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Scutogyrus gen. n. (Monogenea: Ancyrocephalidae) for *Cichlidogyrus longicornis minus* Dossou, 1982, *C. l. longicornis*, and *C. l. gravivaginus* Paperna and Thurston, 1969, with Description of Three New Species Parasitic on African Cichlids

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ABSTRACT: *Scutogyrus* gen. n. (Monogenae: Ancyrocephalidae) is defined for *Cichlidogyrus longicornis minus* Dossou, 1982, on *Sarotherodon melanotheron* (Cichlidae). This new genus is characterized by a dorsal transversal bar enlarged laterally with, in its median portion, 2 very long auricles hollow at their base and by the ventral transversal bar arched, rigid, and supporting 1 large, thin, oval plate. In agreement with Douëllou (1993), *C. longicornis* Paperna and Thurston, 1969, on *Oreochromis niloticus* and *C. gravivaginus* Paperna and Thurston, 1969, on *O. leucostictus* are considered valid; the new combinations *Scutogyrus longicornis* (Paperna and Thurston, 1969) and *S. gravivaginus* (Paperna and Thurston, 1969) are proposed for them. Three new species are also described: *Scutogyrus bailloni* sp. n. on *Sarotherodon galilaeus*, *S. ecoutini* sp. n. on *S. occidentalis*, and *S. chikhii* sp. n. on *O. mossambicus*. A key to the species of *Scutogyrus* is given.

RESUME: Un nouveau genre *Scutogyrus* gen. n. (Monogenea: Ancyrocephalidae) est défini pour *Cichlidogyrus longicornis minus* Dossou, 1982 parasite de *Sarotherodon melanotheron*. Le nouveau genre est caractérisé par la morphologie de la barre tranversale dorsale élargie latéralement et munie de 2 très longs auricules et de la barre transversale ventrale arquée, rigide, supportant 1 mince plaque ovoide. En accord avec Douëllou (1993) *Cichlidogyrus longicornis* Paperna et Thurston, 1969 de *Oreochromis niloticus* et *C. gravivaginus* Paperna et Thurston, 1969 de *O. leucostictus* sont considerés comme de bonnes espèces, nous proposons les nouvelles combinaisons *Scutogyrus longicornis* (Paperna et Thurston, 1969) et *S. gravivaginus* (Paperna et Thurston, 1969). Trois nouvelles espèces sont décrites: *S. bailloni* chez *Sarotherodon galilaeus*, *S. ecoutini* chez *S. occidentalis* et *S. chikhii* chez *Oreochomis mossambicus*. On propose une clé de détermination des *Scutogyrus*.

KEY WORDS: *Scutogyrus* gen. n., Monogenea, gills parasite, Cichlidae, freshwater, Africa.

This article addresses the finding, in West and Central Africa, on *Oreochromis niloticus* (L., 1758), on *O. mossambicus* (Peters, 1852), and on 3 species of *Sarotherodon* (*S. galilaeus* (L., 1758), *S. melanotheron* Rüppel, 1852, and *S. occidentalis* (Daget, 1962)) of monogeneans that, by the structure of their haptor, clearly belong to *Cichlidogyrus longicornis*. After careful examination of these parasites, it is believed that they represent, in this area, some specificity toward the hosts.

Materials and Methods

Fish were captured in various rivers and lagoons of Senegal, Gambia, Guinea, the Ivory Coast, and the Congo using gill nets or cast nets or after poisoning with Rotenone (Predatox®). Fish were either dissected on site immediately after capture or kept fresh and dissected later in the laboratory. In both cases, the left gill arches, separated by dorsal and ventral sections, were frozen at −20°C or in liquid nitrogen until examination. To verify the specific identity of host fishes, the carcasses were numbered, fixed, and preserved in formalin. After thawing, the parasites were detached from the gill using a strong water current and transferred individually with a mounted needle directly into a drop of ammonium picrate–glycerine mixture, according to Malmberg (1957). The preparation was then covered with a round coverslip, and after several hours (necessary for proper impregnation by the mounting medium) the coverslip was sealed with Glyceel (GURR-BDH Chemicals Ltd.). From these preparations, drawings were made of the sclerotized pieces of the haptor and of the copulatory complex using a camera lucida. All measurements were made with a digitizer. Measurements, given in micrometers as the range mean ± standard deviation (minimum–maximum), are those proposed by Gussev (1962) (Fig. 1).

The method of lettering and numbering the haptoral pieces is that adopted at ICOPA IV (Euzet and Prost, 1981), whereas the method of naming is that proposed by Pariselle and Euzet (in press a): *uncinulus* for the

little marginal hooklets, and *gripus* for the large median hooks.

Results

The discovery of Monogenea whose haptor presents a morphology similar to that of *Cichlidogyrus longicornis,* but processing a penis and vagina with different morphologies, implying reproductive isolation, leads to the description of 3 new species. This characteristic of the haptor has profoundly influenced taxonomic studies. Until now, and despite the differences in the size and shape of the copulatory complex, authors have only distinguished subspecies; therefore, it has been necessary to reexamine the taxonomic status of the 3 subspecies already described.

After careful examination, it is believed that these species, possessing the very particular haptor characteristics of *C. longicornis* and specificity toward the genera *Oreochromis* and *Sarotherodon,* lead to the proposal of a new genus. The name *Scutogyrus* gen. n. is proposed to point out the shield-like shape (*scutus* in Latin) of the ventral transverse bar.

It is certain that *Scutogyrus* gen. n. is very close to *Cichlidogyrus,* particularly in the presence of auricles on the dorsal transverse bar. The 2 genera are both gill parasites of African cichlids, but a detailed examination of the haptor shows some significant differences between the two genera: very long auricles and lateral outgrowths of the dorsal transverse bar and rigidity of the ventral transverse bar supporting 1 large sclerotized plate on *Scutogyrus.* The anatomical differences of the haptor translate into functional peculiarities of this organ and therefore indicate an original attachment of *Scutogyrus* on the gill of the host fish.

Scutogyrus gen. n.

Ancyrocephalidae. Three pairs of cephalic glands. Two posterior ocelli with crystalline lenses. Two small anterior ocelli, not always present. Simple intestinal branches joined posteriorly. Two pairs of gripi, 1 dorsal and 1 ventral. Dorsal transverse bar highly arched, enlarged laterally, winged, having in its median portion 2 very long auricles hollow at their bases. Ventral transverse bar arched, rigid, supporting 1 large, thin, oval plate marked by fan-shaped median thickenings. Fourteen uncinuli. Testis median, posterior. Vas deferens dextral, not encircling intestinal branch. Seminal vesicle present. One prostatic reservoir. Male copulatory complex with penis and accessory piece. Ovary median pretesticular. Vaginal opening sublateral dextral. Vagina sclerified. Seminal receptacle present. Parasites of African Cichlidae.

TYPE SPECIES: *Scutogyrus minus* (Dossou, 1982) comb. n. for *Cichlidogyrus longicornis minus* Dossou, 1982.

TYPE HOST: *Sarotherodon melanotheron* Rüppel, 1852.

REMARKS: The choice of the type species of this new genus was complex because, when establishing *Cichlidogyrus longicornis,* Paperna and Thurston (1969) distinguished two subspecies. For the first cited *C. longicornis longicornis* (only 3 specimens from *Oreochromis niloticus,* which are probably lost), there is no type material. Paperna's (1979) designation of a parasite of *Sarotherodon galilaeus,* collected from Volta Lake in Ghana, as holotype for *C. l. longicornis* is erroneous because it contradicts the rules of the International Code of Zoological Nomenclature. This specimen cannot represent a lectotype, because it does not belong to the type series of *C. l. longicornis.* For the second subspecies (*C. longicornis gravivaginus* from *Tilapia leucosticta*), there exists, in the collection of the Musée Royal de l'Afrique Centrale at Tervuren, 1 preparation (MT 35 932) that was designated by Paperna (1979) as the "type" of this subspecies. According to D. C. Kritsky (pers. comm.), the type for *C. longicornis* cannot be chosen from the subset collected from *Tilapia leucosticta* because these specimens are not part of the series used to establish the nominotypical subspecies. The type for the new genus *Scutogyrus* can be any of the valid species we have. Because *Cichlidogyrus minus* Dossou, 1982, is a well-described species, without any doubt concerning the morphology of its haptor and its host (see later), it was selected to be the type species of *Scutogyrus.*

Scutogyrus minus (Dossou, 1982) comb. n. (Figs. 2, 3)

Cichlidogyrus longicornis minus Dossou, 1982.

HOST: *Sarotherodon melanotheron* Rüppel, 1852.

SITE: Gills.

TYPE LOCALITY: Ouémé River, Bénin.

MATERIAL STUDIED: Thirty individuals coming from the Ivory Coast, stained and mounted according to Malmberg (1957).

Material deposited at the Muséum National d'Histoire Naturelle, Paris: 460 H.F. Tg. 55 (1 specimen), Tg. 56 (1 specimen), Tg. 57 (1 spec-

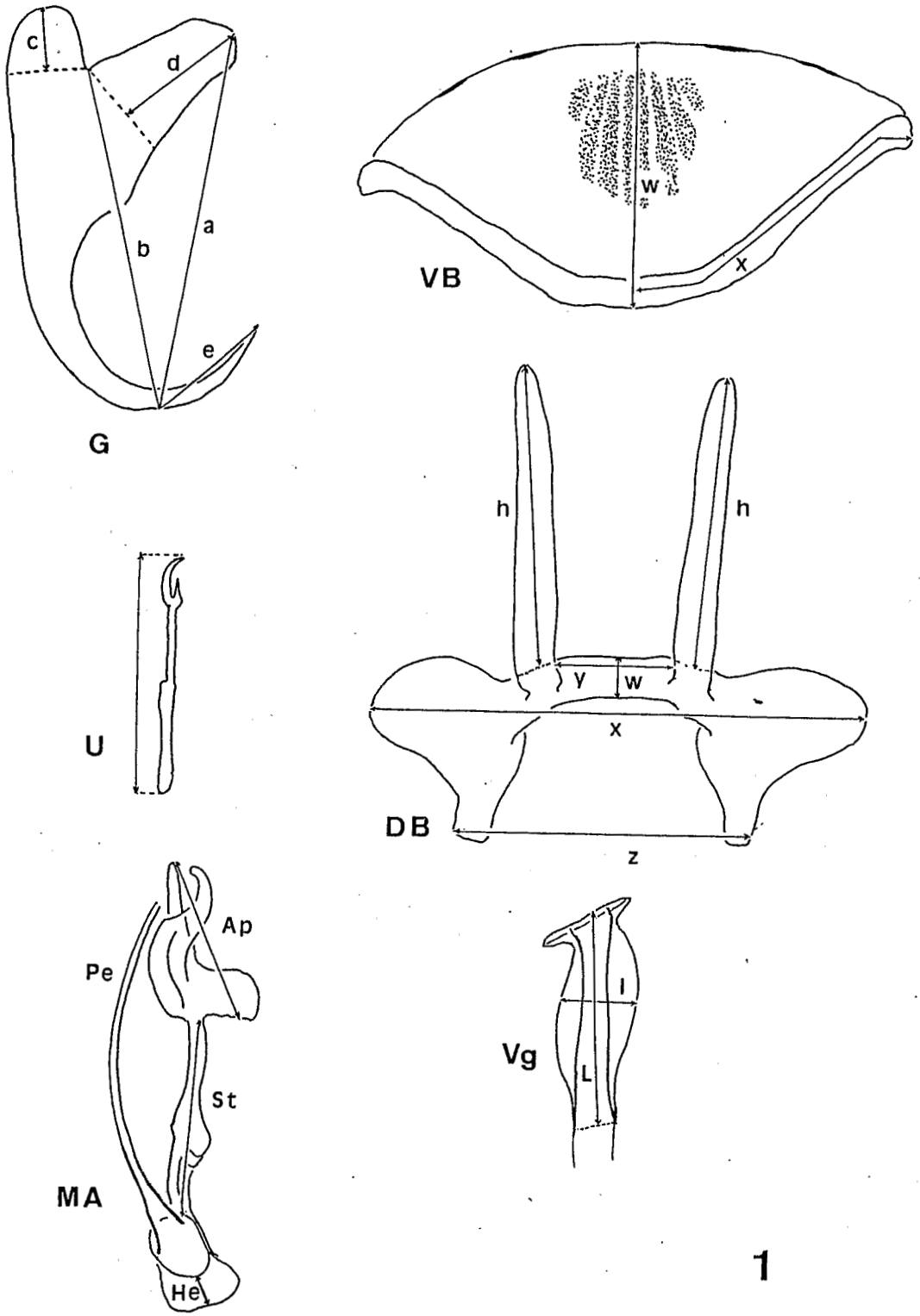

Figure 1. Measurements used in this study. Ap = accessory piece, DB = dorsal transverse bar, G = gripus, He = heel, MA = male apparatus, Pe = penis, St = stalk, U = uncinuli, VB = ventral transverse bar, Vg = vagina.

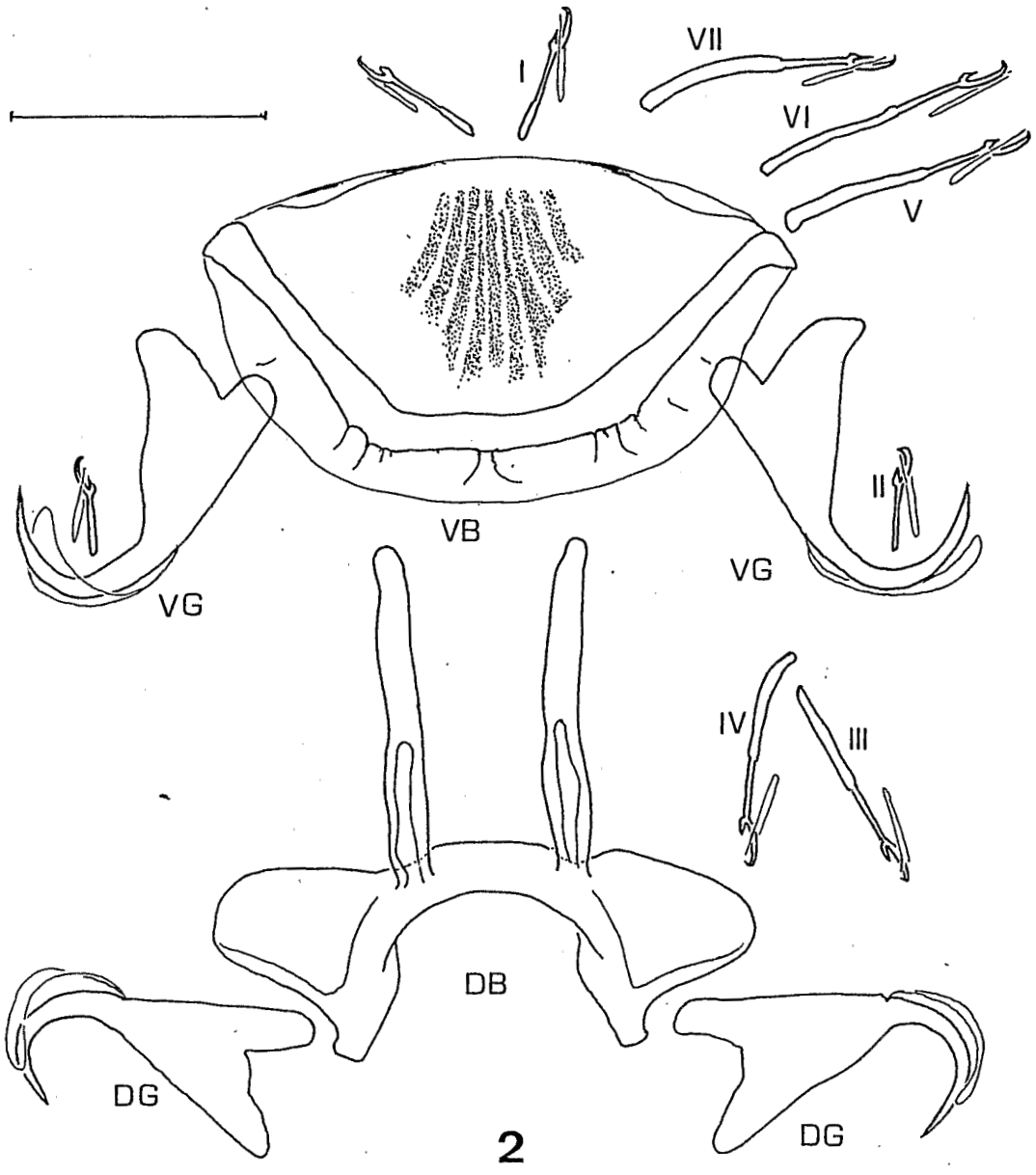

Figure 2. ***Scutogyrus minus*** **(Dossou, 1982). Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I-VII = uncinulus. Scale bar = 30 μm.**

imen); at The Natural History Museum, London: Reg. No. 1994.4.7.1 (1 specimen); at the Musée Royal d'Afrique Centrale, Tervuren: M.R.A.C. 37.357 (2 specimens).

S. minus was also found (nobis) on the same host in the Ivory Coast: at the Layo research station, Ebrié Lagoon (4 January 1991); in Bakré Lake, Abidjan offshore bar (3 March 1992); in Ayamé Lake, Bia River (4 November 1991); and in the Comoé River at Abengourou (29 January 1991). In Guinea in the Konkouré River at Wassou bridge (17 April 1992); and in the Bourouma River 10 km SW from La Ramié (19 April 1992).

DESCRIPTION: Adults 665 ± 85.5 (509–884) long, 106 ± 18.1 (72–139) wide at level of vagina.

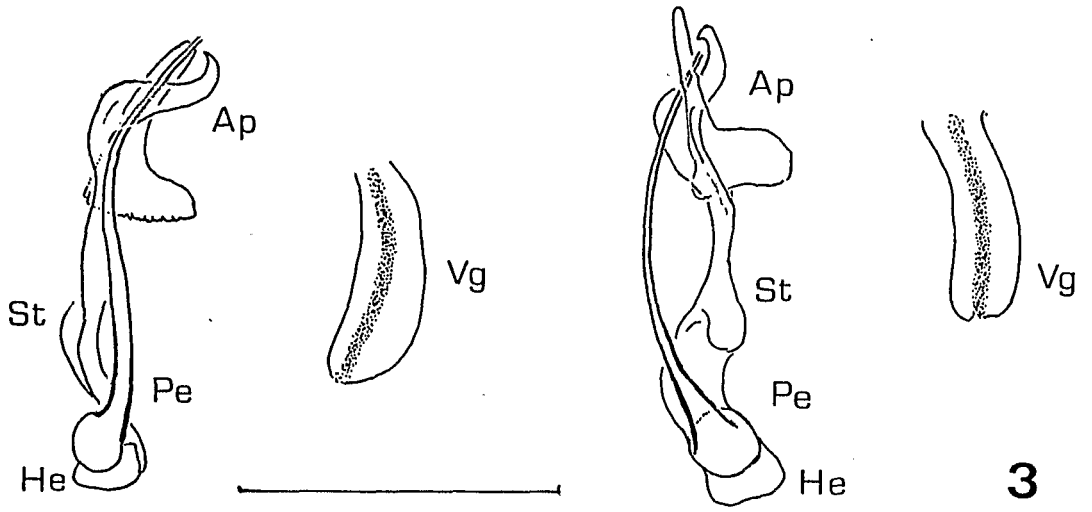

Figure 3. ***Scutogyrus minus*** **(Dossou, 1982). Two genital apparatus. Scale bar = 30 μm.**

Pharynx 56 ± 7.9 (38–70) at its widest point. Dorsal gripus with root fused to shaft, blade arched: a = 30 ± 1.1 (24–33), b = 24 ± 1.4 (19–27), c = 8 ± 1.2 (5–11), d = 11 ± 1.2 (8–14), e = 9 ± 0.7 (8–11). Dorsal transverse bar: x = 62 ± 2.6 (55–67), w = 6 ± 0.7 (5–8), y = 14 ± 0.8 (13–16), z = 31 ± 3.4 (25–38), h = 39 ± 1.6 (36–43). Ventral gripus comparable to dorsal, with root more fused to shaft: a = 29 ± 0.9 (27–31), b = 29 ± 1.4 (26–32), c = 4 ± 1.1 (1–7), d = 8 ± 1.2 (6–11), e = 12 ± 0.8 (10–14). Ventral transverse bar arched and rigid: x = 39 ± 1.8 (34–43), w = 31 ± 3.4 (18–37). Uncinulus: I = 16 ± 0.6 (15–17), II = 12 ± 0.4 (11–14), III = 28 ± 1.1 (24–30), IV = 29 ± 1.2 (24–31), V = 29 ± 0.9 (26–30), VI = 25 ± 1.1 (22–28), VII = 25 ± 0.9 (23–28).

Penis slightly arched, tubular: Pe = 43 ± 1.5 (39–45), He = 3 ± 0.5 (3–4). Accessory piece with large widening at the base, terminates in 2 unequal opposed outgrowths, largest hook-shaped: Ap = 17 ± 0.9 (15–19), St = 26 ± 1.8 (21–30). Vagina forms a moderately wide tube: L = 20 ± 1.5 (16–23), l = 6 ± 0.5 (5–7).

REMARKS: For Douëllou (1993), the creation by Dossou (1982), on the basis of measurements (inferior) and morphology of haptoral and sclerotized genitalia pieces, the subspecies *Cichlidogyrus longicornis minus* is not justified. We observed that the difference related by Dossou (1982) to the haptor was not confirmed; however, sufficient differences were noted in the morphology of the accessory piece and the vagina (see comparisons with the following species). Thus, we propose to elevate to species status the subspecies *C. longicornis minus* described by Dossou (1982).

Scutogyrus longicornis (Paperna and Thurston, 1969) comb. n. (Figs. 4, 5)

Cichlidogyrus longicornis longicornis Paperna and Thurston, 1969.

Cichlidogyrus longicornis Paperna and Thurston, 1969, of Douëllou, 1993.

HOST: *Oreochromis niloticus* (L., 1758).

SITE: Gills.

TYPE LOCALITY: Lakes George and Albert, Uganda.

MATERIAL STUDIED: Thirty individuals from Senegal and the Ivory Coast, stained and mounted according to Malmberg (1957).

Material deposited at the Muséum National d'Histoire Naturelle, Paris: 461 H.F. Tg. 58 (1 specimen), Tg. 59 (4 specimens); at The Natural History Museum, London: Reg. No. 1994.4.7.2 (1 specimen); at the Musée Royal d'Afrique Centrale, Tervuren: M.R.A.C. 37.358 (3 specimens).

This species was found on *O. niloticus* in Ghana (Paperna, 1969), Egypt (Ergens, 1981), the Philippines (Natividad et al., 1986; Bondad-Reantaso and Arthur, 1990), the Ivory Coast (nobis) in Ayamé Lake, Bia River (4 November 1991), the Comoé River at Abengourou (29 January 1991), and the IDESSA Research Station at

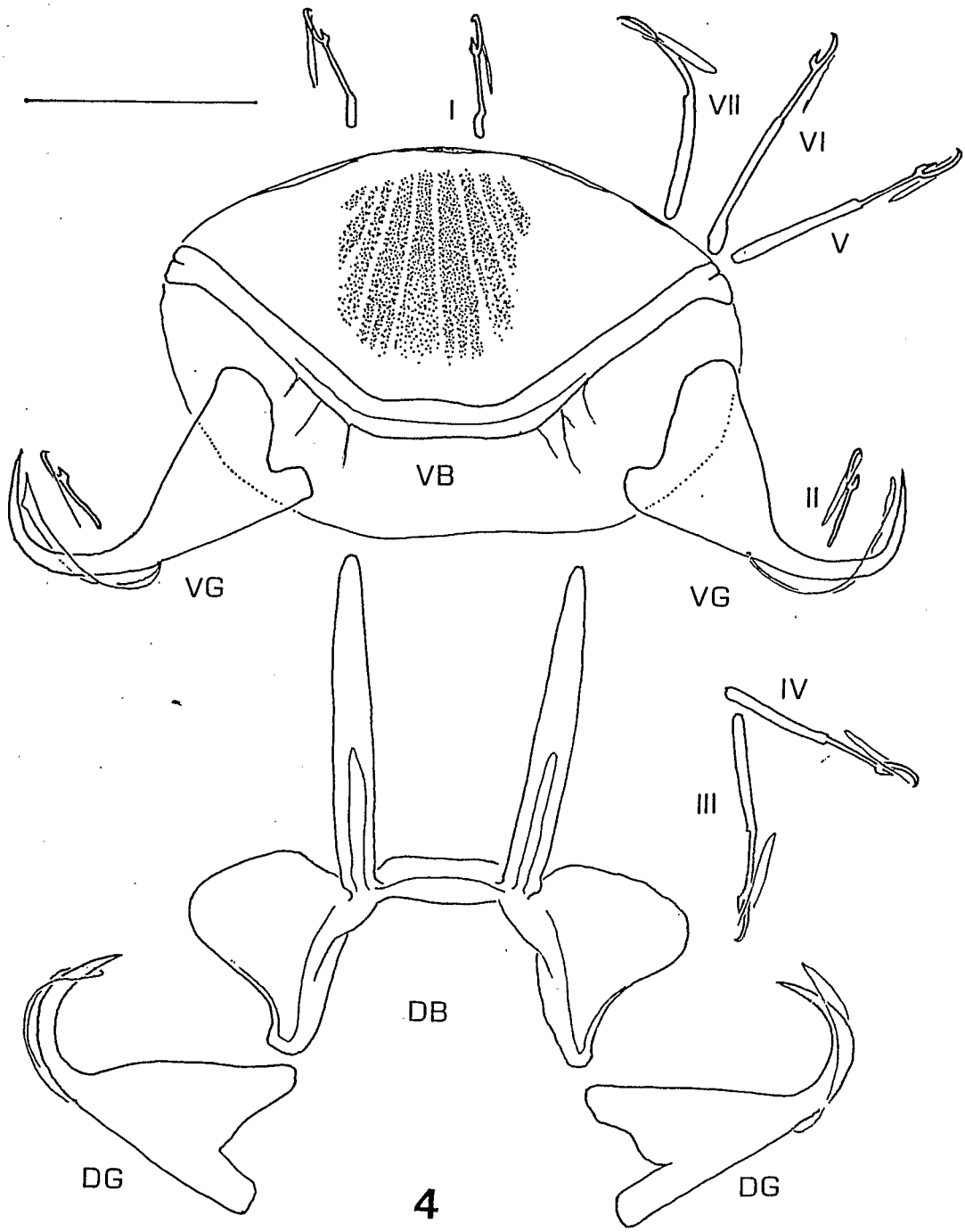

Figure 4. ***Scutogyrus longicornis*** **(Paperna and Thurston, 1969). Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I-VII = uncinuli. Scale bar = 30 μm.**

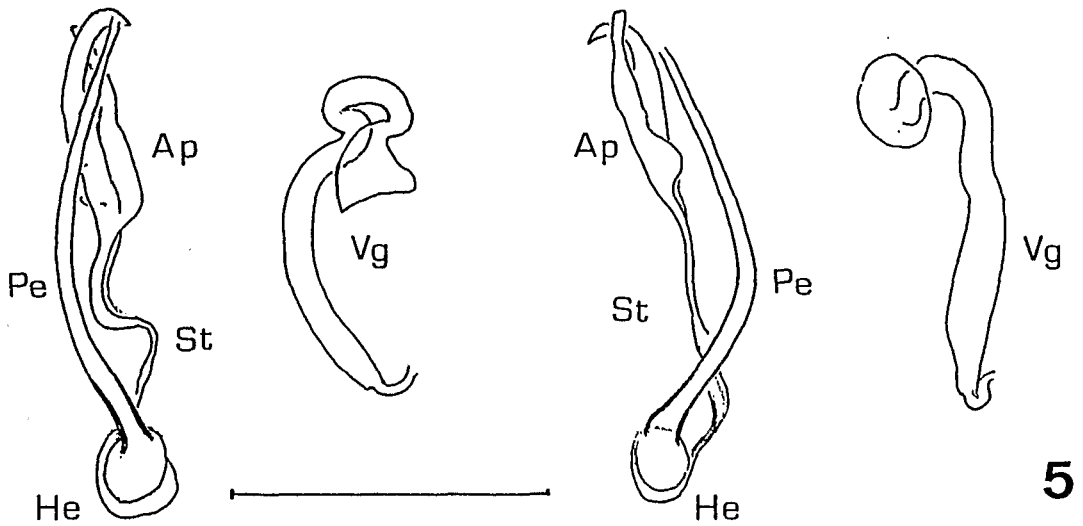

Figure 5. ***Scutogyrus longicornis*** **(Paperna and Thurston, 1969). Two genital apparatus. Scale bar = 30 μm.**

Bouaké; also on *Sarotherodon galilaeus*(?) and *Tilapia zillii*(?) in Ghana (Paperna, 1969), on *Oreochromis mortimeri* in Lake Kariba Zimbabwe (Douëllou, 1993), and on *O. aureus* (nobis) in the Senegal River at Djouj National Park (13 April 1991).

DESCRIPTION: Adults 786 ± 99.5 (541–971) long, 157 ± 15.8 (127–193) wide at vagina. Pharynx 82 ± 3.8 (72–90) at its widest point. Dorsal gripus with root fused to shaft, blade regularly arched: a = 33 ± 1.4 (30–39), b = 28 ± 2 (21–32), c = 8 ± 2 (4–16), d = 11 ± 1.4 (8–16), e = 10 ± 0.8 (8–12). Dorsal transverse bar: x = 62 ± 2.6 (56–67), y = 15 ± 1.1 (13–18), z = 30 ± 2.5 (25–36), w = 5 ± 0.6 (4–6), h = 41 ± 1.8 (37–45). Ventral gripus: a = 34 ± 1.4 (30–37), b = 33 ± 1.4 (30–37), c = 4 ± 0.7 (3–6), d = 10 ± 1 (8–13), e = 13 ± 1 (10–15). Ventral transverse bar arched and rigid: x = 41 ± 2.2 (37–47), w = 34 ± 3.1 (27–41). Uncinulus: I = 17 ± 0.8 (16–19), II = 13 ± 0.4 (12–14), III = 31 ± 1.5 (28–34), IV = 33 ± 1.1 (30–36), V = 33 ± 1.2 (28–36), VI = 29 ± 1.6 (26–35), VII = 28 ± 1.1 (26–32).

Penis slightly arched, tubular: Pe = 48 ± 3.1 (40–56); with a poorly developed heel: He = 2 ± 0.5 (1–3). Accessory piece with small enlargement at base, terminates in 2 opposing unequal and straight outgrowths: Ap = 21 ± 1.2 (19–24), St = 20 ± 2.8 (15–25). Sinuous vagina a narrow tube: L = 41 ± 4.4 (34–55), l = 4 ± 0.9 (3–7).

REMARKS: This species can be distinguished from *Scutogyrus minus* by the dimension of the penis (48 vs. 43), the heel (2 vs. 3), and the accessory piece (length: 21 vs. 17, enlargement small vs. large widening), by the shape of the largest terminal outgrowth of this piece (straight vs. hook-shaped), and by the morphology and the length of the sclerified portion of the vagina (narrow tube vs. wider, length 41 vs. 20). This parasite corresponds to *Cichlidogyrus longicornis longicornis* described also on *O. niloticus* by Paperna and Thurston (1969) and to *C. longicornis* described by Douëllou (1993) on *O. mortimeri*, and according to this author *Cichlidogyrus longicornis longicornis* needs to be elevated to specific status.

Scutogyrus gravivaginus (Paperna and Thurston, 1969) comb. n. (Figs. 6, 7)

Cichlidogyrus longicornis gravivaginus Paperna and Thurston, 1969.

Cichlidogyrus gravivaginus Paperna and Thurston, 1969, of Douëllou, 1993.

HOST: *Tilapia leucosticta* = *Oreochromis leucostictus* (Trewavas, 1933).

SITE: Gills.

TYPE LOCALITY: Jinja, Lake Victoria, Uganda.

MATERIAL STUDIED (holotype): MT 35 932 of the Musée Royal d'Afrique Centrale, Tervuren.

This species was also found by Paperna (1979)

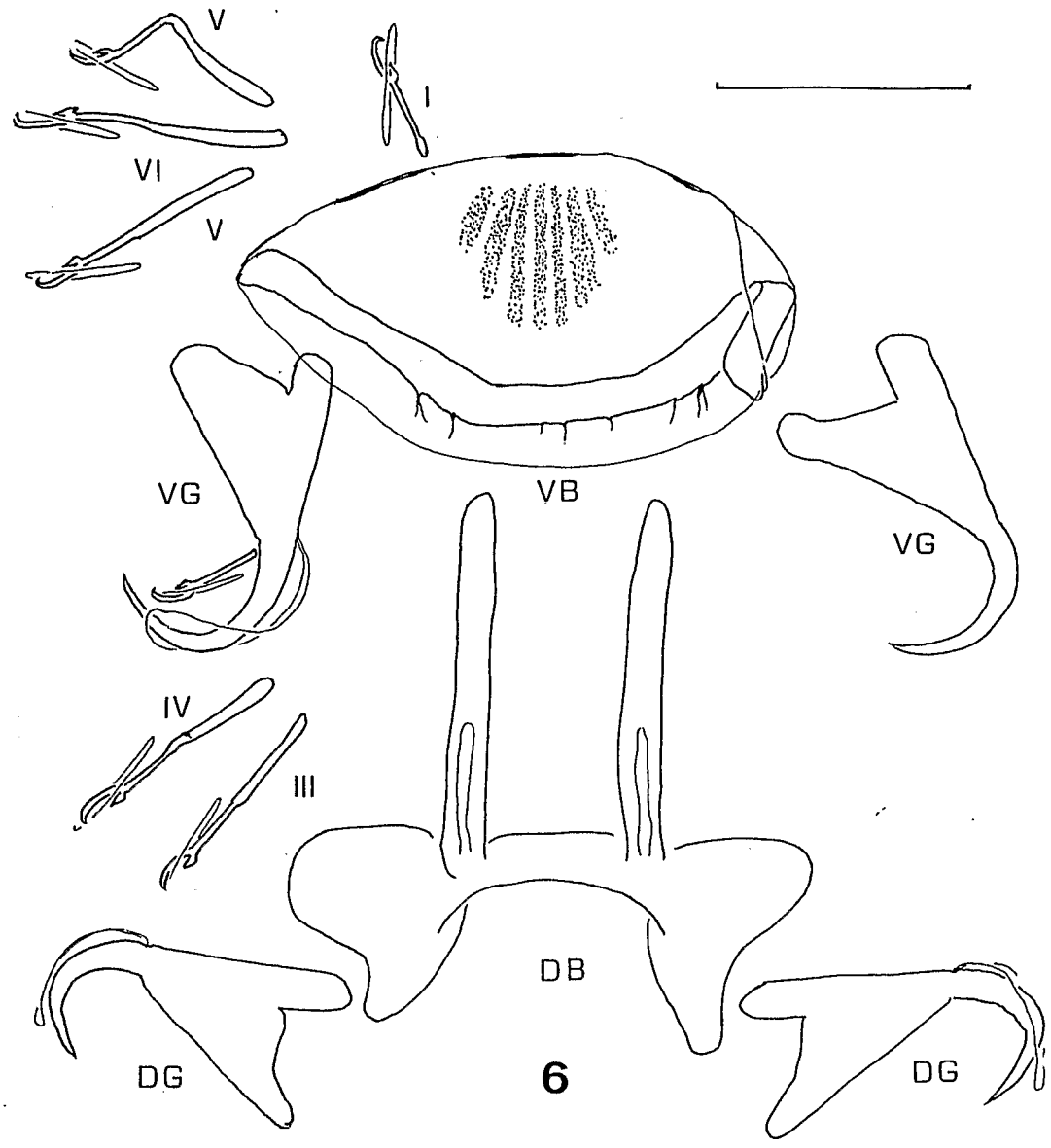

Figure 6. ***Scutogyrus gravivaginus*** **(Paperna and Thurston, 1969). Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I-VII = uncinuli. Scale bar = 30 μm.**

on *Oreochromis variabilis* in Lake Victoria, Uganda, and by Douëllou (1993) on *O. mortimeri* in Lake Kariba, Zimbabwe.

DESCRIPTION: The condition of the holotype did not permit detailed study of the anatomy, as only a few sclerified pieces of the haptor and of the genital system could be observed.

Dorsal gripus (anchors X of original description): a = 35, b = 28, c = 8, d = 12, e = 10. Dorsal transverse bar (bar X), enlarged into wings at each side, has 2 very long median appendices: x = 58, y = 16, z = 37, w = 5, h = 41. Ventral gripus (anchor V of original description): a = 35, b = 30, c = 8, d = 12, e = 11. Ventral transverse bar (bar V) has 1 thin, oval plate transversally arranged: x = 77, w = 32. Uncinulus: U = 25–30, except I and II U = 15. Male copulatory complex composed of a thin tubular penis (Pe = 77), whose basal bulb is marked by 1 trapezoidal heel (He = 16) and 1 accessory piece enlarged to

form a triangle, finished in 2 opposed spikes (Ap = 26). The accessory piece is linked to base of penis by a sinuous stalk: St = 35. S-shaped tubular vagina: L = 55; diameter varies from 15 (at opening) to 6.

REMARKS: The examination of the type specimen showed that the measurements of the haptoral pieces correspond, very nearly, to those of the original description, while those for the copulatory complex differ (77 vs. 53–57). However, the morphology of this complex, which consists of a penis with a developed heel and an accessory piece with a triangular enlargement, leads us (according to Douëllou, 1993) to believe that an inversion was introduced in the publication of Paperna and Thurston (1969, p. 21) between the legends of Figure 3c and 3d. Therefore, Figure 3d given as *Cichlidogyrus longicornis longicornis* would be that of *Cichlidogyrus longicornis gravivaginus* and conversely for Figure 3c. This inversion would help to explain the difference noted in the size of the penis between the type material and the original description.

This specimen, regarding the drawings and measurements, shows no significant differences with the subspecies *C. longicornis gravivaginus* as described by Paperna and Thurston (1969) or *C. gravivaginus* as described by Douëllou (1993). The great differences in the measurements of the penis (77 vs. 43 or 48), the heel (16 vs. 3 or 2), and the vagina (55 vs. 20 or 41 in length, 15 vs. 6 or 4 maximum diameter) between this species and the one previously cited are sufficient to consider it a valid species.

Scutogyrus bailloni sp. n. (Figs. 8, 9)

HOST: *Sarotherodon galilaeus* (L., 1758).

SITE: Gills.

TYPE LOCALITY: Mékrou River at "W" National Park, Niger (18 February 1993).

MATERIAL STUDIED: Twenty-four specimens stained and mounted according to Malmberg (1957).

Holotype and 1 paratype deposited at the Muséum National d'Histoire Naturelle, Paris: 462 H.F. Tg. 60.

Paratypes deposited at the Muséum National d'Histoire Naturelle, Paris: 462 H.F. Tg. 61 (2 specimens); at The Natural History Museum, London: Reg. No. 1994.4.7.3 (2 specimens); at the Musée Royal d'Afrique Centrale, Tervuren: M.R.A.C. 37.359 (2 specimens).

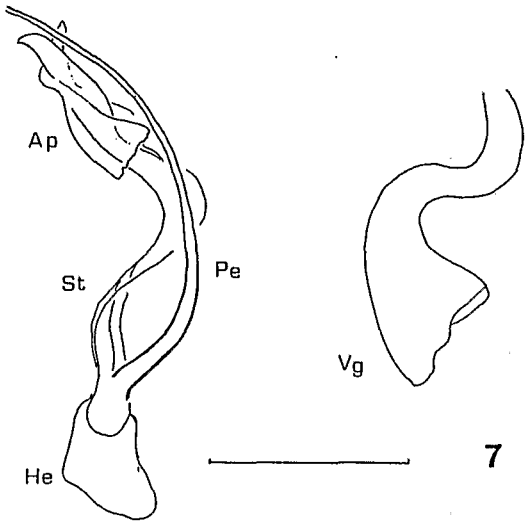

Figure 7. ***Scutogyrus gravivaginus*** **(Paperna and Thurston, 1969). Genital apparatus. Scale bar = 30 μm.**

This species was also found on the same host in the Kou River (Volta Noire River tributary) at Bama near Bobodioulasso, Burkina Fasso (12 August 1991).

DESCRIPTION: Adult 816 ± 160 (502–1114) long; 159 ± 26.5 (103–212) wide at level of vagina. Pharynx 95 ± 16 (66–128) at widest point. Dorsal gripus with root fused to shaft, blade arched: a = 31 ± 1.1 (28–33), b = 25 ± 1.1 (23–27), c = 8 ± 1 (6–10), d = 11 ± 1.2 (9–13), e = 9 ± 0.6 (7–11). Dorsal transverse bar: x = 60 ± 2.6 (55–64), w = 6 ± 0.9 (4–7), y = 14 ± 1 (13–17), z = 30 ± 2.1 (27–34), h = 37 ± 1.9 (34–42). Ventral gripus comparable to dorsal: a = 31 ± 0.8 (29–32), b = 29 ± 1.2 (26–31), c = 5 ± 1.2 (2–8), d = 9 ± 1.1 (7–11), e = 13 ± 1 (10–15). Ventral transverse bar arched and rigid: x = 40 ± 1.8 (36–43), w = 34 ± 2.9 (28–39). Uncinulus: I = 17.4 ± 0.8 (16–19), II = 13 ± 0.4 (12–14), III = 27 ± 1.3 (24–30), IV = 29 ± 1.7 (24–32), V = 29 ± 1.1 (27–32), VI = 25 ± 1.4 (24–30), VII = 25 ± 1.5 (22–29).

Penis long, with basal globular bulb and large trapezoidal heel: Pe = 84 ± 3.4 (76–90), He = 17 ± 1.9 (14–23). Accessory piece terminates in a single hook: Ap = 31 ± 3 (26–39). Stalk thick: St = 39 ± 6.3 (23–47). Vagina long, with crenelated lining, terminates in a thin-walled folded pocket: L = 69 ± 5.5 (56–83), l = 11 ± 4.2 (5–19).

REMARKS: This species is easily distinguishable from the preceding species by the size of the

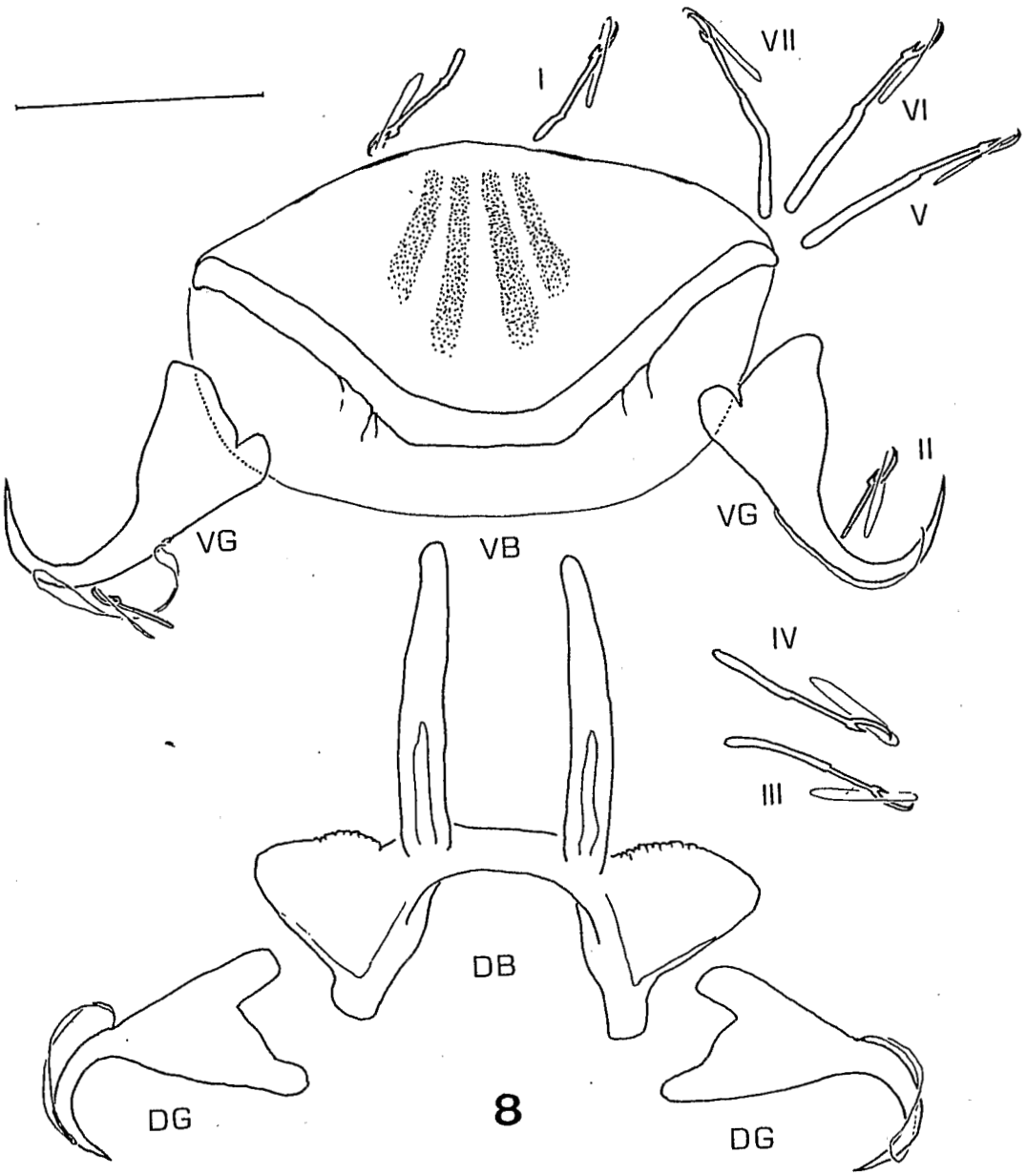

Figure 8. ***Scutogyrus bailloni*** **sp. n. Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I-VII = uncinuli. Scale bar = 30 μm.**

male copulatory organ (84 vs. 77 at the most) and the vagina (69 vs. 55 at the most), and by the shape of the extremity of the accessory piece (single vs. double for all previous species) and of the stalk (thick vs. thin). Therefore, we consider it a new species and propose the name *Scutogyrus bailloni* in honor of F. Baillon, who kindly assisted in the acquisition of material.

The parasite of *S. galilaeus*, deposited under the name *Cichlidogyrus longicornis longicornis* (Paperna and Thurston, 1969) at the Music Royal d'Afrique Centrale, Tervuren, with the number MT 35 931, was also examined. Despite the state of the material, the length of the male copulatory complex (48) shows that it is not the species from *S. galilaeus* as described herein. The

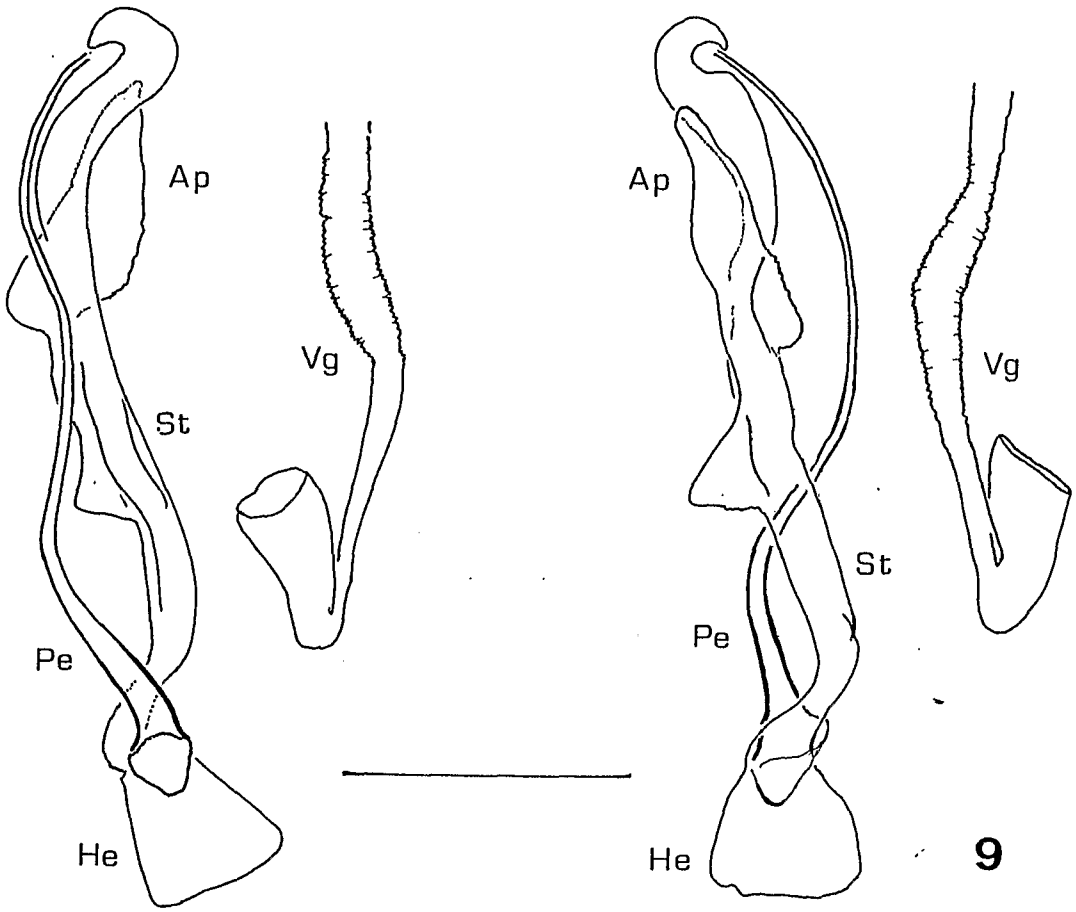

Figure 9. ***Scutogyrus bailloni*** **sp. n. Two genital apparatus. Scale bar = 30 μm.**

morphology of the accessory piece is close to that of *S. minus,* but because the vagina could not be observed no conclusions could be drawn.

Scutogyrus ecoutini sp. n.
(Figs. 10, 11)

HOST: *Sarotherodon occidentalis* (Daget, 1962).

SITE: Gills.

TYPE LOCALITY: Bourouma River 10 km SW from La Ramié, Guinea (19 April 1992).

MATERIAL STUDIED: Twenty-six specimens stained and mounted according to Malmberg (1957).

Holotype deposited at the Muséum National d'Histoire Naturelle, Paris: 463 H.F. Tg. 62.

Paratypes deposited at the Muséum National d'Histoire Naturelle, Paris: 463 H.F. Tg. 63 (2 specimens); at The Natural History Museum, London: Reg. No. 1994.4.7.5 (1 specimen); at the Musée Royal d'Afrique Centrale, Tervuren: M.R.A.C. 37.360 (2 specimens).

DESCRIPTION: Adult 652 ± 88.2 (533–833) long, 118 ± 13.6 (91–143) wide at level of vagina. Pharynx 69 ± 10.3 (51–104) wide at its widest point. Dorsal gripus with root fused to shaft, blade arched: a = 32 ± 1.1 (27–34), b = 27 ± 1.3 (24–29), c = 8 ± 1.2 (5–11), d = 10 ± 1.4 (7–13), e = 10 ± 0.8 (8–12). Dorsal transverse bar: x = 65 ± 3.1 (58–70), w = 6 ± 0.7 (5–7), y = 15 ± 1 (13–17), z = 30 ± 2.4 (27–36), h = 37 ± 1.8 (31–40). Ventral gripus comparable to dorsal, with shorter root and shaft: a = 32 ± 1.3 (25–34), b = 30 ± 1.3 (27–34), c = 4 ± 0.8 (2–7), d = 8 ± 1 (7–12), e = 13 ± 1 (11–15). Ventral transverse bar arched and rigid: x = 37 ± 1.8 (31–40), w = 31 ± 2.5 (28–37). Uncinulus: I = 16 ± 0.5 (15–18), II = 12 ± 0.5 (10–13), III =

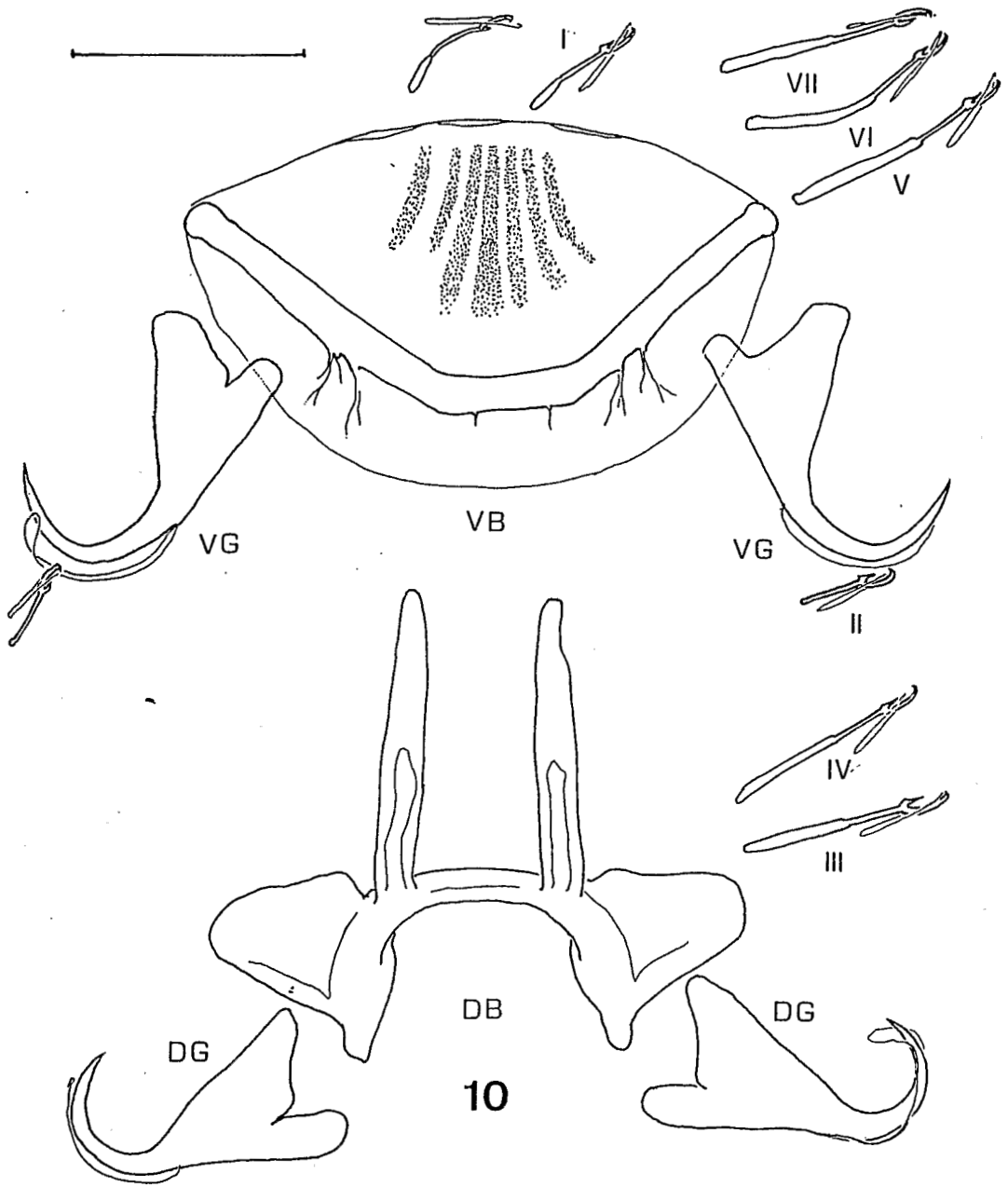

Figure 10. ***Scutogyrus ecoutini*** **sp. n. Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I–VII = uncinuli. Scale bar = 30 μm.**

27 ± 1.4 (25–32), IV = 29 ± 1.2 (25–31), V = 29 ± 1.1 (26–32), VI = 26 ± 1.4 (20–28), VII = 25 ± 1 (23–28).

Penis very long, sinuous, filiform, (Fig. 11) with small globular bulb and thin irregular heel: Pe = 411 ± 22.7 (376–455), He = 5 ± 0.8 (3–6). Accessory piece terminates in a large hook: Ap = 40 ± 1.5 (37–43). Stalk very fine: St = 14 ± 3.2 (6–19). Vagina tubular, thin, forming 1 spiral (18 ± 1.6 (13–21) in diameter) linked by a straight portion (28 ± 5.2 (20–41) long) to the genital opening.

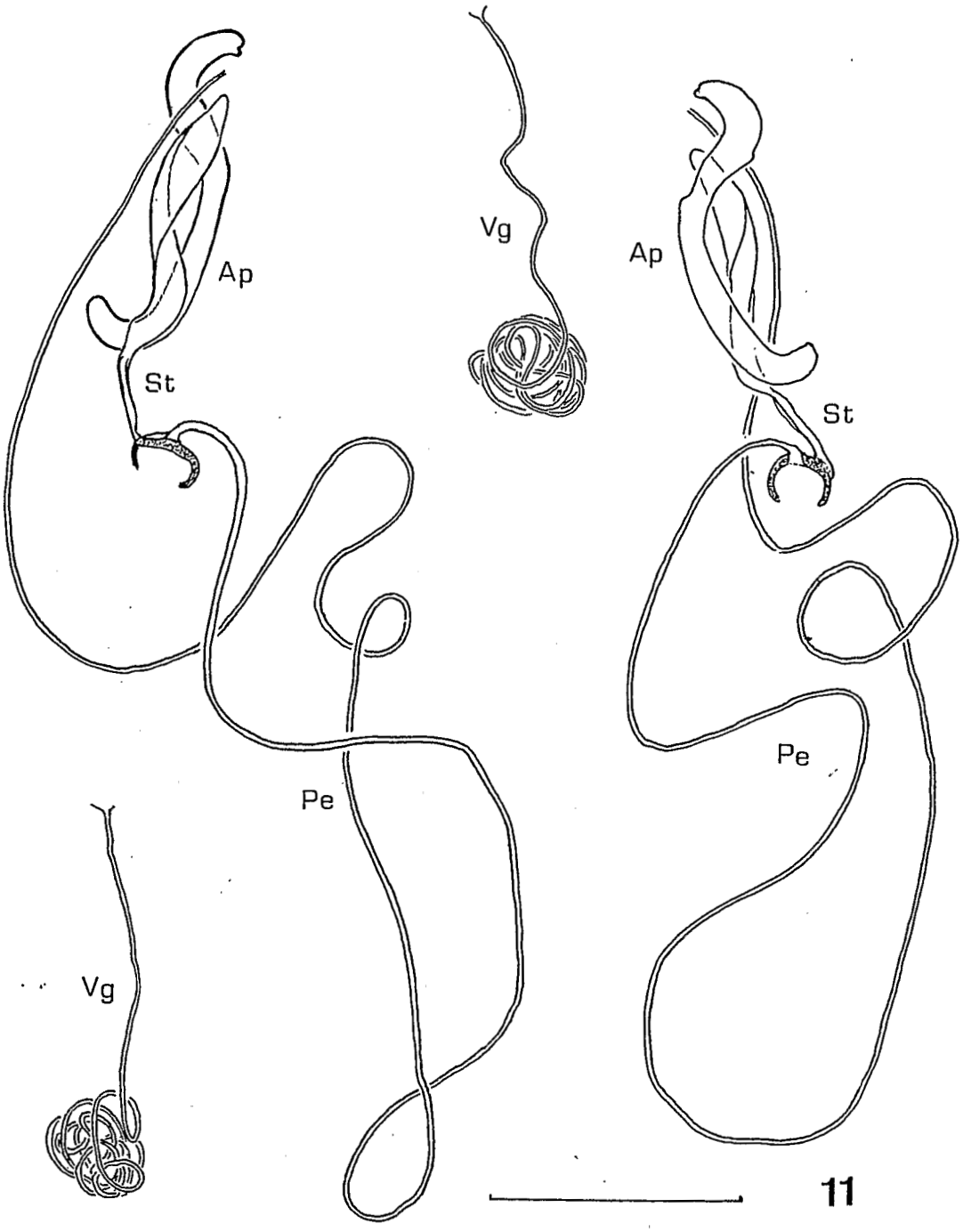

Figure 11. ***Scutogyrus ecoutini*** **sp. n. Two genital apparatus. Scale bar = 30 μm.**

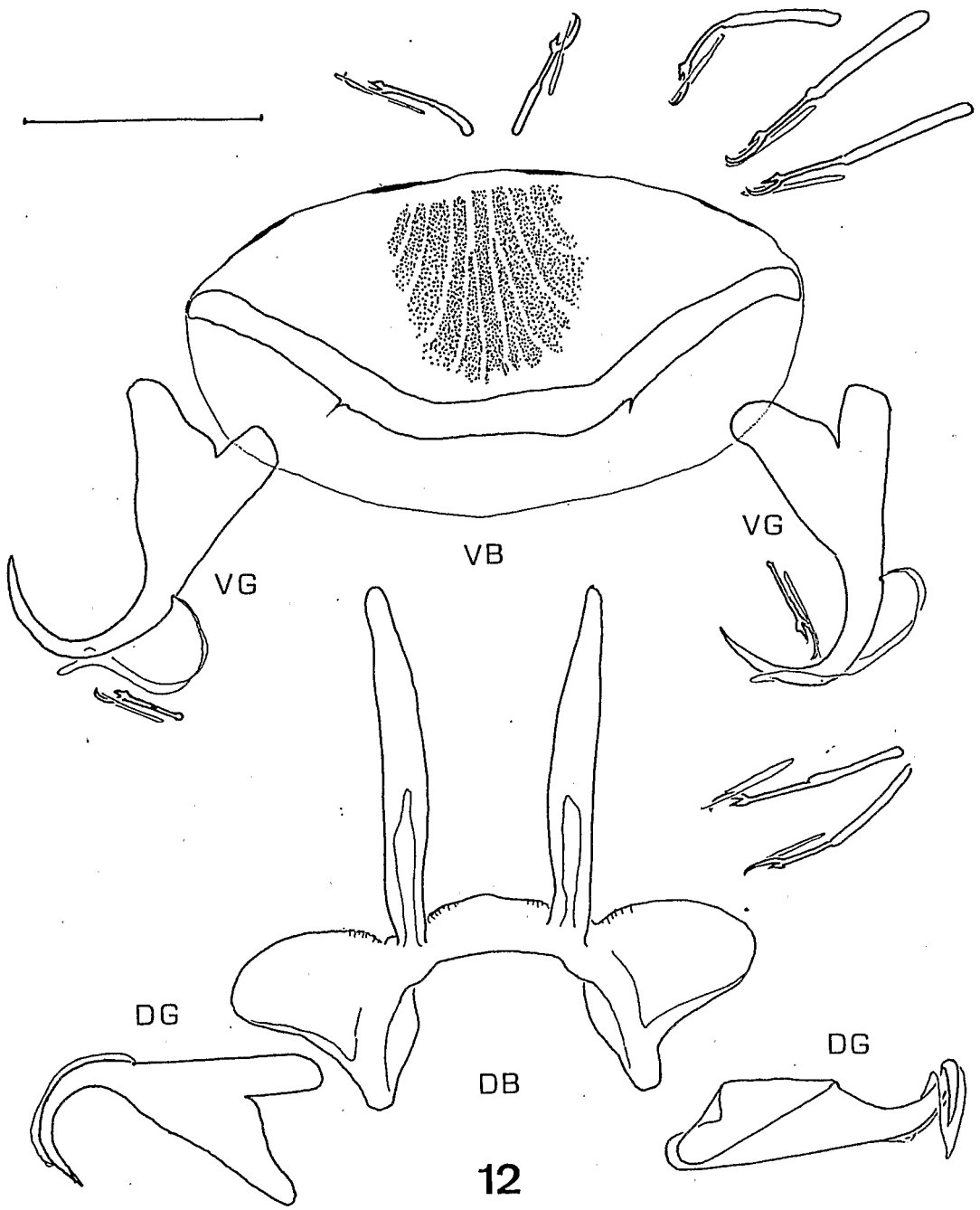

Figure 12. ***Scutogyrus chikhii*** **sp. n. Haptoral sclerites. DG = dorsal gripus, VG = ventral gripus, I-VII = uncinuli. Scale bar = 30 μm.**

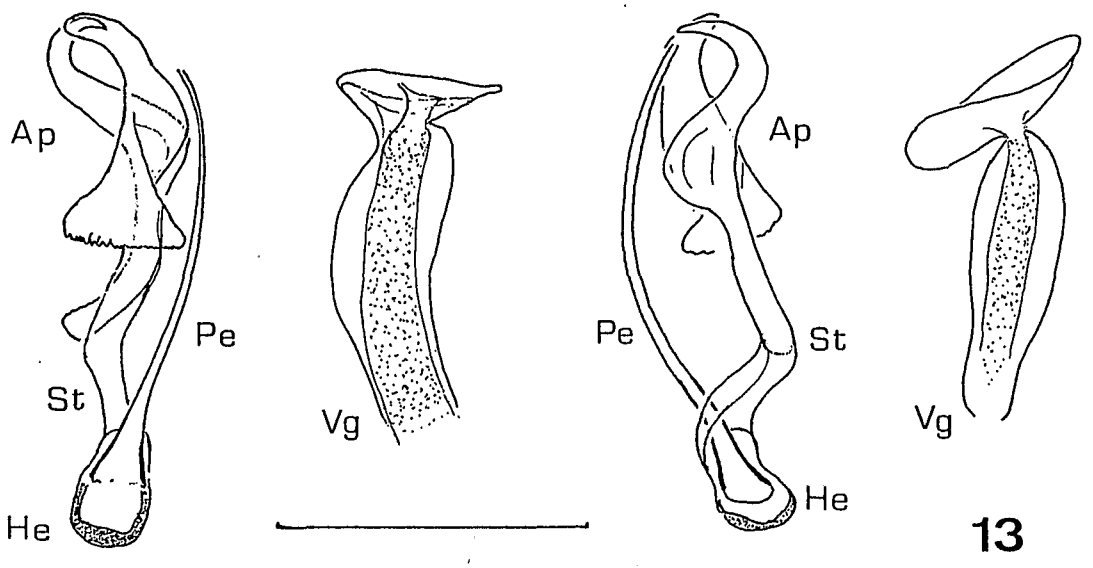

Figure 13. ***Scutogyrus chikhii*** **sp. n. Two genital apparatus. Scale bar = 30 μm.**

REMARKS: The morphology and size of the penis (sinuous and filiform vs. thin tubular and slightly arched, 411 vs. 89 at the most in length) and the vagina (spiraled vs. sinuous at the most) separate this parasite of *Sarotherodon occidentalis* from all the precedent species. We propose the name *Scutogyrus ecoutini* sp. n. in honor of Dr. Jean-Marc Ecoutin, who assisted in the collection of material.

Scutogyrus chikhii sp. n. (Figs. 12, 13)

HOST: *Oreochromis mossambicus* (Peters, 1852).

SITE: Gills.

TYPE LOCALITY: Cayo Lake, near Pointe Noire, Congo (25 May 1993).

MATERIAL STUDIED: Thirteen specimens stained and mounted according to Malmberg (1957).

Holotype deposited at the Muséum National d'Histoire Naturelle, Paris: 464 H.F. Tg. 64.

Paratypes deposited at The Natural History Museum, London: Reg. No. 1994.4.7.5 (1 specimen); at the Musée Royal d'Afrique Centrale, Tervuren: M.R.A.C. 37.361 (1 specimen).

DESCRIPTION: Adults 796 ± 89.2 (671–1,000) long, 145 ± 23.9 (111–185) wide at level of vagina. Pharynx 85 ± 11.6 (73–113) at widest point. Dorsal gripus with root fused to shaft, blade arched: a = 32 ± 1.4 (29–35), b = 27 ± 1.3 (24–29), c = 8 ± 1.6 (3–11), d = 11 ± 1.5 (9–15), e = 9 ± 1.2 (8–11). Dorsal transverse bar: x = 64 ± 3.9 (55–68), w = 7 ± 1 (6–10), y = 15 ± 1.1 (13–17), z = 33 ± 2 (29–36), h = 42 ± 2 (38–46). Ventral gripus: a = 32 ± 1.4 (29–35), b = 27 ± 1.3 (24–29), c = 5 ± 1.3 (3–8), d = 8 ± 1.3 (5–11), e = 13 ± 1 (11–15). Ventral transverse bar arched and rigid: x = 42 ± 1.7 (38–45), w = 34 ± 2.9 (27–38). Uncinulus: I = 17 ± 0.6 (17–19), II = 13 ± 0.3 (12–13), III = 29 ± 1.2 (27–32), IV = 31 ± 1 (29–34), V = 31 ± 1.2 (29–34), VI = 26 ± 0.8 (24–27), VII = 26 ± 1.1 (24–29).

Penis short, slightly arched: Pe = 49 ± 1.8 (45–52), He = 7 ± 2.7 (2–10). Accessory piece, marked by a lateral subtriangular widening and a posterior club-like expansion, terminates in 2 pincer-like hooks: Ap = 23 ± 1.4 (20–26), St = 23 ± 3.6 (17–29). Vagina with sclerified portion pocket-like: L = 26 ± 3.8 (19–32), l = 9 ± 0.9 (8–11).

REMARKS: This species differs from previous species by the morphology of the accessory piece (2 opposite hook-shaped outgrowths vs. only 1 [*S. bailloni* or *S. ecoutini*] or 2 with only 1 hook-shaped [*S. minus*] or 2 straight [*S. longicornis* or *S. gravivaginus*] and of the vagina (pocket-like vs. tubular for all the previous species [except *S. ecoutini* filiform]). These characteristics are sufficient to consider the parasite of *O. mossambicus* from the Congo as a new species. We propose

the name *Scutogyrus chikhii* in honor of Lounès Chikhi, who provided the first material.

Discussion

The new genus described in the preceding is found only on hosts from *Oreochromis* and *Sarotherodon,** and all the hosts from these 2 genera, sampled in this study's area (or elsewhere; see e.g., Ergens, 1981; Douëllou, 1993), present at least 1 *Scutogyrus*—this is why we can say that it is a good biological tag for these 2 Tilapiine genera and probably a good example of coevolution between host and parasite.

If 4 species within *Scutogyrus* are host-specific, 2 have been found on several species of fishes: *S. longicornis* on *Oreochromis niloticus* (type host), *O. aureus,* and *O. mortimeri,* and *Sarotherodon galilaeus* (and *T. zillii*; see preceding footnote) and *S. gravivaginus* on *Oreochromis leucostictus* (type host), *O. variabilis,* and *O. mortimeri.* However, we noticed that, in the case of *S. longicornis,* 3 hosts listed have a very similar parasitic fauna: all the Monogenea that we have found (nobis) on *O. aureus* have been described on *O. niloticus* (*Cichlidogyrus halli, C. thurstonae, C. tilapiae,* and *S. longicornis*). In the same way, *O. mortimeri* possesses, in addition to *Scutogyrus longicornis* and *S. gravivaginus, Cichlidogyrus halli, C. sclerosus, C. tilapiae,* and *S. longicornis,* which are known from *O. niloticus,* and occasionally 3 other species (*C. dossoui, C. karibae,* and *C. zambezensis*) described by Douëllou (1993). This fact (different species of hosts possessing the same parasitic fauna) must be compared to the study on the subgenus Coptodon (Cichlidae) (Pariselle and Euzet, in press b), where the parasitic specificity is related to the genetic proximity of host. This represents a great danger for native fishes because the parasites followed their hosts when they were introduced (see Natividad et al., 1986; Bondad-Reantaso and Arthur, 1990).

Key for *Scutogyrus* Species

1a. Penis and vagina filiform, very long ... *S. ecoutini*
1b. Penis and vagina nonfiliform ... 2
2a. Penis more than 70 μm long ... 3
2b. Penis less than 70 μm long ... 4
3a. Vagina tubular and narrow ... *S. bailloni*
3b. Vagina wide ... *S. gravivaginus*
4a. Accessory piece terminates in equal pincer-like hooks ... *S. chikhii*
4b. Accessory piece terminates in unequal hooks ... 5
5a. Lateral outgrowth of accessory piece well marked ... *S. minus*
5b. Lateral outgrowth of accessory piece poorly marked ... *S. longicornis*

* Paperna (1979) indicated *Cichlidogyrus longicornis longicornis* as host for *Tilapia zillii,* insofar as we have never found again this parasite on this host, despite numerous samples studied from Senegal, Guinea, Mali, Benin, Niger, the Ivory Coast, Egypt, and so forth. It seems to be an accidental catching or an erroneous determination of the host species.

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Literature Cited

Bondad-Reantaso, M. G., and J. R. Arthur. 1990. The parasites of Nile tilapia (*Oreochromis niloticus* (L.)) in the Philippines, including an analysis of changes in the parasite fauna of cultured tilapia from fry to marketable size. Pages 729–734 *in* R. Hirano and I. Hanyu, eds. The Second Asian Fisheries Forum. Asian Fisheries Society, Manila, Philippines.

Dossou, C. 1982. Parasites de poissons d'eau douce du Bénin III. Espèces nouvelles du genre *Cichlidogyrus* (Monogenea) parasites de Cichlidae. Bulletin de l'Institut Fondamental d'Afrique Noire 44:295–322.

Douëllou, L. 1993. Monogeneans of the genus *Cichlidogyrus* Paperna, 1960 (Dactylogyridae: Ancyrocephalinae) from cichlid fishes of Lake Kariba (Zimbabwe) with descriptions of five new species. Systematic Parasitology 25:159–186.

Ergens, R. 1981. Nine species of the genus *Cichlidogyrus* Paperna, 1960 (Monogenea: Ancyrocephalinae) from Egyptian fishes. Folia Parasitologica 28:205–214.

Euzet, L., and M. Prost. 1981. Report of the meeting on Monogenea: problems of systematic, biology and ecology. Pages 1003–1004 *in* W. Slusarski, ed. Review of Advances in Parasitology. P.W.N. Polish Scientific Publishers, Warsaw.

Gussev, A. V. 1962. *In* I. E. Bykhovskaya-Pavlovskaya et al. Key to Parasites of Freshwater Fish of the USSR. Akademiya Nauk SSSR, Moscow-Leningrad. 919 pp. (Translated from Russian by IPST, Ser. No. 1136, Jerusalem, 1964.)

Malmberg, G. 1957. [On the occurrence of *Gyrodactylus* on Swedish fishes.] Skrifterutgivna av Sodra Sveriges Fiskeriforening (1956):19–76. (In Swedish, with description of species and a summary in English.)

Natividad, J. M., M. G. Bondad-Reantaso, and J. R. Arthur. 1986. Parasites of Nile tilapia (*Oreo-*

chromis niloticus) Pages 255–259 *in* the Philippines. *in* J. L. MacLean et al., eds. The First Asian Forum. Asian Fisheries Society, Manila, Philippines.

Paperna, I. 1969. Monogenetic trematodes of the fish of the Volta basin and South Ghana. Bulletin de l'Institut Fondamental d'Afrique Noire 31:840–880.

———. 1979. Monogenea of inland water fish in Africa. Annales du Musée Royal d'Afrique Centrale, Série in-8° (Sciences Zoologiques), No. 226, 1–131.

———, **and J. P. Thurston.** 1969. Monogenetic trematodes collected from cichlid fish in Uganda; including the description of five new species of *Cichlidogyrus*. Revue de Zoologie et de Botanique Africaines 79:15–33.

Pariselle, A., and L. Euzet. In press a. Gill parasites of the genus *Cichlidogyrus* Paperna, 1960 (Monogenea, Ancyrocephalidae) from *Tilapia guineensis* (Bleeker, 1862), with descriptions of six new species. Systematic Parasitology.

———, **and** ———. In press b. Revision of the genus *Cichlidogyrus* Paperna, 1960 (Monogenea, Ancyrocephalidae) gill parasite from the West African Cichlidae of the subgenus *Coptodon* Regan, 1920 (Pisces), with descriptions of four new species. Systematic Parasitology.

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