A review of the Benhamiinae collection of The Natural History Museum, London (Oligochaeta: Acanthodrilidae)

By

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Abstract. During a visit to The Natural History Museum, London, in the spring of 1994, the author revised the material of the earthworm subfamily Benhamiinae. This report summarises that work, and gives descriptions of five new species: *Dichogaster* (*Dichogaster*) *calabarensis*, *Dichogaster* (*Diplothecodrilus*) *hindei*, *D.* (*Diplothecodrilus*) *oxtobyae*, *D.* (*Diplothecodrilus*) *simsi*, and *Eutrigaster* (*Graffia*) *maya* spp. nov.

One of the richest earthworm collections can be found in The Natural History Museum, London. It contains many type series belonging to different genera of the subfamily Benhamiinae. The collection also contains numerous other specimens from various localities of Africa and South America. So far only a part of this material has been identified. During the present investigations, each species was re-appraised, and previously unnamed specimens of the subfamily Benhamiinae were identified.

The subfamily Benhamiinae was erected by Michaelsen (1897a) to accommodate the earthworm genera with meronephric excretory system, duplicated gizzards and three pairs of calciferous glands. It was not clearly defined, so present day specialists can only guess whether it would have contained all of the closely related genera *Benhamia* Michaelsen, 1889; *Dichogaster* Beddard, 1888; *Microdrilus* Beddard, 1893 and *Millsonia* Beddard, 1894.

Michaelsen (1900) united all of the above genera under the name *Dichogaster* and placed them into the subfamily Trigastrinae Michaelsen, 1900. Later on, different authors placed this continuously increasing genus into various families or subfamilies (Stephenson, 1930; Omodeo, 1958; Jamieson, 1971; Sims, 1980), meanwhile the genus *Dichogaster* tripled its size and became a "catch-all" taxon. The repeated partial revisions (Omodeo, 1955,

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1958; Sims, 1987; Csuzdi & Zicsi, 1991) have not solved its taxonomic problems. However, Csuzdi and Zicsi (1994a), Csuzdi (1995, 1996) published detailed revisions of this group and proposed the following system.

Family ACANTHODRILIDAE Claus, 1880, emend. Csuzdi, 1996

Diagnosis. Body cylindrical, dorsal pores present. Male pores usually paired on *xvii* with paired prostatic pores on both *xvii* and *xix*, or paired on *xvii* or *xix* with a single pair of prostatic pores on the same segment. Prostatic pores rarely more numerous or more posteriorly. Usually 1-3 oesophageal gizzards (occasionally rudimentary or absent), intestinal gizzards absent. Calciferous glands common, supra-oesophageal vessel often present. Prostatic glands tubular in structure of ectodermal origin with central canal. Excretory system holonephridial, or meronephridial with one pair of megameronephridia lying in the posterior part of the body.

Subfamily *BENHAMIINAE* Michaelsen, 1897, emend. Csuzdi, 1996

Diagnosis. Male terminalia acanthodriline, sometimes with microscolecine or balantine reduction, rarely with 3 pairs of prostatic glands. Several stalked extramural calciferous glands paired on the oesophagus behind the genital segments. Excretory system holonephridial, or meronephridial with one pair of caudal megameronephridia.

Tribe Benhamiini Michaelsen, 1897

Diagnosis. Excretory system meronephric with caudal megameronephridia. Two or three stalked extramural calciferous glands paired on the oesophagus between segments *xiv-xvii*. Two simple or one fused gizzards before the genital segments, rarely vestigial.

Genus *Agastrodrilus* Omodeo & Vaillaud, 1967

Agastrodrilus dominicae Lavelle, 1981

Material examined: *Agastrodrilus dominicae*, **Paratypes**; Ivory Coast, shrub savanna, forest close to Foro Foro; Leg. P. Lavelle; IX. 1980; Reg. No. BM(NH) 1981.3.1-4.

Agastrodrilus insolitus Sims, 1986

Material examined: *Agastrodrilus insolitus*, Syntypes; S.E. Ghana, under tomato plants Ada, Kanyanga; Leg. J. D. Plisko; Reg. No BM(NH) 1984.4.27-45; *Agastrodrilus insolitus*; S.E. Ghana, sugar cane plantations, Kpong; Leg. J.D. Plisko; Reg. No. BM(NH) 1984.4.46-47 (Sims, 1986); S.E. Ghana, cultivated field, Ada Koloidaw; Leg. J.D. Plisko; Reg. No. BM(NH) 1984.4.48-52 (Sims, 1986).

Agastrodrilus lavellei Sims, 1986

Material examined: *Agastrodrilus lavellei*, Syntypes; Ghana, S.E., bush near Achimota (N. of Accra); Leg. J. D. Plisko; Reg. No. BM(NH) 1984.4.456-467; *Agastrodrilus lavellei*; S.E. Ghana, bush near Achimota (N. of Accra); Leg. J. D. Plisko; Reg. No. BM(NH) 1984.4.468-471 (Sims, 1986); S.E. Ghana, Green Hill, Legon, Achimota; Leg. J.D. Plisko; 26.06.1965; Reg. No. BM(NH) 1984.4.472 (Sims, 1986); S.E.Ghana, Bodonya, New Achimota Village; Leg. J.J. Niles; Reg. No. BM(NH) 1968.2.30. (Sims, 1986).

Agastrodrilus opisthogynus Omodeo & Vaillaud, 1967

Material examined: *Agastrodrilus opisthogynus*; Ivory Coast, Lamto, 60 km south of Toumodi; Leg. P. Lavelle; 1969; Reg. No. BM(NH) 1970.4.1-4.

Remarks. The specimens are desiccated with no taxonomic value.

Genus *Benhamia* Michaelsen, 1889, emend. Csuzdi & Zicsi, 1994

Benhamia itoliensis Michaelsen, 1892

Syn.: *Benhamia itoliensis* var. *coerulea* Michaelsen, 1899 (Cognetti, 1909)
Benhamia johnstoni Beddard, 1901 (Cognetti, 1909)
Benhamia mollis Beddard, 1901 (Michaelsen, 1912)
Benhamia moorei Beddard, 1901 (Cognetti, 1909)
Dichogaster jaculatrix Baylis, 1915 (Stephenson, 1933)
Dichogaster itoliensis var. *minor* Stephenson, 1933 (Csuzdi, 1995)

Material examined: *Benhamia mollis*, Type; Nyanza Lake; Reg. No. BM(NH) 1904.10.5.659; *Benhamia moorei*, Type; Kurungu Mts. Lake Kivu; Reg. No. BM(NH) 1904.10.5.660; *Benhamia johnstoni*, Type; Ruwenzori, 6500 ft.; Leg. Sir Harry Johnston; Reg. No. BM(NH) 1902.1.21.1.

New records: British East Africa, Kabale, Bukoba; Leg. Loveridge; 4. I. 1923; Reg. No. BM(NH) 1924.10.20.1, 1 Ex.; Tanzania, Kigoma Region, Gombe Nat. Park near chimpanzee observation point; Leg. Ian Bryceson; 28. IX. 1981; Reg. No. BM(NH) 1982.9.4, 1 Ex.

Genus *Benhamiona* Csuzdi & Zicsi, 1994

Benhamiona balantina (Omodeo, 1958)

Material examined: *Benhamia balantina*; Ivory Coast, savanna on summit of Mt. Nimba, 1750 m; Leg. P. Lavelle; I. 1968; Reg. No. BM(NH) 1971.22.1.

Benhamiona budgetti (Beddard, 1900)

Material examined: *Benhamia budgetti*, Types; Gambia, McCarthy Island; Leg. Budgett; Reg. No. BM(NH) 1904.10.5.650-652; *Benhamia budgetti*; Gambia, Birkama Ba, 10 miles W. of Georgetown; Leg. & det. R.W. Sims; 5-7. X. 1964; Reg. No. BM(NH) 1966.30.2-10 (Sims, 1967); Gambia, Willigara, 13 miles W. of Georgetown; Leg. & det. R.W. Sims; 7. X. 1964; Reg. No. BM(NH) 1966.30.11-19 (Sims, 1967); Gambia, forest reserve Nyamba, 16 miles S. of Bathurst; Leg. & det. R.W. Sims; 23. IX. 1964; Reg. No. BM(NH) 1966.30.20-21 (Sims, 1967); Gambia, Jakali swamp, Sapu, 12 miles W. of Georgetown; Leg. & det. R.W. Sims; 3. X. 1964; Reg. No. BM(NH) 1966.30.37-45 (Sims, 1967); Gambia, Willigara, 13 miles W. of Georgetown; Leg. & det. R.W. Sims; 7. X. 1964; Reg. No. BM(NH) 1966.30.46-123 (Sims, 1967).

Benhamiona buettikoferii (Horst, 1884)

Syn.: *Acanthodrilus büttikoferii* Horst, 1884

New record: Liberia, Harbel; Leg. W.C. Osman Hill; 13. XI. 1961; Reg. No. BM(NH) 1961.30.1, 1 Ex.

Benhamiona esca (Stephenson, 1931)

Material examined: *Dichogaster esca* Types; Reg. No. BM(NH) 1930.9.16.10-11; *Dichogaster esca*; Gold Coast, Aburi, 25 km. N. of Accra; Leg. F.R. Irvine; Reg. No. BM(NH) 1932.9.28.3-4; Gold Coast, Tafo, Akim, closed forest; Leg. F.R. Irvine; I. 1939; Reg. No. BM(NH) 1949.12.12.25-26; Ghana, S.E., Prempeh College, Kumasi; Leg. M.A. Tazelaar; 17. XI. 1955; Reg. No. BM(NH) 1964.2.14 (Sims, 1965); Ghana, S.E. Tafo; Leg. M.A. Tazelaar; 17. X. 1952; Reg. No. BM(NH) 1964.2.1-3 (Sims, 1965); Ghana, Kunst, Kumasi; Leg. J.J. Niles; 18. VII. 1964; No. BM(NH) 1965.1.8-9.

New record: Gold Coast, Axim, open valley to Dunkwa; Leg. A.E. Kitson; 1915; Reg. No. BM(NH) 1917.5.13.3, 1 Ex.

Genus *Dichogaster* Beddard, 1888, emend. Csuzdi, 1996

Subgenus *Dichogaster* Beddard, 1888, emend. Csuzdi, 1996

Dichogaster (Dichogaster) arcifera Omodeo, 1958

New record: Ivory Coast, Lamto 60 km S. of Toumodi, beside Bandama stream, gallery forest; Leg. P. Lavelle; 1969; Reg. No. BM(NH) 1970.4.44-46, 2 Ex., AF/3308, 1 Ex.

Dichogaster (Dichogaster) baeri Sciacchitano, 1952

Material examined: Ivory Coast, Lamto, gallery forest; Leg. P. Lavelle; Reg. No. BM(NH) 1971.22.59-69.

Dichogaster (Dichogaster) ehrhardti (Michaelsen, 1898)

Syn.: *Dichogaster ehrhardti* var. *linneli* Michaelsen, 1910 (Csuzdi, 1995).

Material examined: Bissao, W. Africa; Leg. E. Cambridge; Reg. No. BM(NH) 1924.3.1.250-254; Nigeria, Oyo state, Univ. Ile Ife campus; Leg. A. O. Segun; X. 1976; Reg. No. BM(NH) 1976.24.4; Gambia, Willigara, 13 miles W. of Georgetown; Leg. R.W. Sims; 7. X. 1964; Reg. No. BM(NH) 1966.30.224-238 (Sims, 1967); Gambia, Birkama Ba, 10 miles W. of Georgetown; Leg. R.W. Sims; 7. X. 1964; Reg. No. BM(NH) 1966.30.219-221 (Sims, 1967); Gambia, Bakau, 7 miles W. of Bathurst; Leg. R.W. Sims; 10. X. 1964; Reg. No. BM(NH) 1966.30.217 (Sims, 1967); Gambia, Jakali swamp, Sapu, 12 miles W. of Georgetown; Leg. R.W. Sims; 5. X. 1964; Reg. No. BM(NH) 1966.30.222-223 (Sims, 1967); Gambia, Abuko reservoir 10 miles S. of Bathurst; Leg. R.W. Sims; 29. IX. 1964; Reg. No. BM(NH) 1966.30.213-216 (Sims, 1967); Gambia, Birkama, 20 km S. of Bathurst; Leg. R.W. Sims; 25. IX. 1964; Reg. No. BM(NH) 1966.30.218 (Sims, 1967).

New records: Nigeria, around zool. garden, Univ. of Ile Ife Oyo state; Leg. A.O. Segun; Reg. No. BM(NH) 1978.23.1-2, 2 Ex.; Nigeria, Nsukka, zool. garden; Leg. A.O. Segun; 2. IX. 1977; Reg. No. BM(NH) 1978.44.4, 1 Ex.; Nigeria, Nsukka, zool. garden; Leg. A.O. Segun; 10. VIII. 1977; Reg. No. BM(NH) 1978.44.3, 1 Ex.; Ivory Coast, Lamto, 60 km. S. of Toumodi, beside Bandama stream, gallery forest; Leg. P. Lavelle; 1969; Reg. No. BM(NH) 1970.4.39-43, 5 Ex.

Dichogaster (Dichogaster) greeffi Michaelsen, 1902

Syn.: *Dichogaster thomeana* Cognetti, 1910 (Csuzdi, 1995).

New record: Sao Thome island, Gulf of Guinea; Leg. W.H.T Tams; 1. XI. 1932; Reg. No. BM(NH) 1935.1.9.1, 1 Ex.

Dichogaster (Dichogaster) ligula Sims, 1964

Material examined: *Dichogaster ligula*, Holotype; Sierra Leone, gravel bed of stream entering R. Aberdeen close to sea, Freetown; Leg. J. Phipps; 1956; Reg. No. BM(NH) 1964.10.1; *Dichogaster ligula*, Paratypes; Sierra Leone, gravel bed of stream entering R. Aberdeen close to sea, Freetown; Leg. J. Phipps; 1956; Reg. No. BM(NH) 1964.10.3-8; *Dichogaster ligula*; Sierra

Leone, gravel bed of stream entering R. Aberdeen close to sea, Freetown; Leg. J. Phipps; 1956; Reg. No. BM(NH) 1964.10.10-30 (belonging to the type series).

Dichogaster (Dichogaster) terraenigrae Omodeo & Vaillaud, 1967

Material examined: Ivory Coast, scrub savanna forest, close to Foro Foro; Leg. P. Lavelle; IX. 1980; Reg. No. BM(NH) 1981.3.10-11; Ivory Coast, under palm trees, savanna Lamto, 60 km S. of Toumodi; Leg. P. Lavelle; 1969; Reg. No. BM(NH) 1970.4.31-33.

Remarks: Previously, Csuzdi and Zicsi (1994a) transferred this species to the genus *Benhamia* on the condition that it required further corroboration. The recent investigations of the excretory system on the specimens housed in the Museum showed that this species undoubtedly belongs to the genus *Dichogaster (Dichogaster).*

Dichogaster (Dichogaster) titillata Sims, 1967

Material examined: *Dichogaster titillata,* Syntypes; Gambia, Williagara, 7-9. X. 1964; Reg. No. BM(NH) 1966.30.240-426, 1966.30.429-480.

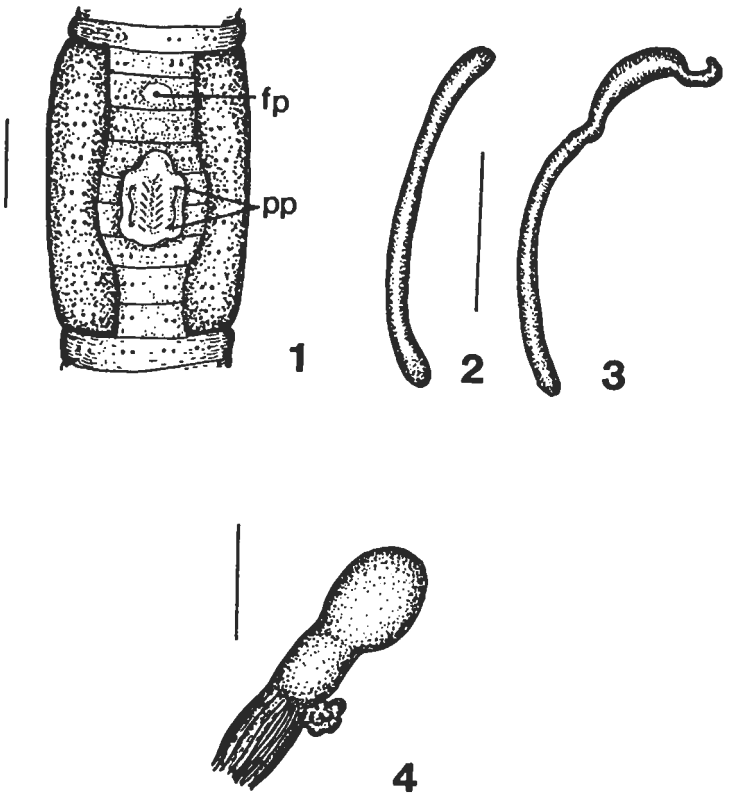
Dichogaster (Dichogaster) wenkei (Michaelsen, 1931)

Syn.: *Dichogaster agilis* Omodeo & Vaillaud, 1967 (Csuzdi, 1995)

Material examined: *Dichogaster agilis;* Ivory Coast, Bandama Stream, Lamto, 60 km S. of Toumodi; Leg. P. Lavelle; 1969; Reg. No. BM(NH) 1970.4.19-22.

Dichogaster (Dichogaster) calabarensis sp. n.

External characters. Length of the Holotype 120 mm, diameter just after the clitellum 2 mm, number of segments 244. Paratypes are 105-115 mm in length, 2 mm in diameter, number of segments 238-251. The colour of the preserved specimens is yellowish-brown. Prostomium withdrawn, the first dorsal pore occurs in intersegmental furrow 13/14. Setae are closely paired and all on the ventral surface of the body. Setal formula at segment *xxiv*: *aa:ab:bc:cd:dd* = 3:1:4:1:50. Female pore single, situated on segment *xiv* mid-ventral on an oval porophore. Two pairs of spermathecal pores are present in furrows 7/8 and 8/9 in setal lines *b.* Male pores are paired on segment *xviii* situated at the end of seminal grooves. Clitellum saddle-shaped, extends over segments *xiii-xxi.* There are one pair of prostatic pores on segment *xvii* in setal line connected with the male pores on each side by a bow-shaped seminal groove. Unpaired ventromedian genital papilla present on segment *xv* (Fig. 1).



Figs. 1—4. *Dichogaster (Dichogaster) calabarensis* sp. n. 1. Ventral view of the clitellar region; fp = female pore, pp = prostatic pores. 2. Smaller penial seta. 3. Larger penial seta. 4. Spermatheca. (Scale bar 1 mm)

Internal characters. The anterior septa to 7/8 are not recognizable. There are no septa notably strengthened. Two large distinct gizzards in segments *v* and *vi*. Calciferous glands are lamellate and paired in segments *xv-xvii*. The anterior pair is notably smaller than the others. Typhlosole arising in segment *xxi* is followed on both sides by a simple accessory ridge extending as far as the *xi*th segment. Paired lateral hearts are present in segments *x*, *xi* and *xii*. The excretory system is meronephridial; there are 5 sac-shaped meronephridia on each side of the intestine. In addition to meronephridia, there is a pair of

ventromedian megameronephridia on the posterior part of the body. Testes and funnels are paired in segments *x* and *xi* closed into perioesophageal testis sacs. Two pairs of small seminal vesicles present in *xi, xii,* and a pair of large racemose ovaries suspending from the posterior face of septum 12/13. Ovarial funnels are small leading into a little ovisac in segment *xiv*. The two vasa deferentia of each side are easily seen entering the body wall in segment *xviii*.

One pair of tubular prostatic glands is present in *xvii*. They are long highly coiled tubes occupying 2-3 segments. Each prostate is accompanied by a penial setal sac containing two different types of mature seta. The larger seta is 3.1 mm in length, and at the middle 0.05 mm thick. Its ectal third is curved, sickle-shaped. The tip is sharply pointed and hooked. Under the curved part, the seta bears a very fine ornamentation of transversely arranged minute teeth. The second seta is smaller, 2.2 mm in length and at the middle 0.05 mm in diameter. Its tip is rounded knob-shaped. There is no ornamentation (Fig. 2—3). Two pairs of spermathecae present in segments *viii* and *ix* of almost equal size. The duct is short and about one-third diameter of the sac-shaped ampulla which is divided into two parts. The lower part of ampulla is slightly thinner than the upper one. There is a multilocular diverticulum arising from the junction of the ampulla and the duct (Fig. 4).

Remarks. This species is unique within the subgenus *Dichogaster* with its incomplete microscolecine reduction of the male terminalia.

Localities: **Holotype**; Nigeria, 27 km E. of Calabar, under rotten leaves; Leg. J.C. Reid; 1. IX. 1980; Reg. No. BM(NH) 1985.4.4. **Paratypes**; Nigeria, 27 km E. of Calabar, under rotten leaves; Leg. J. C. Reid; 1. IX. 1980; Reg. No. BM(NH) 1985.4.5-6, 2 Ex., AF/3317, 1 Ex.

Subgenus *Diplothecodrilus* Csuzdi, 1996

Dichogaster (Diplothecodrilus) aequatorialis (Michaelsen, 1896)

Syn.: *Dichogaster variabilis* Černosvitov, 1938 (Csuzdi, 1995)

Material examined: *Dichogaster variabilis,* **Type**; Mt. Elgon, Omo 20; 8. I. 1933; Reg. No. BM(NH) 1949.3.1.734-736.

Remarks: The type specimen is deposited in the Muséum national d'Histoire naturelle, Paris (Jamieson, 1975). In the Natural History Museum, London, only several microscope slides could be found.

Dichogaster (Diplothecodrilus) affinis (Michaelsen, 1890)

Syn.: *Benhamia mexicana* Rosa, 1891 (Csuzdi & Zicsi, 1989)
Benhamia crassa Beddard, 1893 (Csuzdi & Zicsi, 1989)
Benhamia floresiana Horst, 1893 (Pickford, 1938)
Dichogaster sinuosus Stephenson, 1931a (Pickford, 1938)
Dichogaster sinicus Chen, 1938 (Csuzdi & Zicsi, 1989)

Material examined: *Benhamia crassa,* Type; Lagos, W. Africa; Reg. No. BM(NH) 1904.10.5.829; *Dichogaster sinuosus,* Syntypes; Burma, Lalaw; Leg. G.E. Gates; Reg. No. BM(NH) 1930.5.9.22-24.

New records: Kenya, Fort Hull 4400 ft; Leg. Hinde; Reg. No. BM(NH) 1910.8.3.24, 1 Ex.; Kenya, Aberdares, Kararumo road, forest (0° 41' S., 36° 50'E.); Leg. Miss. E.A. Oxtoby; 12.XII.1974; Reg. No. BM(NH) 1981.6.2867-2879, 13 Ex.; Kenya, Nairobi, Kenyatta College; Leg. Miss, E.A. Oxtoby; 22.VII.1974; Reg. No BM(NH) 1981.6.2862-2864, 3 Ex.; Kenya, Muranga district, Kimandi; edge of stream near forest, Oxtoby's Shamba field (0° 43' S., 37° 09' E.); Leg. Miss E.A. Oxtoby; IX.1976. Reg. No. BM(NH) 1981.6.2692-2700, 9 Ex.; Kenya, Meru, Nkubu Kionyo forest (0° 04' S., 37° 40' E.); Leg. Miss E.A. Oxtoby; 14.VIII.1974; Reg. No. BM(NH) 1981.6.2885, 1 Ex.; Kenya, Aberdares foothills, Castle forest station, N. of Nairobi, near river, 6800 ft.; Leg. Miss E.A. Oxtoby; 30.I.1974; Reg. No. BM(NH) 1981.6.2728-2782, 38 Ex.; Kenya, Nairobi, Kenyatta College house garden; Leg. Miss E.A. Oxtoby; IX.1977; Reg. No. BM(NH) 1981.6.2792-2801, 10 Ex.; Kenya, Aberdare Mts. Nat. Park, roots of giant lobelias; Leg. Miss E.A. Oxtoby; VI.1972; Reg. No. BM(NH) 1981.6.2524-2529, 5 Ex., AF/3307, 1 Ex.; Kenya, forest side of road Thika-Ghatanga -Kinangop, 6000 ft. (0° 50' S. , 36° 50' E.); Leg. Miss E.A. Oxtoby; 23.VII.1974; Reg. No. BM(NH) 1981.6.2881-2884, 4 Ex.; Kenya, Meru district, forest near Nkubu, mainly *Podocarpus* vegetation (0° 04' S., 37° 40' E.); Leg. Miss. E.A. Oxtoby; VI.1974; Reg. No. BM(NH) 1981.6.2789-2790, 2 Ex.; Kenya, pine plantation, Nduru near Kisii (0° 41' S. , 34° 46' E.); Leg. Miss E.A. Oxtoby; VI.1971; Reg. No. BM(NH) 1981.6.2890-2995 6 Ex.; Kenya, Mombasa, Shino-la-Tewa school; Leg. Miss E.A. Oxtoby; Reg. No. BM(NH) 1981.6.2539, 1 Ex.; Kenya, Kimande forest, 7500 ft. (0° 49' S. , 36° 48' E.); Leg. Miss E.A. Oxtoby; XII.1976; Reg. No. BM(NH) 1981.6.2831-2854, 24 Ex.; Kenya, Kikuyu Escarpment forest near Nairobi (1° 15' S., 36° 40' E.); Leg. Miss. E.A. Oxtoby; III.1972; Reg. No. BM(NH) 1981.6.2886-2889, 4 Ex.; Kenya, Aberdare Mts.; Leg. Miss E.A. Oxtoby; 18.XI.1974; Reg. No. BM(NH) 1981.6.2631-2659, 29 Ex.; Galapagos, transition vegetation at top of the lava flow at James Bay; 1500 ft.; Leg. Hugh A. Ford; 17.VIII.1968. Reg. No. BM(NH) 1982.40.1-6, 6 Ex.; Galapagos, wet zone at top of lava flow in James Bay, 1800 ft. Leg. Hugh A. Ford; 23.IX.1968; Reg. No. BM(NH) 1982.40.21-22, 2 Ex.; Burma, Rangoon; Leg. G.E. Gates; Reg. No. BM(NH) 1933.2.15.50, 1 Ex.

Dichogaster (Diplothecodrilus) annae (Horst, 1893)

Syn.: *Dichogaster travancorensis* Fedarb, 1898 (Csuzdi, 1995)
Dichogaster curgensis Michaelsen, 1921 (Csuzdi, 1995)
Dichogaster curgensis var. *unilocularis* Stephenson, 1931a (Csuzdi, 1995)
Dichogaster cheranganiensis Černosvitov, 1938 (Csuzdi, 1995)
Dichogaster silvestris cacaois Righi, 1968 (Righi, 1984)
Dichogaster servi Righi & Ayres, 1975 (Csuzdi, 1995)
Benhamia parva Michaelsen, 1896 (Csuzdi, 1995)

Material examined: *Benhamia travancorensis,* Type; Travancore; Reg. No. BM(NH) 1904.10.5.664; *Dichogaster cheranganiensis,* Type; Omo exp. 31; 13.III.1933; Reg. No. BM(NH) 1949.3.1.741; *Dichogaster curgensis unilocularis,* Types; Burma, Loshio; Leg. G.E. Gates; Reg. No. BM(NH) 1930.5.9.15-16;

New records: Ghana, Tafo; Leg. H.C. Evans; 1.IV.1971; Reg. No. BM(NH) 1972.2.109-114, 6 Ex.; Kenya, Kakamega forest beneath bark of rotting fallen log (0° 15' N., 34° 51' E.); Leg. Miss. E.A. Oxtoby; 20.XI.1976; Reg. No. BM(NH) 1981.6.2714-2717, 4 Ex.; Uganda, Kampala, house garden 25. January Avenue; Leg. Miss. E.A. Oxtoby; V.1974; Reg. No. BM(NH) 1981.6.2532-2536, 5 Ex.; Kenya, Kakamega, forest, 1600 m, under bark of rotting fallen tree; Leg. McKay; 24.XI.1976. Reg. No. BM(NH) 1981.6.2718, 1 Ex.

Dichogaster (Diplothecodrilus) austeni (Beddard, 1901)

Syn.: *Dichogaster loveridgei* Stephenson, 1933 (Csuzdi, 1991)
Dichogaster monticellii Cognetti, 1915 (Csuzdi, 1995)
Dichogaster pafuriensis Reinecke & Ackermann, 1977 (Csuzdi, 1995)

Material examined: *Benhamia austeni,* Types; Nyasaland; Reg. No. BM(NH) 1904.10.5.631-649; *Dichogaster loveridgei,* Paratypes; Tanganyika, Kigogo, Uzungve Mts; Leg. A. Loveridge; Reg. No. BM(NH) 1932.11.18.1-3.

New record: Tanzania, Mwanikana Forest Reserve, 5000 ft, in rotten log; Leg. K.M. Howell & S.N. Stuart; 4.I.1978; Reg. No BM(NH) 1982.28.1-2, 2 Ex.

Dichogaster (Diplothecodrilus) bolaui (Michaelsen, 1891)

Syn.: *Dichogaster bolaui* var. *decanephra* Michaelsen, 1915 (Righi, 1968)
Dichogaster bolaui var. *malabaricus* Stephenson, 1920 (Righi, 1968)
Benhamia bolaui pacifica Eisen, 1900 (Michaelsen, 1900)
Dichogaster lageniformis Friend, 1916 (Csuzdi & Zicsi, 1989)
Dichogaster hatomaana Ohfuchi, 1957 (Csuzdi, 1995)
Benhamia malayana Horst, 1893 (Pickford, 1938)
Benhamia octonephra Rosa, 1895 (Michaelsen, 1900)
Benhamia rugosa Eisen, 1896 (Pickford, 1938)

Material examined: *Dichogaster bolaui,* Type; Germany, Hamburg; Leg. W. Michaelsen; Reg. No. BM(NH) 1924.3.1.244.

New records: Kenya, Muranga district, Kimandi, edge of stream near forest, Oxtoby's Shamba field (0° 43' S., 37° 09' E.); Leg. Miss. E.A. Oxtoby; IX.1976; Reg. No. BM(NH) 1981.6.2701, 1 Ex.; Kenya, Ngorengore-Bomet road (0° 47' S. , 35 °12' E.); Leg. Miss. E.A. Oxtoby; 7.III.1978. Reg. No. BM(NH) 1981.6.2613-261, 5 Ex.; Kenya, Nairobi, Kenyatta College; Leg. Miss. E.A. Oxtoby; 22.VII.1974; Reg. No. BM(NH) 1981.6.2860-2861, 2 Ex.; Kenya, Kakamega forest station nursery (0° 16' N., 34° 53' E.); Leg. Miss. E.A. Oxtoby; 14.XI.1978; Reg. No. BM(NH) 1981.6.2583-2584, 2 Ex.; Kenya, Muewa grassland (0° 45' S., 37° 29' E.); Leg. Miss. E.A. Oxtoby; 7.III.1978. Reg. No. BM(NH) 1981.6.2823-2824, 2 Ex.; Kenya, Machakos district, Mbooni (1° 40' S., 37° 40' E.); Leg. Miss. E.A. Oxtoby, IX.1974. Reg. No. BM(NH) 1981.6.2802-2811, 11 Ex.; Kenya, Mombasa, Shirino-la-Tewa school; Leg. Miss. E.A. Oxtoby; VI.1974; Reg. No. BM(NH) 1981.6.2865-2866, 2 Ex.; Kenya, Mbooni, Machakos district (1° 39' S., 37° 28' E.); Leg. J. Kamen; IX.1974; Reg. No. BM(NH) 1981.6.2572-2580, 9 Ex.; Kenya, Mombasa, Shino-la-Tewa school; Leg. J. Kamen; Reg. No. BM(NH) 1981.6.2541-2567, 27 Ex.; Oman, 2 km. N. of Al Khadra, wadi Saktan Jabal 1500 ft; (23° 22' N., 57° 19 E.); Leg. M.D. Gallagher; 6.V.1977; Reg. No. BM(NH) 1977.18.13, 1 Ex.; Galapagos, Santa Cruz, S.W. of Mount Crocker (main peak) 1800 ft; Leg. Hugh A. Ford; 7.IX.1968; Reg. No. BM(NH) 1982.40.20, 1 Ex.

Remarks: In addition to this newly identified material, there are other series of *D. (Dt.) bolaui* originating from various parts of the world.

Dichogaster (Diplothecodrilus) christyana Michaelsen, 1937

Material examined: *Dichogaster christyana,* Types; Lake Nyasa, Vua; Leg. C. Christy; Reg. No. BM(NH) 1926.7.27.8-13.

Dichogaster (Diplothecodrilus) culminis (Michaelsen, 1896)

Syn.: *Dichogaster duwonica* Cognetti, 1907 (Csuzdi, 1995)
Dichogaster dorsalis Michaelsen, 1915 (Csuzdi, 1995)

Material examined: *Dichogaster daemoniaca*, Cognetti, 1907; Ruwenzori, Nyamgasani valley; Leg. D. Buxton, I. 1935 Reg. No. BM(NH) 1935.4.24.1-4 (Michaelsen, 1937).

New record: Uganda, S.W., Ruwenzori Nyamagasani valley; Leg. B. Jamieson; 21.I.1956; Reg. No. BM(NH) 1957.3.8.1, 4, 9, 3 Ex.

Dichogaster (Diplothecodrilus) djemdjemensis Stephenson, 1932

Material examined: *Dichogaster djemdjemensis*, Type; Abyssinia, Djem-Djem forest; Leg. J. Omer-Cooper; 10.X.1926; Reg. No BM(NH) 1931.12.9.12.

Dichogaster (Diplothecodrilus) elgonensis Michaelsen, 1937

New record: Uganda, Mt. Elgon, river Sasa; Leg. B. Jamieson; Reg. No. BM(NH) 1973.20.2-10, 7 Ex., AF/3311, 2 Ex.

Dichogaster (Diplothecodrilus) erlangeri Michaelsen, 1903

Syn.: *Dichogaster kenyae* Michaelsen, 1914b (Csuzdi, 1995)

Material examined: *Dichogaster aequatorialis* (Michaelsen, 1896); Kenya, 7000 ft; Leg. S.L. Hinde; Reg. No. BM(NH) 1911.9.22.6-9.

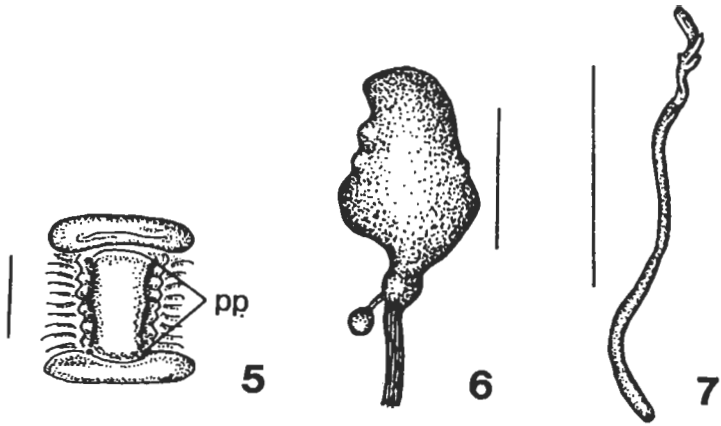
New records: Kenya, Muranga district Kimandi, Oxtoby's Shamba field (0° 43' S., 37° 09' E.); Leg. Miss. E.A. Oxtoby; Reg. No. BM(NH) 1981.6.2691, 1 Ex.; Kenya, Kimande, forest lake in plantation (0° 49' S., 36° 48' E.); Leg. Miss. E.A. Oxtoby 1.V.1976; Reg. No. BM(NH) 1981.6.2722, 1 Ex.; Kenya, Meru district, forest near Nkubu, mainly *Podocarpus* vegetation (0° 04' S., 37° 40' E.); Leg. Miss. E.A. Oxtoby; VI.1974; Reg. No. BM(NH) 1981.6.2791, 1 Ex.; Kenya, Meru forest (0° 05' N., 37° 37' E.); Leg. Miss. E.A. Oxtoby; 1970; Reg. No. BM(NH) 1981.6.2785, 1 Ex.; Kenya, Muranga district Kimandi, above Oxtoby's Shamba field (0° 43' S., 36° 48' E.) 7500 ft.; Leg. Miss. E.A. Oxtoby, XII. 1976; Reg. No. BM(NH) 1981.6.2702-2703, 1 Ex., AF/3310, 1 Ex.

Dichogaster (Diplothecodrilus) gracilis (Michaelsen, 1892)

Syn. *Benhamia pallida* Michaelsen, 1892 (Michaelsen, 1907)

Material examined: Kenya, Mt. Kenya Sirimoni track (0° 03' S , 37° 17' E), 4000 m; Leg. E.A. Oxtoby; 19 XI. 1974; Reg. No. BM(NH) 1981.6.2467-2492, 21 Ex.

New records: Kenya, Aberdares foothills, Castle forest, N. of Nairobi, near river, 6800 ft; Leg. Miss. E.A. Oxtoby; 30.I.1974; Reg. No. BM(NH) 1981.6.2724-2727, 4 Ex., AF/3304, 1 Ex.



Figs. 5–7. *Dichogaster (Diplothecodrilus) guildingi* Baird, 1871. 5. Ventral view of the prostatic region: pp = prostatic pores. 6. Spermatheca. 7. Penial seta. (Scale bar 1 mm)

Dichogaster (Diplothecodrilus) guildingi Baird, 1871

Material examined: *Lumbricus guildingi,* Types; St. Vincent, W. Indies; Leg. Rev. Lansdown Guilding; Reg. No. BM(NH) 1839.12.26.28, 2 Ex.

Remarks: This species was regarded as *species incertae sedis* by Michaelsen (1900). The two preadult type specimens in the Museum are however in good condition, so that a short redescription can be given.

External characters. Length of the specimens 50 mm, diameter 2.5 mm. The colour of the preserved specimens is yellowish. First dorsal pore occurs in intersegmental forrow 5/6. Setae are closely paired and all on the ventral surface of the body. Female pores are paired on segment *xiv,* situated somewhat ventrally from the setae *a.* Two pairs of spermathecal pores are present in furrows 7/8 and 8/9 in setal lines *ab.* Male pores are paired on segment *xviii,* they are inconspicuous, situated along the seminal grooves. There is no clitellum, but a ventromedian genital field situated between segments *xvii* and *xix.* There are two pairs of prostatic pores on segments *xvii* and *xix* in setal line *b* connected on each side by a bow-shaped seminal groove (Fig. 5). Genital papillae absent.

Internal chatacters. Two large distinct gizzards in segments *v* and *vi.* Calciferous glands are lamellate and paired in segments *xv-xvii,* about equal in size. Paired lateral hearts are present in segments *x, xi* and *xii.* The excretory system is meronephridial with 7 sac-shaped meronephridia on each

side. Apart from meronephridia, there is a pair of ventromedian megameronephridia on the posterior part of the body. Testes and funnels are paired, situated in segments *x* and *xi*. Two pairs of small seminal vesicles presents in *xi, xii*. Two pairs of tubular prostatic glands are present as big highly coiled tubes in *xvii* and *xix*. Each prostate is provided with a large penial setal sac containing only one fully developed and several immature setae. The fully formed seta is somewhat curved, 2 mm in length, and at the middle 0.025 mm thick. Its ectal end is sharply pointed, and the upper third shows a very characteristic ornamentation of scattered teeth becoming gradually stronger towards the tip (Fig. 6). There are two pairs of spermathecae of almost equal size in segments *viii* and *ix*. The duct is short, its length is about one-third of the ampulla. The ampulla consists of a small lower part that is provided with a little spherical diverticulum as well as with a large irregular sac-shaped upper part (Fig. 7).

Dichogaster (Diplothecodrilus) heterochaeta Michaelsen, 1922

Syn.: *Dichogaster chappuisi* Černosvitov, 1938 (Csuzdi, 1995)

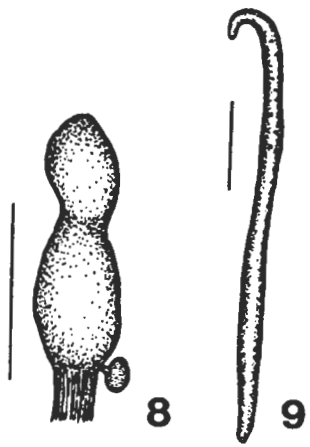
Material examined: *Dichogaster chappuisi*, Syntypes; Mt. Elgon; 20. VIII. 1933; Reg. No. BM(NH) 1949.3.1.732-733.

Remarks. The type specimen is located in the Muséum national d'Histoire naturelle, Paris (Jamieson, 1975). In the Natural History Museum, London, only several microscope slides could be found.

Dichogaster (Diplothecodrilus) ? jamaicae (Eisen, 1900)

Material examined: *Eutrigaster orobia* (Graff, 1957); Jamaica, Coley near Kellits, 950 m; from an epiphyte; Leg. R.W. Sims; 13. XI. 1973; Reg. No. BM(NH) 1986.2.601 (Sims, 1987). *Eutrigaster orobia* (Graff, 1957); Jamaica, St. Anne's District, 3-4 km north of the Mason River Research Station, 850 m, from epiphytes; Leg R.W. Sims, 14. XI.1073; Reg. No. BM(NH) 1986.2.602-604. (Sims, 1987).

Remarks: In his revision of the genus *Eutrigaster* Cognetti, 1904, Sims (1987) published a new occurrence of *E. orobia* (Graff, 1957) from Jamaica but there are some differences from the original description of *E. orobia* (Graff, 1957): the diverticulum of the spermatheca is unilocular (Fig. 8), and penial setae are attached to each prostate. These setae are short, about 0.4 mm long and 0.008 mm wide. Their tip is somewhat curved, hook-shaped. The ornamentation is almost missing, only several small, hardly visible teeth are present on the ectal end (Fig. 9). There are only 3 meronephridia on each side.



Figs. 8–9. *Dichogaster (Diplothecodrilus) ? jamaicae* (Eisen, 1900). 8. Spermatheca. 9. Penial seta. (Scale bar 1 mm: 8., and 0.1 mm: 9.)

Dichogaster (Diplothecodrilus) jordani Michaelsen, 1937

Material examined: *Dichogaster jordani,* Types; Angola, Kongulu, Amboim district, 800 m; Leg. K. Jordan; Reg. No. BM(NH) 1935.1.28.1-5, 1935.1.28.13-22, 1935.3.24.1.

Dichogaster (Diplothecodrilus) kigogoana Stephenson, 1932

Syn.: *Dichogaster hamburgensis* Omodeo, 1958 nom. nov. pro *Dichogaster rosea* Michaelsen, 1935 nec *Dichogaster rosea* (Michaelsen, 1889) (Csuzdi, 1995)

Material examined: *Dichogaster kigogoana,* Type; Reg. No. BM(NH) 1933.2.22.646-647.

Remarks: Only several microscope slides could be found.

Dichogaster (Diplothecodrilus) loboziana Michaelsen, 1915

Syn. nov. *Dichogaster flagellifera* Stephenson, 1933

Material examined: *Dichogaster flagellifera,* Types; Zaire, Albertville; Leg. A. Loveridge; 21.V.1930; Reg. No. BM(NH) 1932.11.18.6-7.

Dichogaster (Diplothecodrilus) loennbergi Michaelsen, 1912

New records: Kenya, Meru district, forest near Nkubu, mainly *Podocarpus* vegetation (0° 04' S., 37° 40' E.); Leg. Miss. E.A. Oxtoby; VI.1974; Reg. No. BM(NH) 1981.6.2786-2787, 2 Ex., AF/3315, 1 Ex.; Kenya, Aberdares foothills, Castle forest station, N. of Nairobi, near river, 6800 ft; Leg. Miss. E.A. Oxtoby; 30.I.1974; Reg. No. BM(NH) 1981.6.2723, 1 Ex.

Dichogaster (Diplothecodrilus) macfadyeni Csuzdi, 1991

New record: Tanzania, Tanga region, W. Usambara Mts., Mazumbai Forest Reserve, under log; Leg. K.M. Howell, S.N. Stuart; XII. 1978; Reg. No. BM(NH) 1980.34.1, 1 Ex.

Dichogaster (Diplothecodrilus) modesta Michaelsen, 1903

Syn.: *Dichogaster hamatus* Stephenson, 1932 (Csuzdi, 1995)

Material examined: *Dichogaster hamatus*, Types; Abyssinia, Djem-Djem forest; Leg. J. Omer-Cooper; 21.IX.1926; Reg. No. BM(NH) 1931.12.9.5-10.

Dichogaster (Diplothecodrilus) modiglianii (Rosa, 1896)

Syn.: *Dichogaster doveri* Stephenson, 1931 (Stephenson, 1931a)
Benhamia kafuruensis Michaelsen, 1896 (Csuzdi & Zicsi, 1989)
Benhamia nana Eisen, 1896 (Csuzdi & Zicsi, 1989)
Benhamia papillata Eisen, 1896 (Omodeo, 1973)
Benhamia papillata var. *hawaiiensis* Eisen, 1900 (Omodeo, 1973)

Material examined: *Dichogaster doveri*, Types; In ditch, museum compound, Kuala Lumpur, Selangor, Federated Malay States; Leg. C. Dover 1933.2.14.60-61.

New records: Kenya, Ngorengore-Bomet road (0° 47' S. , 35° 12' E.); Leg. Miss E.A. Oxtoby; 7.III.1978; Reg. No. BM(NH) 1981.6.2618-2630, 13 Ex.; Kenya, Nairobi Kenyatta College; Leg. Miss E.A. Oxtoby; 22.VII.1974; Reg. No. BM(NH) 1981.6.2856-2859, 4 Ex.; Kenya, Kakamega forest station nursery (0° 16' N., 34° 53' E.), Leg. Miss E.A. Oxtoby; 14.XI.1978; Reg. No. BM(NH) 1981.6.2581-2582, 2 Ex.; Kenya, Muewa grassland (0° 45' S., 37° 29' E.); Leg. Miss E.A. Oxtoby; 7.III.1978; Reg. No. BM(NH) 1981.6.2815-2822, 8 Ex.; Kenya, pine plantation Nduru near Kisii (0° 41' S. , 34° 46' E.); Leg. Miss E.A. Oxtoby; VI.1971; Reg. No. BM(NH) 1981.6.2896-2898, 3 Ex.; Kenya, Mombasa, Shino-la-Tewa school; Leg. Miss E.A. Oxtoby; Reg. No. BM(NH) 1981.6.2540, 1 Ex.; Sudan, Dafur; Leg. Admiral Lynes; Reg. No. BM(NH) 1923.10.31.13, 1 Ex.

Dichogaster (Diplothecodrilus) mundamensis (Michaelsen, 1897)

Syn.: *Dichogaster mansfeldi* Michaelsen, 1915 (Csuzdi, 1995)

New records: Nigeria, 27 Km. E. of Calabar, under rotten leaves; Leg. J.C. Reid; 22.VI.1982; Reg. No. BM(NH) 1985.4.5, 1 Ex.; Canary Islands, La Laguna, Tenerife; Leg. Thomas; 22.IX.1978; Reg. No. BM(NH) 1982.5.21-45, 25 Ex.; Canary Islands, La Laguna, Tenerife; Leg. Thomas; 7.XI.1981; Reg. No. BM(NH) 1982.5.47-59, 10 Ex., AF/3312, 3 Ex.; Canary Islands, Santa Maria Del Mar, Tenerife; Leg. J.A.Talavera Sosa; 20.II.1977; Reg. No. BM(NH) 1982.5.46, 1 Ex.

Dichogaster (Diplothecodrilus) neumanni (Michaelsen, 1897)

New record: Uganda, Makerere, Resthouse near Butiaba, Lake Albert (1° 49' N., 31° 19' E.); Leg. Miss. E.A. Oxtoby; V.1974; Reg. No. BM(NH) 1981.6.2531, 1 Ex., AF/3303, 1 Ex.

Dichogaster (Diplothecodrilus) rubella Michaelsen, 1935

Material examined: *Dichogaster rubella*; Uganda, Kigezi Kayansa forest, 7500 ft; Leg. Pittman; Reg. No. BM(NH) 1934.4.23.1 (Michaelsen, 1937).

Dichogaster (Diplothecodrilus) rungweensis Stephenson, 1933

Material examined: *Dichogaster rungweensis*, Types; Tanganyika, Ukinga Mts. Madehani; Leg. A. Loveridge; Reg. No. BM(NH) 1932.2.23.644-668.

Dichogaster (Diplothecodrilus) ruwenzorii Cognetti, 1907

Material examined: *Dichogaster ruwenzorii*; Uganda, S.W., Ruwenzori Nyamagasani valley; Leg. B. Jamieson; 21.I.1956; Reg. No. BM(NH) 1957.3.8.2, 3, 5, 6, 7, 8, 10, 11.

Dichogaster (Diplothecodrilus) saliens (Beddard, 1893)

Syn.: *Dichogaster crawi* Eisen, 1900 (Stephenson, 1931a)

New records: Ghana, Tafo; Leg. M. A. Tazelaar; 1956; Reg. No. BM(NH) 1984.5.129; Penang; Coll. Beddard; Reg. No. BM(NH) 1904.10.5.185, 1 Ex.; Galapagos, Santa Cruz "Pampas" region, 2 km. N.W. of Media Luna, ca. 675 m; Leg. R. Silberglied; 4.VI.1970; Reg. No. BM(NH) 1982.42.3-8, 6 Ex.; Galapagos, Santa Cruz, S.W. of Mount Crocker (main peak), 1800 ft; Leg. Hugh A. Ford; 7.IX.1968; Reg. No. BM(NH) 1982.40.17-19, 3 Ex.

Dichogaster (Diplothecodrilus) scotti Stephenson, 1932

Material examined: *Dichogaster scotti*, Type; Abyssinia, Djem-Djem forest; Leg. J. Omer-Cooper. Reg. No. BM(NH) 1931.12.9.16.

New records: Zaire, Kivu; Leg. Gasana Ndoli; 1973; Reg. No. BM(NH) 1976.22.15-18; Zaire, Kivu; Leg. Gasana Ndoli; 1973; Reg. No. BM(NH) 1976.22.19-24.

Remarks. The three species *D.* (*Dt.*) *tanganyikae*, *D.* (*Dt.*) *tenuiseta* Michaelsen, 1936 and *D.* (*Dt.*) *silvestris* (Michaelsen, 1896) are closely related. In a previous paper, Csuzdi and Zicsi (1994a) have raised the question of uniting the first two, but later, after examining series of specimens from all the three species, remarkable differences have been found between them. They are as follows:

D.(Dt) tenuiseta: Penial setae maximum 0.01 mm wide in the middle, and the ectal end putty-knife shaped. Meronephridia about 10 on each side of the intestine.

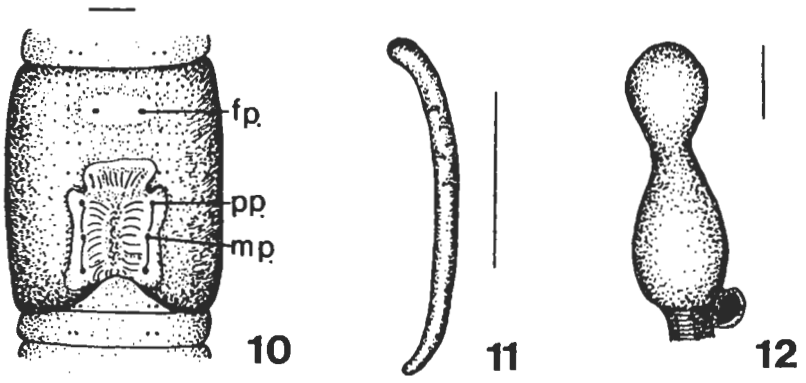
D.(Dt.) silvestris: Penial setae about 0.02 mm wide in the middle, the ectal tip sharply pointed. Meronephridia about 6 on each side of the intestine.

D. (Dt.) tanganyikae: Penial setae around 0.012 mm wide in the middle, the ectal end sharp. Meronephridia about 10 on each side of the intestine.

Dichogaster (Diplothecodrilus) hindei sp. n.

External characters. Holotype: length 120 mm; diameter just after the clitellum 7 mm; number of segments 173. Paratypes are 105-125 mm in length, 5-7 mm in diameter; there are 172-181 segments. The colour of the preserved specimens is yellowish. The prostomium is epilobous 1/2 open and the first dorsal pore occurs in intersegmental furrow 5/6. Setae are closely paired and all on the ventral surface of the body. Setal formula at segment *xxii*: *aa:ab:bc:cd:dd* = 15:2:15:1.5:130. Female pores are paired on segment *xiv* situated somewhat anteriorly to the setae *a*. Two pairs of spermathecal pores present in furrows 7/8 and 8/9 in setal lines *ab*. Male pores paired on segment *xviii* in setal line *a*, small but conspicuous, situated along the seminal grooves. Clitellum extends over segments *xiii-xx*, excluding the *xiiith* and *xxth* annular, interrupted by a ventromedian genital field situated between segments *xvii* and *xix*. Two pairs of prostatic pores on segment *xvii* and *xix* in setal line *b* connected on each side by a straight seminal groove (Fig. 10). Genital papillae absent.

Internal characters. The anterior septa to 7/8 are hardly visible while septa 9/10-10/11 slightly thickened and those of 11/12-13/14 strongly strengthened. Two large distinct gizzards in segments *v* and *vi*. Calciferous glands lamellate and paired in segments *xv-xvii*, of about equal size.



Figs. 10–12. *Dichogaster (Diplothecodrilus) hindei* sp. n. 10. Ventral view of the clitellar region; fp = female pores, pp = prostatic pores. 11. Penial seta. 12.; Spermatheca. (Scale bar 1 mm)

Typhlosole arises in segment *xx* as a low slender ridge gradually becoming a large bilobate organ. Paired lateral hearts are present in segments *x*, *xi* and *xii*. The excretory system is meronephridial with 7 sac-shaped meronephridia on each side. Apart from meronephridia, there is a pair of ventromedian megameronephridia on the posterior part of the body. Testes and funnels paired in segments *x* and *xi*, filled with free sperm masses. Two pairs of small seminal vesicles presents in *xi*, *xii* and a pair of large racemose ovaries pendent from the posterior face of septum 12/13. Ovarian funnels small, leading into a little ovisac in segment *xiv*. The two vasa deferentia of each side are easily seen entering the body wall in segment *xviii*. The ectal portions of sperm ducts are highly convoluted and somewhat thickened.

Two pairs of tubular prostatic glands present as short slightly coiled tubes each confined to segment *xvii* or *xix*. Each prostate is provided with a large penial setal sac containing only one fully developed and several immature setae. The fully formed seta is somewhat curved, 2 mm in length, and at the middle 0.03 mm thick. Its ectal end is rather rounded and the upper third shows a very characteristic ornamentation of densely arranged transverse toothed bars (Fig. 11). There are two pairs of spermathecae in segment *viii* and *ix* of almost equal size. The duct is very short and about half of the diameter of the ampulla, which is large, oval shaped, divided into two parts by a narrow neck. The lower part of the ampulla is somewhat larger than the upper one

carrying an oval sessile diverticulum that sometimes contains two sperm-balls (Fig. 12).

Remarks: This species shows affinities with *D. (Dt.) princeps* Cognetti, 1910, but differs in the form of the penial setae and the spermathecae as well as in the absence of genital papillae.

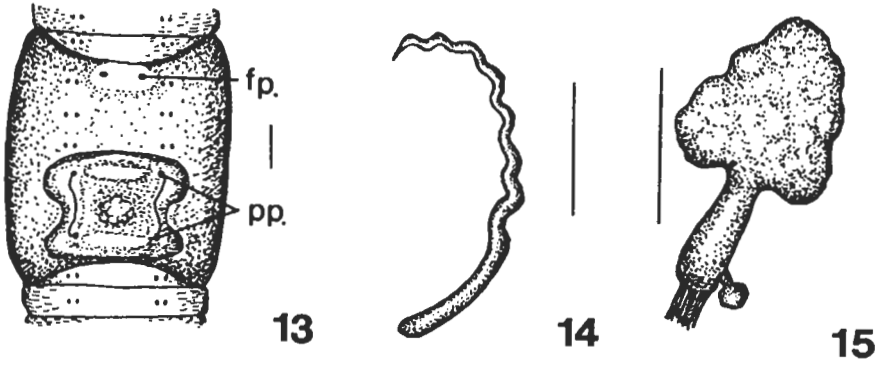
Localities: **Holotype**; Kenya, Aberdare Mts., 10000 ft., Leg. Hinde, Reg. No. BM(NH) 1910.8.3.5; **Paratypes**; Kenya, Aberdare Mts., 10000 ft., Leg. Hinde, Reg. No. BM(NH) 1910.8.3.6-21, 16 Ex., AF/3318, 6 Ex.; Kenya, Aberdare Mts. Nat. Park, roots of giant lobelias; Leg. Miss. E.A. Oxtoby, IV.1972, Reg. No. BM(NH) 1981.6. 2516, 1 Ex.; Kenya, Aberdares, 3000 m, Leg. Miss. E.A. Oxtoby, 18.XI.1974, Reg. No. BM(NH) 1981.6.2537-2538, 2 Ex.

Dichogaster (Diplothecodrilus) oxtobyae sp. n.

External characters. Holotype 65 mm in length, diameter just after the clitellum 4 mm, number of segments 141. The Paratypes are 40-80 mm in length, 3-4 mm in diameter. There are 122-135 segments. The colour of the preserved specimens is yellowish. Prostomium epilobous 1/2 open and the first dorsal pore occurs in intersegmental furrow 5/6. The setae are closely paired and all on the ventral surface of the body. Setal formula at segment *xxiv: aa:ab:bc:cd:dd* = 11:3.5:14:4:140. Female pores paired on segment *xiv* situated somewhat anteriorly to the setae *a*. Two pairs of spermathecal pores are present in furrows 7/8 and 8/9 in setal lines *a*. Male pores are paired on segment *xviii*, they are inconspicuous, situated in the seminal grooves. The clitellum extends over segments *xiii-xx*, annular, incomplete ventrally on *xiii* and *xx*. There is a ventromedian genital field situated between segments *xvii* and *xix*. Two pairs of prostatic pores present on segment *xvii* and *xix* in setal line *b* connected on each side by a bow-shaped seminal groove (Fig. 13). Genital papillae absent.

Internal characters. Anterior septa to 6/7 are hardly visible while septa 7/8-16/17 are slightly thickened. There are two large distinct gizzards in segments *v* and *vi*. Calciferous glands are lamellate and paired in segments *xv-xvii*, of about equal size. Typhlosole simple undulated ridge arising in segment *xxiv*. Paired lateral hearts are present in segments *x*, *xi* and *xii*. Excretory system meronephridial with 6-7 sac-shaped meronephridia on each side. The meronephridia are followed by a pair of ventromedian megameronephridia on the posterior part of the body. Testes and funnels are paired, situated in segments *x* and *xi* enclosed into perioesophageal spermsacs. Two pairs of seminal vesicles present in *xi, xii* and a pair of large racemose ovaries pendent from the posterior face of septum 12/13. Ovarian funnels are small, ovisacs lacking. The two vasa deferentia of each side are easily seen entering the body wall in segment *xviii*. Ectal portions of sperm ducts are straight and somewhat thickened.

Two pairs of tubular prostatic glands are present as long highly coiled tubes in segment *xvii* and *xix*. Each prostate is provided with a large penial

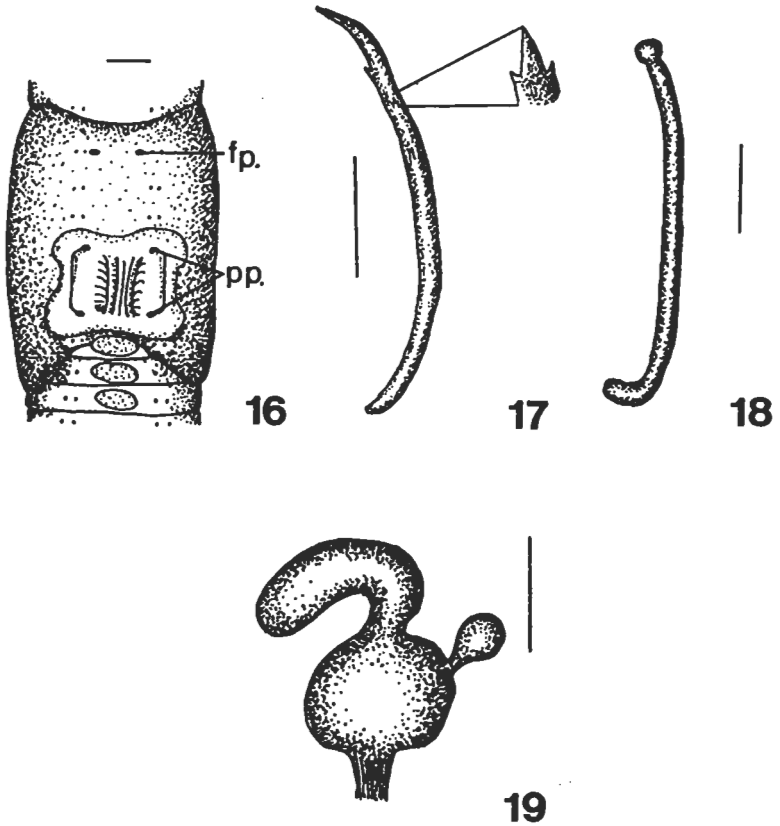


Figs. 13–15. *Dichogaster (Diplothecodrilus) oxtobyae* sp. n. 13. Ventral view of the clitellar region; fp = female pores, pp = prostatic pores. 14. Penial seta. 15. Spermatheca. (Scale bar 1 mm)

setal sac containing only one fully developed and several immature setae. The fully formed seta is somewhat curved, 3 mm in length, and at the middle 0.01 mm thick. Its ectal tip is simple and moderately sharply pointed. The ornamentation of the seta is restricted to its ectal half, consisting of scattered little teeth (Fig. 14). There are two pairs of spermathecae in segment *viii* and *ix* of almost equal size. The duct is short and somewhat narrower than the lower part of the ampulla. The ampulla which is three times longer than the duct, is divided into two parts by a narrow neck. The lower part of the ampulla carrying a roundish diverticulum somewhat longer than the pear-shaped upper one (Fig. 15).

Remarks. This species shows close affinities with *D. (Dt.) kiwuensis* Michaelsen, 1910, but there are significant differences in form of the spermathecae and in situation of the clitellum.

Localities: Holotype; Kenya, Meru forest (0° 05' N., 37° 37' E.); Leg. Miss. E.A. Oxtoby; 1970; Reg. No. BM(NH) 1981.6.2783; Paratypes; Kenya, Meru forest (0° 05' N., 37° 37' E.); Leg. Miss. E.A. Oxtoby; 1970; Reg. No. BM(NH) 1981.6.2784, 1 Ex; Kenya, Kimande forest, 7500 ft; (0° 49' S. , 36° 48' E.); Leg. Miss. E.A. Oxtoby; XII. 1976; Reg. No. BM(NH) 1981.6.2829-2830, 2 Ex., AF/3313, 1 Ex.; Kenya, Muranga district Kimandi, above Oxtoby's Shamba field (0° 43' S., 36° 48' E.), 7500 ft.; Leg. Miss. E.A. Oxtoby, XII. 1976; Reg. No. BM(NH) 1981.6.2704-2713, 8 Ex., AF/3309, 2 Ex.



Figs. 16–19. *Dichogaster (Diplothecodrilus) simsi* sp. n. 16. Ventral view of the clitellar region; fp = female pores, pp = prostatic pores. 17. Larger penial seta. 18. Smaller penial seta. 19. Spermatheca. (Scale bar 1 mm [16., 19.]; 0.5 mm [17.] and 0.25 mm [18.])

Dichogaster (Diplothecodrilus) simsi sp. n.

External characters. Length of the Holotype 65 mm, diameter just after the clitellum 4 mm, number of segments 137. Paratypes are 60-70 mm in length, 3-5 mm in diameter, number of segments 112-142. The colour of the preserved specimens is yellowish. The prostomium is prolobous, the first dorsal pore

occurs in intersegmental forrow 5/6. Setae are closely paired and all on the ventral surface of the body. Setal formula at segment *xxii: aa:ab:bc:cd:dd* = 19:3:15:2:130. Female pores are paired on segment *xiv,* situated in the setal ring within *aa,* distance from *a* = 1/2 *ab.* Two pairs of spermathecal pores are present in furrows 7/8 and 8/9 in setal lines *ab.* Male pores are paired on segment *xviii,* they are inconspicuous, situated in the seminal grooves. Clitellum extends over segments *xiii-xxi,* 1/2 *xxii,* excluding the *xiiith* and *xxith* segments annular, interrupted by a genital field situated on the ventral surface between segments *xvii* and *xix.* There are two pairs of prostatic pores on segment *xvii* and *xix* in setal line *a* connected on each side by a straight seminal groove. Unpaired ventromedian genital papillae present on segment *xx-xxii* (Fig. 16).

Internal characters. Anterior septa to 7/8 are not recognisable. There are no septa notably strengthened, but 10/11-13/14 are slightly thickened. There are two large distinct gizzards in segments *v* and *vi.* Calciferous glands are lamellate and paired in segments *xv-xvii,* of about equal size. The typhlosole arises in segment *xxii* as a low slender ridge gradually becoming a moderate bilobate organ. Paired lateral hearts are present in segments *x, xi* and *xii.* Excretory system is meronephridial, there are 5 sac-shaped meronephridia on each side of the intestine. In addition to meronephridia, there is a pair of ventromedian megameronephridia on the posterior part of the body. Testes and funnels are paired in segments *x* and *xi,* closed into a large ventromedian testis sac. Two pairs of seminal vesicles present in *xi, xii,* and a pair of large racemose ovaries hanging from the posterior face of septum 12/13. Ovarial funnels are small leading into a little ovisac in segment *xiv.* The two vasa deferentia of each side are easily seen entering the body wall in segment *xviii.* The ectal portions of sperm ducts are slightly convoluted and somewhat thickened.

Two pairs of tubular prostatic glands are present in *xvii* and *xix.* They are short, slightly coiled tubes confined into their own segment. Each prostate is accompanied by a penial setal sac containing two different types of mature setae. The larger seta is somewhat curved, 1.35 mm in length, and at the middle 0.025 mm thick. Its ectal tip is simple and moderately sharply pointed. The upper third of this seta shows a very characteristic ornamentation of scattered prominent teeth, of which the first under the tip is a very strong forward standing one. The second seta is smaller, 0.65 mm in length and at the middle 0.01 mm in diameter. Its tip is rounded knob shaped, the ornamentation consists of small thorns situated on the ectal third of the seta (Figs. 17–18). There are two pairs of spermathecae in segment *viii* and *ix* of almost equal size. The duct is short and about one-third of the diameter of the ampulla that is pear-shaped, divided into two parts. The lower part of ampulla is slightly larger than the sometimes downward bent upper one. There is a small, almost sessile diverticulum arising from the lower part of ampulla (Fig. 19).

Remarks. This species appears to be close to *D. (Dt.) macfadyeni* Csuzdi, 1991 but differs in several characters, for example the extension of clitellum, shape of spermatheca, dimension and ornamentation of the larger penial seta.

Localities: Holotype; Kenya, Aberdare Mts., 10000 ft., Leg. Hinde, Reg. No. BM(NH) 1910.8.3.25; Paratypes; Kenya, fort Hull, 4400 ft; Leg. Hinde; Reg. No. BM(NH) 1910.8.3.22-23, 2 Ex.; Kenya, Aberdare Mts., 10000 ft., Leg. Hinde, Reg. No. BM(NH) 910.8.3.26-40, 15 Ex., AF/3319, 5 Ex.; Kenya, Aberdare Mts., 3000 m (0° 25' S , 36° 38' E), Leg Miss. E.A. Oxtoby, 18. XI. 1974, Reg. No. BM(NH) 2497-2515, 14 Ex., AF/3316, 5 Ex.; Kenya, Aberdare Mts. Nat. Park. roots of giant lobelias; Leg. Miss. E.A. Oxtoby, VI. 1972, Reg. No. BM(NH) 1981.6. 2517-23, 5 Ex., AF/3306, 2 Ex.

Genus *Eutrigaster* Cognetti, 1904, emend. Csuzdi & Zicsi, 1991

Subgenus *Eutrigaster* Cognetti, 1904

Eutrigaster (Eutrigaster) grandis Sims, 1987

Material examined: *Eutrigaster grandis*, Syntypes; Jamaica, Coley, near Kellits, Calderon, 925 m; Leg. R.W. Sims; 13. XI. 1973; Reg. No. BM(NH) 1986.2.582-587.

Remarks: In contrast to the original description (Sims, 1987, p. 435), the species is holoandric. It has two pairs of testes in segments *x* and *xi* and two pairs of seminal vesicles in segments *xi* and *xii*.

Eutrigaster (Eutrigaster) montecyanensis Sims, 1987

Syn. *Eutrigaster franzi* Csuzdi & Zicsi, 1991 (Csuzdi, 1995)

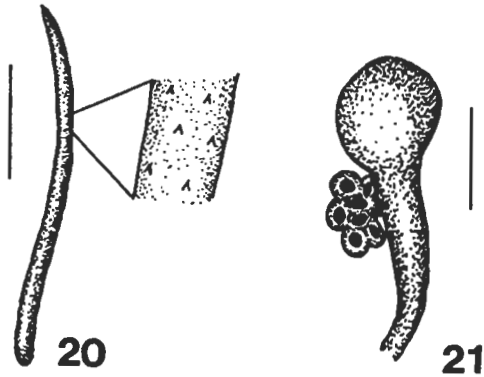
Material examined: *Eutrigaster montecyanensis*, Syntypes; Jamaica, near Irish Town, beside the road to Newcastle, Blue Mountains, 1000 m; Leg. R.W. Sims; 6. XI. 1973; Reg. No. BM(NH) 1986.2.593-596; *Eutrigaster montecyanensis*, Jamaica, St. Anne's area, 5 km north of the Mason River Research Station, Calderon; Leg. R.W. Sims; Reg. No. BM(NH) 597-600.

Remarks: In contrast to the original description (Sims, 1987, p. 435), the species is holoandric. It has two pairs of testes in segments *x* and *xi* and two pairs of small seminal vesicles in segments *xi* and *xii*.

Subgenus *Graffia* Csuzdi & Zicsi, 1991

Eutrigaster (Graffia) maya sp. n.

External characters. Length of the incomplete Holotype 52 mm, diameter just after the clitellum 3.5 mm, number of segments 95. Paratypes 48-65 mm in length, 3-3.5 mm in diameter, 107-132 segments present. The colour of the preserved specimens is reddish-brown. Prostomium is almost tanylobic, V-



Figs. 20–21. *Eutrigaster (Graffia) maya* sp. n. 20. Penial seta. 21. Spermatheca. (Scale bar 0.1 mm: 20., and 0.5 mm: 21.)

shaped. First dorsal pore in furrow 11/12. Setae closely paired along the ventral surface of the body. Setal formula at segment *xxiv* is *aa:ab:bc:cd:dd* = 9:2.5:9:3:75. Female pores paired on segment *xiv*, situated somewhat anteriorly to the setae *a*. Two pairs of spermathecal pores are present in furrows 7/8 and 8/9 in setal lines *ab*. Male pores are paired on segment *xviii*, they are minute but conspicuous, situated in the seminal grooves. The clitellum extends over segments *xiii-xx*, annular but not fully developed. Two pairs of prostatic pores present on segment *xvii* and *xix* in setal line *b* connected on each side by a bow-shaped seminal groove. Genital papillae absent.

Internal characters. There are no thickened septa. A slightly muscular proventriculus present in segment *v*. Two large distinct gizzards situated in segments *vi* and *vii*. Calciferous glands are lamellate and paired in segments *xv-xvii*, of about equal size. Typhlosole simple, arises in segment *xxiv*. There is a pair of accessory ridges between segments *xxiv-xxxi*. Paired lateral hearts present in segments *x*, *xi* and *xii*. Excretory system meronephridial with 6 sac-shaped meronephridia on each side. The meronephridia are followed by a pair of ventromedian megameronephridia on the posterior part of the body. Testes and funnels paired in segments *x* and *xi*, enclosed in perioesophageal sperm sacs. Seminal vesicles present in *xi*, *xii*, and a pair of large racemose ovaries pendent from the posterior face of septum 12/13. Ovarian funnels and ovisacs are small. The two vasa deferentia of each side are easily seen entering the body wall in segment *xviii*.

Two pairs of tubular prostatic glands are present as short slightly coiled tubes in segments *xvii* and *xix*. Each prostate is accompanied with a small setal sac containing two simple penial setae. The form of the penial setae is similar to the normal setae. They are very small, somewhat curved, 0.3 mm in length, and at the middle 0.01 mm thick. Its ectal tip is simple and moderately sharply pointed. The ornamentation of the seta is restricted to its ectal third, consisting of scattered minute teeth (Fig. 20). There are two pairs of spermathecae in segment *viii* and *ix* of almost equal size. The duct is long and its ental end somewhat widened. The ampulla is almost round. The widened ental part of the duct carries a multilocular diverticulum containing 4-7 sperm balls (Fig. 21).

Remarks. This species shows affinities with *E. (E.) lineri* (Righi, 1972) but in the case of Righi's species the penial setae show a stronger reduction.

Localities: **Holotype**; Mexico, Chiapas, Cerro Mozotal, 2990 m, 16.7 miles from pass on continental divide above Huixtila, from bromelias; Leg. R.L. Seib; Reg. No. BM(NH) 1985.33.25; **Paratypes**; Mexico, Chiapas, Cerro Mozotal, 2990 m, 16.7 miles from pass on continental divide above Huixtila, from bromelias; Leg. R.L. Seib; Reg. No. BM(NH) 1985.33.26-33, 8 Ex. and 1985.33.34-39, 6 juvenile Ex., AF/3314, 3+2 juv. Ex.

Genus *Guineoscolex* Csuzdi & Zicsi, 1994

Guineoscolex bolamensis (Cognetti, 1910)

Syn.: *Benhamia fula* Sims, 1967 (Csuzdi & Zicsi, 1994a).
Benhamia mandinka Sims, 1967 (Csuzdi & Zicsi, 1994a).

Material examined: *Benhamia fula,* **Syntypes**; Gambia, Birkama Ba, 10 miles W. of Georgetown. Leg. R.W. Sims, 5-7. X. 1964; Reg. No. BM(NH) 1966.30.155-189; *Benhamia mandinka,* **Syntypes**; Gambia, Birkama Ba, 10 miles W. of Georgetown. Leg. R.W. Sims; 5-7. X. 1964; Reg. No. BM(NH) 1966.30.129-150.

Genus *Millsonia* Beddard, 1894, emend. Sims, 1986

Remarks: As Sims (1986) presented a detailed synopsis of *Millsonia* material housed in the Natural History Museum, London, only the species found are listed hereby: *M. artesetosa* Sims, 1986; *M. ashantiensis* Sims, 1986; *M. brevicingulata* Sims, 1986; *M. caecifera* (Benham, 1894); *M. centralis* Sims, 1986; *M. cruciventris* Sims, 1986; *M. ditheca* Sims, 1965; *M. ghanensis* Sims, 1965; *M. guttata* (Michaelsen, 1912); *M. hemina* Sims, 1965; *M. heteronephra* (Michaelsen, 1897); *M. hortensis* Sims, 1986; *M. inermis* (Michaelsen, 1892); *M. jadwigae* Sims, 1986; *M. lamtoiana* Omodeo & Vaillaud, 1967; *M. mima* (Michaelsen, 1891); *M. moderata* Sims, 1986; *M. nigra* Beddard, 1894; *M. nilesi* Sims, 1986; *M. nota* Sims, 1986; *M. oracapensis* Sims, 1986; *M. pulvillaris* Sims, 1986; *M. pumilia* Sims, 1965; *M. riparia* Sims, 1986; *M. schlegeli* (Horst, 1884).

Genus *Monothecodrilus* Csuzdi & Zicsi, 1994

Monothecodrilus reductus (Sims, 1967)

Material examined: *Benhamia reducta,* Syntypes; Gambia, Jakali swamp, Sapu, 12 miles W. of Georgetown; Leg. R.W. Sims; 5. X. 1964; Reg. No. BM(NH) 1966.30.209-211.

Genus *Omodeona* Sims, 1967

Omodeona fallax (Cognetti, 1910)

Syn.: *Omodeona proboscoides* Sims 1967 (Csuzdi & Zicsi, 1994)

Material examined: *Omodeona proboscoides*; Syntypes; Gambia, Abuko, 10 miles S. of Bathurst. Reg. No. BM(NH) 1966.30.483-512.

Tribe Neogastrini Csuzdi, 1996

Diagnosis. Excretory system holonephric or meronephric with caudal megameronephridia. Two stalked extramural calciferous glands paired on the oesophagus in segments *xiv-xv*. One gizzard before the genital segments, sometimes reduced.

Genus *Wegeneriella* Michaelsen, 1933

Wegeneriella valdiviae (Michaelsen, 1902)

Material examined: *Wegeneriella valdiviae*; Nigeria, 27 km N.E. of Calabar, ca 20 % natural forest, in life bluish green; Leg. J.C. Reid; Reg. No. BM(NH) 1985.9.7.

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