cs. & ZICSI, A. (2003): *Earthworms of Hungary (Annelida: Oligochaeta: Lumbricidae)*. In: CSUZDI, Cs. & MAHUNKA, S. (Eds.) *Pedozoologica Hungarica*. Hungarian Natural History Museum, Budapest, 271 pp.

CSUZDI CS., RAZAFINDRAKOTO, M. & BLANCHART, E. (2012): New and little known earthworm species from Central Madagascar (Oligochaeta: *Lumbricidae*). *Zootaxa*, 3578: 36–42. doi: 10.11646/zootaxa.3578.1.2

CSUZDI CS., RAZAFINDRAKOTO, M. & HONG, Y. (2016): The second species of the endemic Malagasy earthworm genus *Howascolex* Michelsen, 1901; *Howascolex farafangana* sp. n. (Clitellata, Megadrilida). *African Invertebrates*, 57(2): 83–91. doi: 10.3897/AfrInvertebr.57.10048

CSUZDI, Cs., RAZAFINDRAKOTO, M. & HONG, Y. (2017a): Three new species of *Kynotus* from the Central Highlands of Madagascar (Clitellata, Megadrilida). *European Journal of Taxonomy*, 336: 1–14. doi: 10.5852/ejt.2017.336

CSUZDI, Cs., CHANG, C.-H., PAVLÍČEK, T., SZEDERJESI, T., ESÓPI, D., & SZLÁVECZ, K. (2017b). Molecular phylogeny and systematics of native North American lumbricid earthworms (Clitellata, Megadrilida). *PLoS One*, 12(8), e0181504. doi:10.1371/journal.pone.0181504

FATIMA, Q. & JAMSHED, A. (2015): The Political and Economic Significance of Indian Ocean: An Analysis. *South Asian Studies*, 30(2): 73–89.

GATES, G.E. (1938): *Nellologaster* gen. nov. with a note on Indian species of *Woodwardiella*. *Records of the Indian Museum*, 40: 426–429.

GATES, G.E. (1945): On some Earthworms from Ceylon II. *Spolia Zaylanica*, 24: 69–90.

GERLACH, J. (2011): *Oligochaeta*. In Gerlach, J. (Ed.) *Crustacea, Platyhelminthes, Nematoda, Nemertea, Annelida, Rotifera and Tardigrada of the Seychelles Islands*. Siri Scientific Press, Manchester, p. 61–64.

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. doi: 10.1098/rstl.1879.0057

HORST, R. (1893): earthworms of the Malay Archipelago. Zoologische Ergebnisse einer reise in Niederländisch Ost-Indien, 3: 28–77.

JAMIESON, B.G.M. (2000): Native earthworms of Australia (Megascolecidae, Megascolecinidae). Science Publishers, Inc. Enfield, New Hampshire, U.S.A., CD Edition, 1518 pp.

KATZ, M.B. (2000): Sri Lanka – India Intraplate Tectonics – Precambrian to Present. Gondwana Research, 3(1): 3–5. doi: 10.1016/S1342-937X(05)70052-6

KINBERG, J.G.H. (1867): Annulata nova. Öfversigt af Koniglich Vetenskapsakademiens förhandlingar, Stockholm, 23: 97–103, 356–357.

LIJUNGSTRÖM, P.-O. (1971): Earthworms of Mauritius. The Mauritius Institute Bulletin, 7(1): 17–38.

MICHAELSEN, W. (1897a): Die Terricolen des Madagaschischen Inselgebiets. Abhandlungen von der Senckenbergischen Naturforschenden Gesellschaft, Frankfurt am Main, 21: 217–252.

MICHAELSEN, W. (1897b): Die Terricolenfauna Ceylons. Jahrbuch der hamburgischen wissenschaftlichen Anstalten 14(2): 157–250.

MICHAELSEN, W. (1899): Oligochäten von den Inseln des Pacific, nebst Erörterungen zur Systematik der Megascoleciden. Zoologische Jahrbücher, Abteilung für Systematik Ökologie und Geographie der Tiere, 12: 211–246.

MICHAELSEN, W. (1903): Oligochaeten von Peradeniya auf Ceylon, ein beitrag zur kenntniss des einflusses botanischer garten auf die einschleppung peregriner thiere. Sitzungsberichte der Königlichen Böhmischen Gesellschaft der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe, 55: 1–16.

MICHAELSEN, W. (1908): The Oligochaeta of India, Nepal, Ceylon, Burma and the Andaman Islands. Memoirs of the Indian Museum, Calcutta, 1(3): 103–253.

MICHAELSEN, W. (1910): Die Oligochäten fauna der vorderindisch-ceylonischen region. Abhandlungen des Naturwissenschaftlichen Vereins in Hamburg, 19(5): 1–108.

MICHAELSEN, W. (1907a): Oligochaeten von Madagaskar, den Comdren und anderen Inseln des westlichen Indischen Ozeans. Reise in Ostafrika von A. Voeltzkow in den Jahren 1903–05, Wissenschaftliche Ergebnisse 2: 41–50.

MICHAELSEN, W. (1907b): Neue Oligochaeten von Vorder-Indien, Ceylon, Birma und den Andaman-Inseln. Jahrbuch der hamburgischen wissenschaftlichen Anstalten, Hamburg, 24: 143–188.

MICHAELSEN, W. (1922): Oligochäten vom westlichen Vorderindien und ihre Beziehungen zur Oligochätenfauna von Madagaskar und den Seychellen. Mitteilungen aus dem Naturhistorischen Museum in Hamburg, 38: 27–68.

MITTERMEIER, R.A., TURNER, W.R., LARSEN, F.W., BROOKS, T.M. & GASCON, C. (2011): Global biodiversity conservation: the critical role of hotspots. In: ZaChos, F.E., HABEL, J.C. (Eds.) Biodiversity Hotspots. Springer Publishers, London, p. 3–22.

PERRIER, E. (1872): Recherches pour servir à l'histoire des lombriciens terrestres. Nouvelles Archives du Muséum d'Histoire Naturelle de Paris, 8: 5–198. doi: 10.5962/bhl.title.12201

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: 1043–1046.

RAZAFINDRAKOTO, M., CSUZDI, Cs., RAKOTOFIRINGA, S. & BLANCHART, E. (2010): New records of earthworms (Oligochaeta) from Madagascar. Opuscula Zoologica (Budapest) 41: 231–236.

RAZAFINDRAKOTO, M., CSUZDI, Cs. & BLANCHART, E. (2011): New and little known giant earthworms from Madagascar (Oligochaeta: Kynotidae). African Invertebrate,s 52: 285–294. doi: 10.5733/afin.052.0205

RAZAFINDRAKOTO, M., CSUZDI Cs., JAMES, S.W. & BLANCHART, E. (2017): New earthworms from Madagascar with key to the Kynotus species (Oligochaeta: Kynotidae). Zoologischer Anzeiger 268: 126–135. doi: 10.1016/j.jcz.2016.08.001

SAVIGNY, J.C. (1826). Analyses des travaux de l’Academie Royale des Sciences pendant l’année 1821, partie physique. In: CUVIER, G. (Ed.) Mémoires d’Académie Royale des Sciences Institute de France, 5: 176–184.

STEPHENSON, J., (1913): On a collection of Oligochaeta, mainly from Ceylon. Spolia zeylandica, 8: 251–276.
STEPHENSON, J. (1915): On some Indian Oligochaeta mainly from southern India and Ceylon. Memoirs of the Indian Museum, 6: 35–108.

STEPHENSON, J. (1923): Oligochaeta. In. SHIPLEY, A.E. & SCOTT, H. (Eds.) The fauna of British India including Ceylon and Burma. Taylor and Francis Inc., London, 518 pp.

WALKER, H.J., INGOLE, B., NAYAK, G.N., WAFAR, M., WAFAR, S., YENNAVAR, P. & LAMBECK, K. (2005). Indian Ocean Islands, Coastal Ecology and Geomorphology. In. FINKL, C.W. & MARKOWSKI, C. (Eds.) Encyclopedia of Coastal Science, Springer Nature, p. 557–564. doi: 10.1007/1-4020-3880-1_180