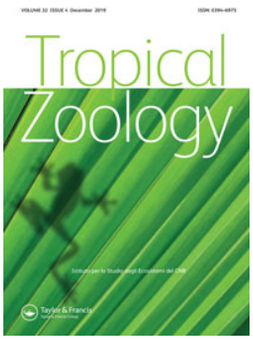

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TERRESTRIAL ISOPODS FROM WEST AFRICA

PART 4: ADDENDA AND CONCLUSIONS: PUBBLICAZIONI DEL CENTRO DI STUDIO PER LA FAUNISTICA ED ECOLOGIA TROPICALI DEL C.N.R.: CCLXX

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PUBBLICATO DALLA UNIVERSITÀ DEGLI STUDI DI FIRENZE
CON IL CONTRIBUTO DEL CONSIGLIO NAZIONALE DELLE RICERCHE

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TERRESTRIAL ISOPODS FROM WEST AFRICA

PART 4: ADDENDA AND CONCLUSIONS

(PUBBLICAZIONI DEL CENTRO DI STUDIO
PER LA FAUNISTICA ED ECOLOGIA TROPICALI DEL C.N.R.: CCLXX)

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I. INTRODUCTION

Part 1 of our review of the terrestrial isopods from West Africa — between the Senegal and Congo rivers — deals with the family Eubelidae (FERRARA & SCHMALFUSS, 1976), Part 2 with the families Tylidae, Ligiidae, Trichoniscidae, Styloniscidae, Rhyscotidae, Halophilosciidae, Philosciidae, Platyarthridae, Trachelipidae, Porcellionidae, Armadillidiidae (SCHMALFUSS & FERRARA, 1978) and Part 3 with the family Armadillidae (SCHMALFUSS & FERRARA, 1983). This 4th and last part includes the study of new collections and the re-examination of the type-specimens of several

species described by HILGENDORF, BUDDE-LUND, and VERHOEFF. It also includes a dichotomous key of all the genera treated in the monograph and comments on the distribution and ecology of the West African Oniscidea.

At present about 160 species are recorded from West Africa. Although this number represents only part of the actual number of species living there it is indicative of the composition of that isopodan fauna.

We wish to thank Prof. E. GRUNER (Berlin), Dr L. TIEFENBACHER (München), Dr Å. ANDERSON (Stockholm), Dr B. HAUSER (Genève), Dr P. BERON (Sofia), Dr R. JOCQUÉ (Tervuren) for having loaned us the material and Dr V. HAAS for the isopods collected in Cameroon.

The following abbreviations are used:

BM = British Museum (Natural History), London;
MHNG = Muséum d'Histoire Naturelle, Genève;
MG = Museo Civico di Storia Naturale «Giacomo Doria», Genoa;
MRAC = Musée Royal de l'Afrique Centrale, Tervuren;
NMNH = National Museum of Natural History, Sofia;
NRS = Naturhistoriska Riksmuseet, Stockholm;
SMNS = Staatliches Museum für Naturkunde, Stuttgart;
ZMB = Zoologisches Museum, Berlin;
ZSM = Zoologische Staatsammlung, München.

Note. — Since most of the species have been treated in our previous papers we refer to these references whenever further reference is unnecessary.

II. FAMILY LIGIIDAE Brandt & Ratzeburg, 1831

A. Genus LIGIA Fabricius, 1798

1. *Ligia gracilipes* Budde-Lund, 1885.

Ligia gracilipes SCHMALFUSS & FERRARA, 1978, p. 24, figs; FERRARA & TAITI, 1979, p. 94.

Material examined. — Fernando Po: 5 ♀♀, Malabo, leg. P. Beron, 21.XII.1976 (NMHN).

Remarks. — This species is distributed from Senegal (Dakar) to Angola (Ambriz). This is the first record for the islands of the Gulf of Guinea.

III. Family PHILOSCIIDAE Vandel, 1952

A. Genus Arcangeloscia Schmalfuss & Ferrara, 1978

1. *Arcangeloscia* sp.

Philoscia buettneri Hilgendorf, 1893, p. 155 (*partim*).
«*Philoscia*» *buettneri*: Schmalfuss & Ferrara, 1978, p. 67; Ferrara & Taiti, 1979, p. 115.

Published material re-examined. — Cameroon: 1 ♀ 8 mm long, Kribi, leg. Morgen, XII.1888 (ZMB, No. 8213).

Remarks. — The specimen from Cameroon mentioned by Hilgendorf (1893) in his description of *Philoscia buettneri* turned out to be different from the type-material of *Philoscia buettneri* from Togo, which has to be ascribed to the genus *Togoscia* (*vide infra*). Unfortunately the sex of the specimen does not allow a specific identification.

B. Genus Congophiloscia Arcangeli, 1950

1. *Congophiloscia saothomensis* Schmalfuss & Ferrara, 1978.

Congophiloscia saothomensis Schmalfuss & Ferrara, 1978, p. 52, figs.

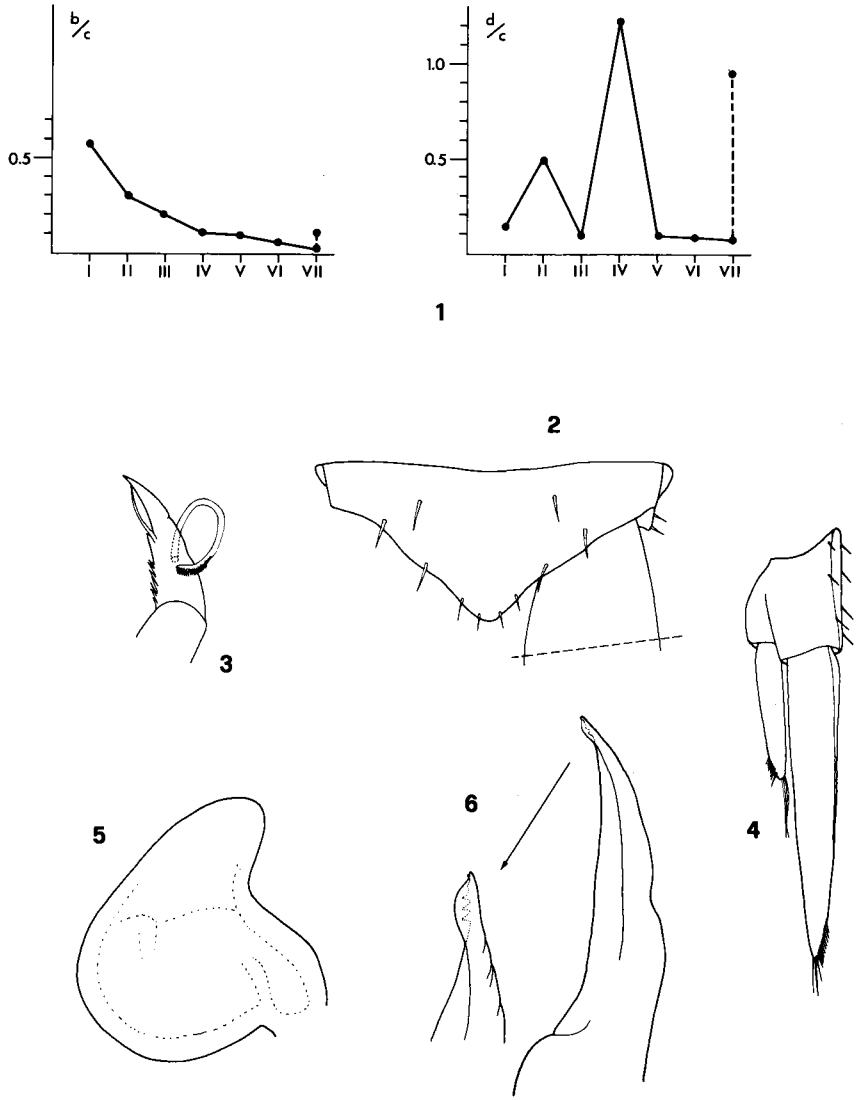
Material examined. — São Tomé: 3 ♂♂, 1 ♀, S. Nicolau, 850 m, leg. G. Schmitz, 1.X.1973 (MRAC 54115).

Distribution. — Only known from São Tomé.

C. Genus Leonoscia n. gen.

Type-species: *Leonoscia bicolorata* n. sp.

Diagnosis. — Few gland pores at the lateral margins of pereon segments 1-4; small ovoid scale-spines at the margins of segments; pereon segment 7 with two *noduli laterales* per side; b/c and d/c co-ordinates of *noduli laterales* as in Fig. 1; frontal and supra-antennal lines absent; pleon epimera reduced; molar penicil of mandible simple; outer ramus of maxilla 1 with 4+6 (5 cleft) teeth, inner ramus with two thickset penicils and very small posterior tooth; maxilliped with hirsute endite and penicil; pereopods equipped with a brush-like dactylar seta; pleopod exopodites without respiratory areas; uropod: insertion of endopodite proximal to that of exopodite.



Figs 1-6. — *Leonoscia bicolorata* n. gen. n. sp., ♂: b/c and d/c co-ordinates of *noduli laterales* (Fig. 1); telson (Fig. 2); dactylar seta (Fig. 3); uropod (Fig. 4); pleopod 1 exopodite (Fig. 5) and endopodite (Fig. 6).

Remarks. — The new genus is akin to *Zebrascia* Verhoeff, 1942 from which it differs in the presence of gland pores and a brush-like dactylar seta and in the insertion of uropod endopodite proximal to that of exopodite.

1. *Leonoscia bicolorata* n. sp.

Material examined. — Sierra Leone: 4 ♂♂ (1 ♂, holotype), 12 ♀♀ (2 ovig.), Freetown, Pepel Town, leg. D. Olu and D. Pitt, IV.1977 (MRAC 54425); 3 ♀♀, Freetown, Murray Town Village, C.M.S. Grammar School, leg. D. Olu and D. Pitt, I.1977 (MRAC 54225); 2 ♀♀ (1 ovig.), same data (MRAC 54227).

Description. — Maximum length ♂ 7.5 mm, ♀ 10.5 mm (ovigerous ♀♀ 8.5-10.5 mm). Back olive-brown with usual muscle spots, first two or first three article and distal third of 5th article of antenna and median part of uropod-exopodite white. Tergites equipped with few upright setae and on the epimeral margins with ovoid scale-spines; 2-3 gland pores per side on pereon segments 1-4; b/c and d/c co-ordinates of *noduli laterales* as in Fig. 1. Eyes with 20-22 ommatidia. Telson (Fig. 2) with slightly sinuous sides. Segments of the antennal flagellum diminishing in length from proximal to distal. Pereopods with dactylar seta as in Fig. 3. Uropods (Fig. 4): protopodite grooved on outer margin, exopodite very long (about 2.5 times longer than endopodite).

Male: pereopods without sexual specializations. Pleopod 1 (Figs 5, 6) exopodite with posterior point rounded, endopodite with swollen apex.

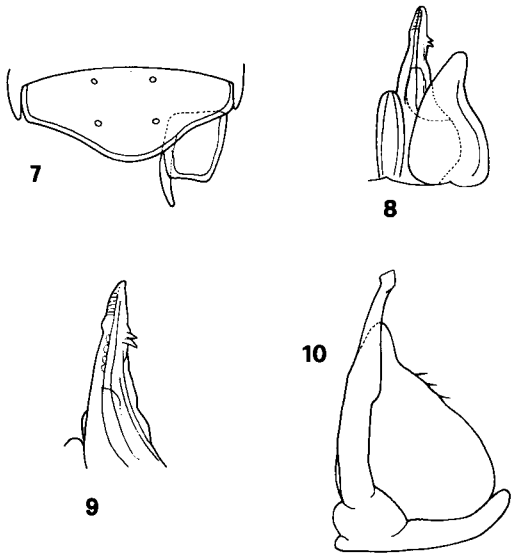
D. Genus PLEOPODOSCIA Verhoeff, 1942

1. *Pleopodoscia isabelensis* Verhoeff, 1942.

Pleopodoscia isabelensis VERHOEFF, 1942a, p. 95, figs; SCHMALFUSS & FERRARA, 1978, p. 55; FERRARA & TAITI, 1979, p. 117.

Type-material re-examined. — Fernando Po: 1 ♂ (holotype, ZSM).

Remarks. — The specimen, dissected and mounted on a slide, is incomplete (some pereon segments and pereopods are missing) and a full description is not possible. However, since the original description as well as VERHOEFF's opinion about the affinities of this genus are erroneous, we think it useful to list all the characters which it has been possible to check: (i) *sulcus marginalis* and gland pores (about 10 per side on pereon segment 1) are present; (ii) two *noduli laterales* per side on pereon segment 7; (iii) frontal line absent (the «frontal line» described by VERHOEFF is due to the crushing of cephalon in the slide preparation), supra-antennal line?; (iv) pleon epimera 3-5 with long posterior points; (v) molar penicil of mandible dichotomized; (vi) outer ramus of maxilla 1 with 4+6 (4-5 cleft) teeth; (vii) endite of maxilliped with a penicil; (viii) pleopod exopodites appar-



Figs 7-10. — *Pleopodoscia isabelensis* Verhoeff, 1942, ♂: telson (Fig. 7); pleopod 1 (Fig. 8); apex of pleopod 1 endopodite (Fig. 9); pleopod 2 (Fig. 10). Figs 7-9 after VERHOEFF (1942a).

ently without respiratory structures; (ix) uropod: endopodite inserted proximal to exopodite.

The corrections to VERHOEFF's diagnosis (iii, vii) as well as the addition of new characters show that the genus *Pleopodoscia* belongs to the West African group of philosciids while no affinities exist between this and *Chaetophiloscia* as stated by the German author. Perhaps it corresponds to some of the genera quoted for this area.

Telson and the characteristic male pleopods 1 and 2 are shown in Figs 7-10.

E. Genus RENNELLOSCIA Vandel, 1970

1. *Rennelloscia kohleri* Schmalfuss & Ferrara, 1978.

Rennelloscia kohleri SCHMALFUSS & FERRARA, 1978, p. 56, figs.

Material examined. — São Tomé: 1 ♂, 6 ♀♀ (2 ovig.), San Miguel, SW-coast, 100 m, leg. G. Schmitz, 30.X.1973 (MRAC 54118).

Remarks. — The new material perfectly agrees with the original description; the two ovigerous females are 2.8 and 3.2 mm long.

Distribution. — South West Cameroon.

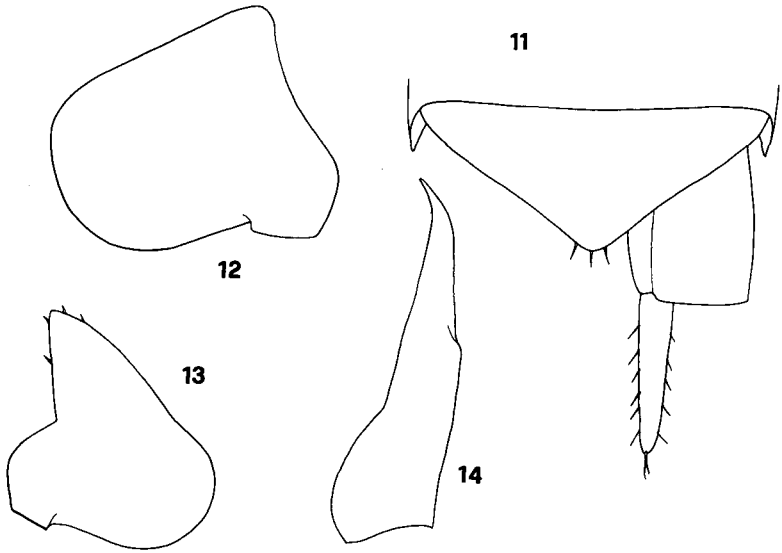
F. Genus TOGOSCIA Schmalfuss & Ferrara, 1978

1. *Togoscia buettneri* (Hilgendorf, 1893).

Philoscia buettneri HILGENDORF, 1893, p. 154 (*partim*).
«*Philoscia*» *buettneri* SCHMALFUSS & FERRARA, 1978, p. 67; FERRARA & TAITI, 1979, p. 115.
?*Togoscia* sp. II SCHMALFUSS & FERRARA, 1978, p. 58, figs.

Type-material re-examined. — Togo: 1 ♀ 7 mm long (holotype), Bismarckburg (= Kasanga), leg. R. Buettner, VII.1891 (ZMB, No. 8705).

Material examined. — Togo: 2 ♂♂ 6-7 mm long, 2 ♀♀ 6.5 mm long, Bismarckburg, leg. R. Buettner, IX.1891 (ZMB, No. 8706); 2 ♂♂ 6-6.5 mm long, 1 ♀ 6 mm long, Bismarckburg, leg. R. Buettner, XII.1890 (ZMB, No. 8703); 3 ♀♀ 6.5-8 mm long, Bismarckburg, leg. R. Buettner, VII.1891 (ZMB, No. 8704).



Figs 11-14. — *Togoscia buettneri* (Hilgendorf, 1893): telson (Fig. 11); pleopod 1 exopodite ♀ (Fig. 12); ♂ pleopod 1 exopodite (Fig. 13) and endopodite (Fig. 14).

Description. — Since the original description of this species could apply to nearly every West African species of Philosciidae a re-description will be given.

Dimensions: maximum length 8 mm; colour completely faded by long conservation; b/c and d/c co-ordinates of *noduli laterales* as described in the generic diagnosis (SCHMALFUSS & FERRARA, 1978, fig. 102); frontal and supra-antennal lines absent; eyes with 24 ommatidia; posterior points of pleon epimera visible in dorsal view; telson (Fig. 11) with sides very slightly concave, apex narrowly rounded; antenna with proximal segment of flagellum longest, distal shortest; mouthparts as described in the generic diagnosis; pleopod exopodite 1 in female as in Fig. 12; uropod as in Fig. 11.

Male: pereopods without specializations; pleopod 1 (Figs 13, 14): exopodite with long triangular posterior lobe; endopodite with pointed apex bent outwards.

Remarks. — The specimens from Cameroon determined by PAULIAN DE FÉLICE (1940a, p. 102) as «*Philoscia buettneri*» do not belong to this species, the *terra typica* of which is Togo and not Cameroon as PAULIAN DE FÉLICE stated.

Most probably the specimen quoted *Togoscia* sp. II in SCHMALFUSS & FERRARA (1978, p. 58) belongs to this species.

Since no type-species was designated for the genus *Togoscia* (only females were studied and no specific names were given), we designate *Togoscia buettneri* as type-species of the genus.

IV. FAMILY PLATYARTHRIDAE Verhoeff, 1949

A. Genus NIAMBIA Budde-Lund, 1904

1. *Niambia atracheata* (Schmalfuss & Ferrara, 1978).

Leptotrichus atracheatus SCHMALFUSS & FERRARA, 1978, p. 85, figs.
Niambia atracheata SCHMALFUSS, 1982, p. 132.

Remarks. — This species was incorrectly ascribed to the genus *Leptotrichus* while it certainly belongs to the genus *Niambia* (SCHMALFUSS, 1982).

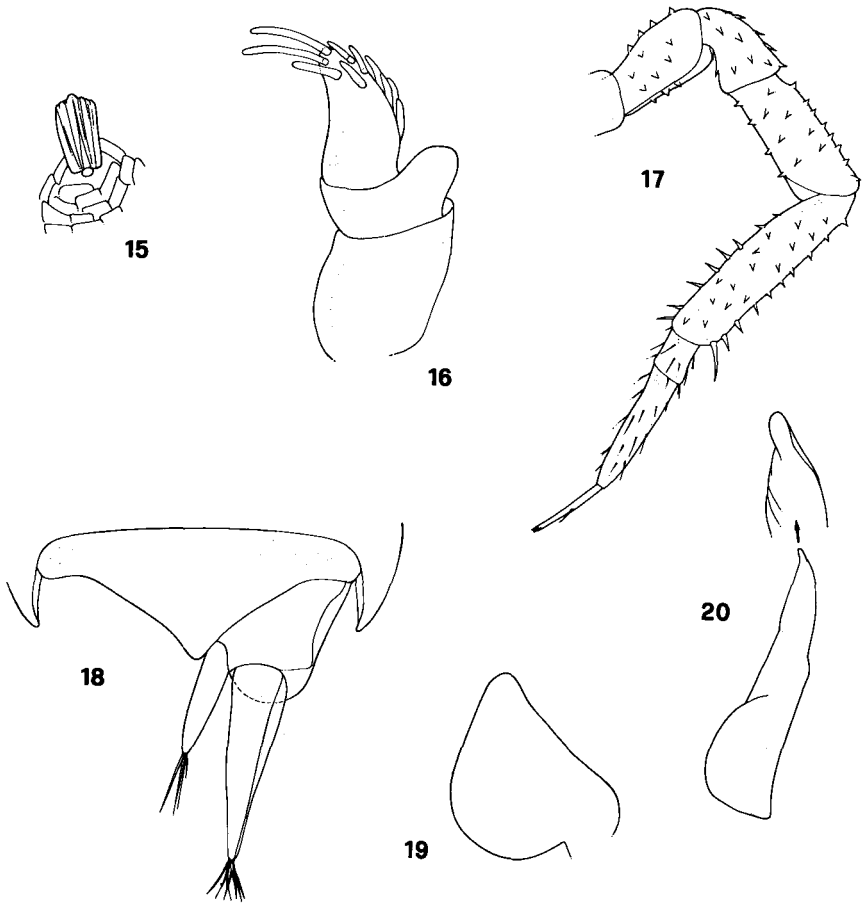
B. Genus TRICHORHINA Budde-Lund, 1908

1. *Trichorhina hospes* Silvestri, 1917.

Trichorhina hospes SCHMALFUSS & FERRARA, 1978, p. 78; FERRARA & TAITI, 1979, p. 125.

Material examined. — São Tomé: 1 ♂, 1 ♀ (ovig.), San Miguel, SW-coast, 100 m, leg. G. Schmitz, 30.X.1973 (MRAC 54118); 2 ♂♂, 1 ♀, Esprainza, N-coast, «Km 30», leg. G. Schmitz, 12-17.XI.1973 (MRAC 54130).

Remarks. — SILVESTRI described this species on a single female from Nigeria (Olokemeji). The new material agrees with SILVESTRI's description, but since no ♂♂ are described from Nigeria there is the possibility that the specimens from São Tomé belong to another species. We give drawings of scale-spines (Fig. 15), antennula (Fig. 16), antenna (Fig. 17), telson and uropod (Fig. 18), and pleopod 1 ♂ (Figs 19, 20).



Figs 15-20. — *Trichorhina hospes* Silvestri, 1917, ♂: scale-spine (Fig. 15); antennula (Fig. 16); antenna (Fig. 17); telson and right uropod (Fig. 18); pleopod 1 exopodite (Fig. 19) and endopodite (Fig. 20).

V. Family PORCELLIONIDAE Brandt & Ratzeburg, 1831

A. Genus Porcellio Latreille, 1804

1. *Porcellio scaber* Latreille, 1804.

Porcellio scaber Schmalfuss & Ferrara, 1978, p. 87; Ferrara & Taiti, 1979, p. 130.

Published material re-examined. — Togo: 1 ♀, Bismarckburg (= Kasanga), leg. R. Buettner, date ?, (ZMB, No. 8700) (published by HILGENDORF, 1893, p. 154).

Remarks. — The re-examination confirmed HILGENDORF's identification, so our assumption that this specimen probably belongs to *Porcellio monardi* Brian, 1953 (Part II, p. 87) was incorrect.

B. Genus PORCELLIONIDES Miers, 1877

1. *Porcellionides pruinosus* (Brandt, 1833).

Porcellionides pruinosus SCHMALFUSS & FERRARA, 1978, p. 90; FERRARA & TAITI, 1979, p. 131.

Material examined. — Sierra Leone: 1 ♀, Freetown, Mt Aureol, leg. D. Olu and D. Pitt, IX.1976 (MRAC 54221).

São Tomé: 1 ♂, 1 ♀, Fortunato, 300 m, 5 km «Néves interieur», leg. G. Schmitz, 13.X.1973 (MRAC 54121).

VI. FAMILY EUBELIDAE Budde-Lund, 1899

A. Genus CONGETHELUM n. gen.

Type-species: *Congethelum hauseri* n. sp.

Diagnosis. — Animals able to conglobate; back without ornamentation; eyes reduced (5-6 ommatidia); cephalon of *Mesarmadillo*-type; pereon segment 1 with thickening laterally flattened and posteriorly grooved; *sulcus arcuatus* and *schisma* present; inner and outer lobe of *schisma* rounded, subequal; a narrow transverse process on ventral surface of pereon segments 2-3; telson with rectangular distal part, rounded apex; antenna with 2-jointed flagellum; inner ramus of maxilla 1 with three penicils; pleopod exopodites 1-2 with *Eubelum*-type pseudotracheae; uropod exopodite inserted terminally.

Remarks. — Because of the structure of the cephalon, pereon segments, telson and uropods *Congethelum* belongs to the group of «typical» Eubelidae (*Eubelum, Mesarmadillo*, etc.). Because of the presence of three maxillary penicils (but only for this unusual character) the new genus corresponds to *Gelsana* Budde-Lund, 1910 and *Periscyphoides* Arcangeli, 1950 (1).

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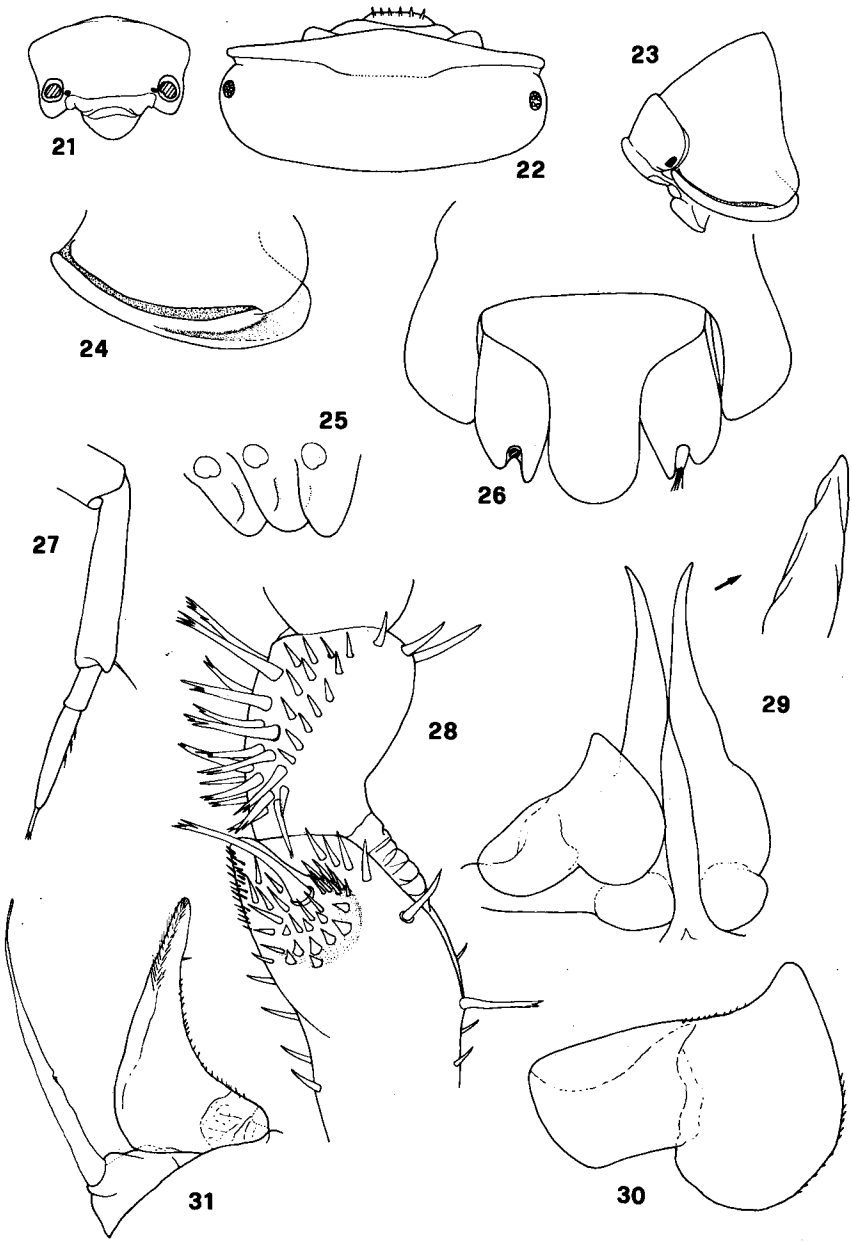
(1) The genus *Fakoanum* Paulian de Félice, 1940 also shows this character but it is too incompletely (and probably incorrectly) described to be discussed.



Figs 21-31. — *Congethelum hauseri* n. gen. n. sp.: cephalon, frontal (Fig. 21) and dorsal (Fig. 22); cephalon and pereon segment 1 (Fig. 23); pereon segment 1 (Fig. 24); pereon segments 2-4, ventral (Fig. 25); telson and uropods (Fig. 26); antenna (Fig. 27); ♂: pereopod 7, ischium and merus (Fig. 28); pleopod 1 (Fig. 29); pleopod 1 exopodite (Fig. 30); pleopod 2 (Fig. 31).

Congethelum is typified essentially by the following characters: structure of pereon segment 1, antenna with 2-jointed flagellum, inner ramus of maxilla 1 with three penicils, two pairs of pseudotracheae.

1. *Congethelum hauseri* n. sp.

Material examined. — Congo: 2 ♂♂ (1 ♂ holotype), 2 ♀♀, 1 ♂ juv., Grotte de Kila-Tari, près de Mouyondizi, leg. V. Aellen and P. Strinati, 11.VIII.1957 (MHNG).

Description. — About 7 mm long; colour: the juvenile specimen is colourless while the adults are dirty-white; the small eyes (5-6 ommatidia) are black. Cephalon (Figs 21, 22) with frontal margin folded on vertex and interrupted in the middle. Pereon segment 1 (Figs 23, 24): thickening enlarged and grooved posteriorly; deep *sulcus arcuatus*; inner and outer lobe of *schisma* larlgely rounded, subequal. Telson (Fig. 26) with long rectangular distal part, largely rounded apex. Antenna (Fig. 27): second segment of flagellum twice as long as first and equipped with some aesthetascs. Uropods (Fig. 26): protopodite with distal margin deeply incised, inner angle acute; exopodite not protruding from protopodite.

Male: pereopods 1-3 with a brush of spines on carpus and merus. Pereopod 7 (Fig. 28): ischium distally with a large triangular lobe equipped with many short, and one very long, spines; merus with several long spines on the sternal surface. Pleopod 1 (Figs 29, 30): exopodite with a short posterior point, endopodite without specializations at the apex. Pleopod 2 as in Fig. 31.

B. Genus EUBELUM Budde-Lund, 1885

1. *Eubelum asperius* Van Name, 1920.

Eubelum asperius FERRARA & SCHMALFUSS, 1976, p. 19, figs; FERRARA & TAITI, 1979, p. 144.
Guineodillo hebetatus VERHOEFF, 1942b, p. 152, figs; FERRARA & SCHMALFUSS, 1976, p. 109; FERRARA & TAITI, 1979, p. 149.

Type-material re-examined. — 3 ♂♂, 3 ♀♀, «Spanisch-Guinea, Rio Muni-Gebiete bei Kokobeach am Munifluss, 20 km oberhalb Ebby, leg. Manger» (syntypes of *Guineodillo hebetatus* Verhoeff, 1942; ZSM).

Material examined. — São Tomé: 10 spec., Colline Mukinki, 300 m, route NO, km 12, leg. G. Schmitz, 16.X.1973 (MRAC 54110); 2 spec., Bombain, 500 m, leg. G. Schmitz, X-XI.1973 (MRAC 54111); 6 spec., same data (MRAC 54112); 1 spec., Aguazo (Morro Carregado, Côte N, km 18), leg. G. Schmitz, 16.X.1973 (MRAC 54114); 9 spec., San Nico-

lau, 850 m, Centre, leg. G. Schmitz, 1.X.1973 (MRAC 54117); 2 spec., Fortunato, 300 m (5 km Néves interieur), leg. G. Schmitz, 13.X.1973 (MRAC 54119).

Remarks. — Re-examination of the type-material of *Guineodillo hebetatus* shows that this species is a junior synonym of *Eubelum asperius.*

Distribution. — This species is largely spread in Zaire, southern Cameroon, Gabon, Congo and Principe Island.

2. *Eubelum haasi* n. sp.

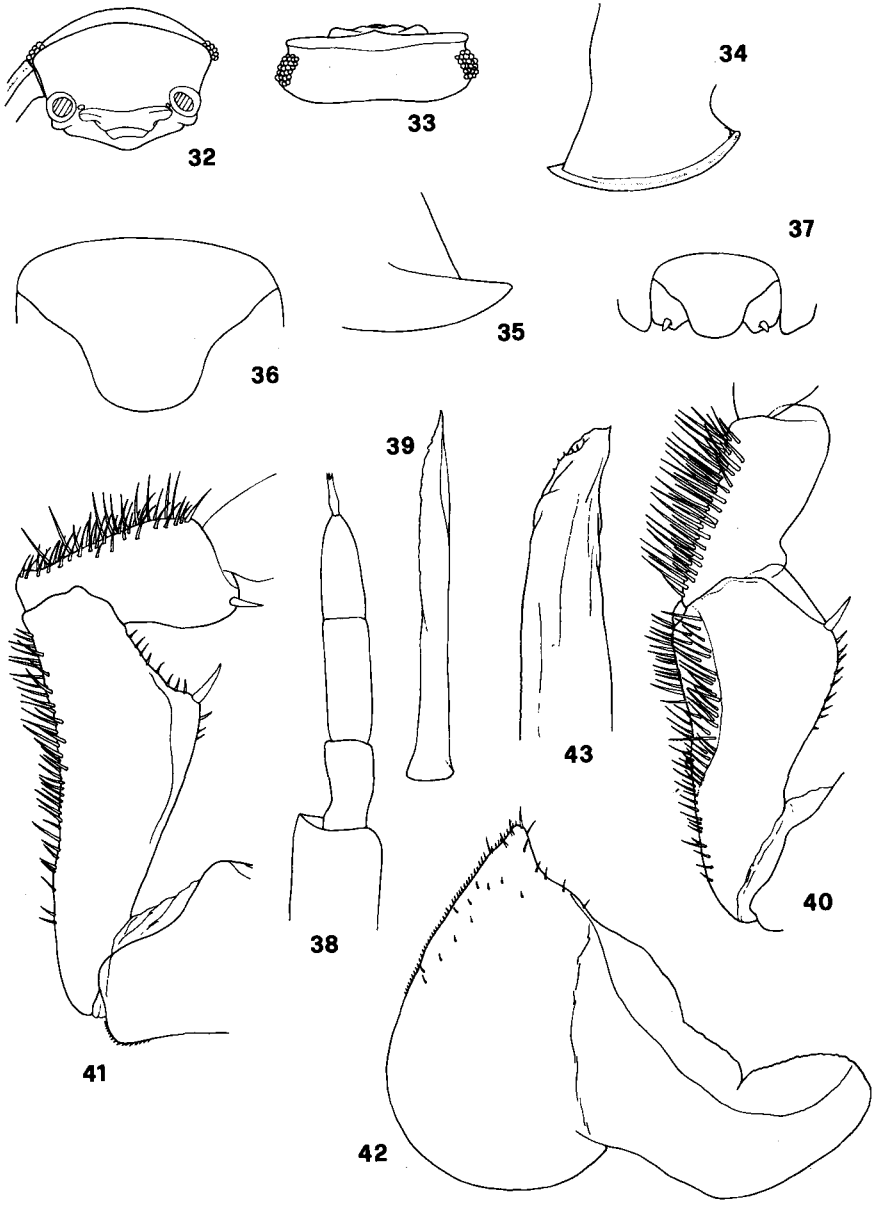
Material examined. — Cameroon: 2 ♂♂ (1 ♂ holotype), near Mouanko (south of Douala), leg. V. Haas, 22.III.1975 (SMNS).

Descriptions. — Dimensions: 14 × 7.3 mm. Iron-grey, a white spot at the postero-lateral angle of pereon segment 1 and at the anterior of the pereon segment 2; flagellum and distal part of 5th segment of antenna pale. Cephalon (Figs 32, 33) with frontal margin folded on vertex; eyes with 22 ommatidia. Pereon segment 1 (Figs 34, 35): lateral thickening very thin and narrow, clearly grooved externally; *sulcus arcuatus* reduced; inner lobe of *schisma* triangular, pointed, protruding distinctly backwards compared to the external one. Second and third pereon segment ventrally with the usual transverse thickenings. Epimera of pleon segment 5 parallel. Telson (Figs 36, 37): about 1.5 times wider than long, distal part very short, largely rounded apex. Antenna (Fig. 38): ratio of flagellum joints 1:1.3:1. Pereopods 1-6 with a brush of spines (Fig. 39) on carpus and merus; ischium of pereopod 6 (Fig. 40) with a spinose area on the distal half. Pereopod 7 (Fig. 41): ischium with sternal margin concave and equipped with long spines. Pleopod 1 (Figs 42, 43): exopodite with a narrow triangular posterior point; endopodite similar to that of many species of *Eubelum.* Uropods (Fig. 37) as in *E. lubricum* Budde-Lund, 1885 and *E. stipulatum* Budde-Lund, 1899.

Remarks. — The new species is akin to *E. lubricum* and *E. stipulatum* from which it is readily distinguished by the thin and narrow thickening of pereon segment 1 and sharp inner lobe of *schisma*, shape of telson and pereopods 6-7 in male. The male modifications of *E. haasi* correspond to *E. vannamei* Arcangeli, 1950 from which it differs by the shape of cephalon, pereon segment 1 and telson.

3. *Eubelum icarense* n. sp.

Material examined. — Cameroon: 1 ♂ (holotype), Icaré, 18 km N Yaoundé, leg. F. Puylaert, 22.IX.1971 (MRAC 53396).



Figs 32-43. — *Eubelum haasi* n. sp., ♂: cephalon, frontal (Fig. 32) and dorsal (Fig. 33); pereon segment 1 (Fig. 34); inner lobe of *schisma*, ventral (Fig. 35); telson (Fig. 36); telson and uropods (Fig. 37); flagellum of antenna (Fig. 38); spine of pereopod 1 merus and carpus (Fig. 39); pereopod 6, ischium and merus (Fig. 40); pereopod 7 ischium and merus (Fig. 41); pleopod 1, exopodite (Fig. 42) and apex of endopodite (Fig. 43).

Description. — Dimensions: 14.5 × 6.5 mm. Grey mottled with pale; back equipped with long setae. Cephalon (Figs 44, 45): about 3 times wider than long; eyes with 23 ommatidia. Pereon segment 1 (Fig. 46): thickening with the typical external groove, *sulcus arcuatus* deep and wide, inner lobe of *schisma* rounded, protruding backwards. Epimera of pleon segment 5 parallel. Telson (Figs 47, 48): short, with quadrangular distal part, apex slightly convex, rounded lateral angles. Antenna (Fig. 49): ratio of flagellum joints 1:1.7:1.3. Pereopods 1-2 with a brush of spines on carpus and merus; pereopod 3 with a brush of spines on carpus; pereopod 7 (Fig. 50): basis distally with a large triangular process; ischium with sternal margin straight. Pleopod 1 (Figs 51, 52): exopodite with short posterior point; endopodite with apex straight. Uropods as in the other species of the genus.

Remarks. — This species is akin to *E. lubricum* from which it differs in the shape of telson, pereopod 7 and pleopod exopodite 1 ♂, and presence of dorsal setae.

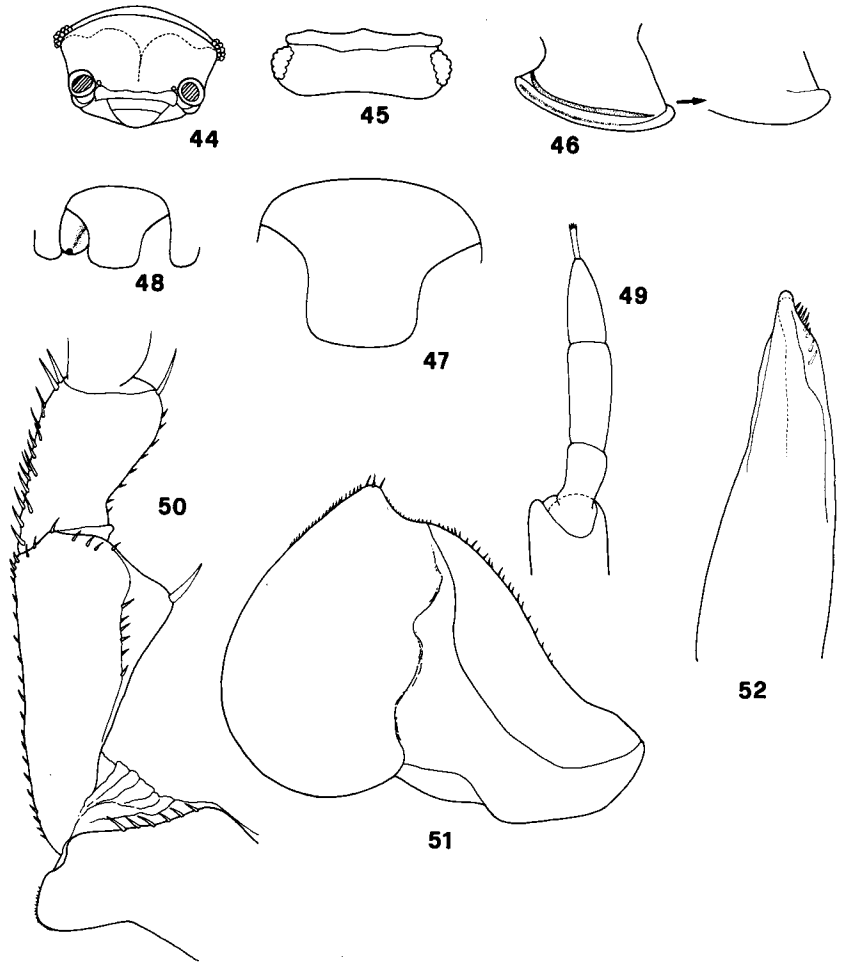
4. *Eubelum squamosum* n. sp.

Material examined. — Cameroon: 1 ♂ (holotype), 1 ♀, Ntem Bilik Ekéké, leg. V. Haas, 9.II.1975 (SMNS).

Description. — Dimensions: 4.5 × 2 mm. Brown with red cephalon. Tergites equipped with ovoid scale-spines. Cephalon (Figs 53, 54): 3 times wider than long, profrons folded up on vertex; eyes with 12-14 ommatidia. Pereon segment 1 (Fig. 55): thickening slightly grooved externally, *sulcus arcuatus* reduced, inner and outer lobes of *schisma* rounded, subequal. Epimera of pleon segment 5 slightly convergent. Telson (Fig. 56): about 1.5 times wider than long, concave sides, apex convex. Antenna (Fig. 57) with 2-jointed flagellum; second segment of flagellum about 3 times as long as first and equipped with some aesthetascs. Uropods as in Fig. 56.

Male: pereopods without specializations. Pleopod 1 (Figs 58, 59): exopodite without posterior point; endopodite without particular specializations.

Remarks. — This species belongs to the *asperius*-group (reduced size, 2-jointed antennal flagellum, etc.). It differs from all the species by the shape of pereon segment 1 and telson, the male modifications and the presence of scale-spines. In the latter character (but only this) the new species corresponds to *E. squamatum* Arcangeli, 1950.

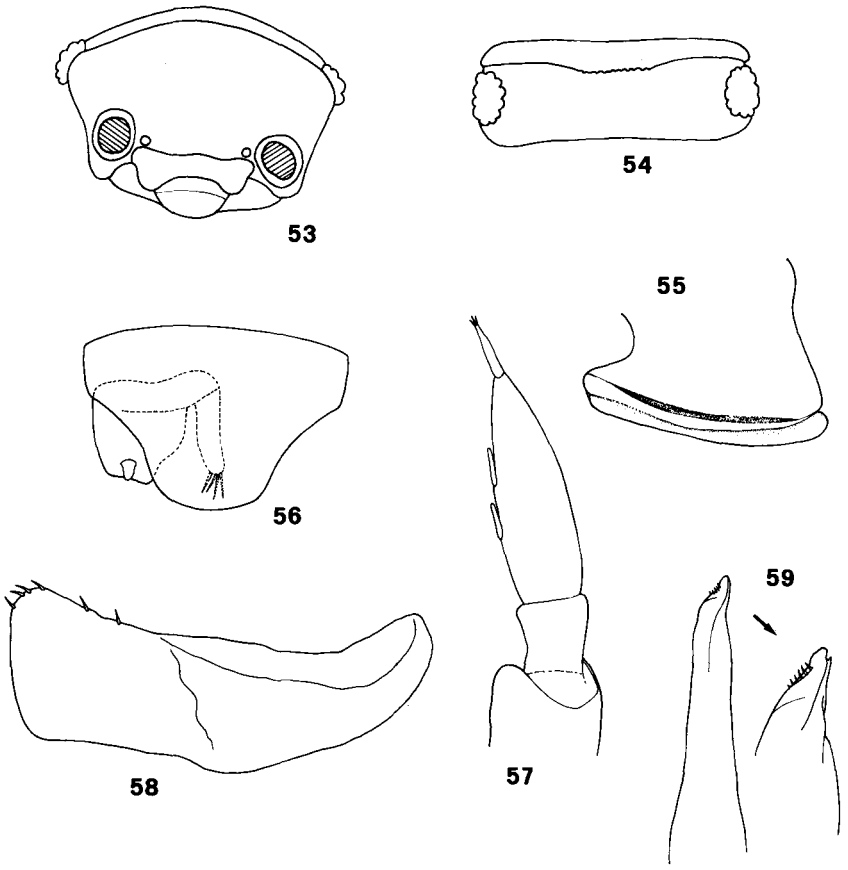


Figs 44-52. — *Eubelum icarense* n. sp., ♂: cephalon, frontal (Fig. 44) and dorsal (Fig. 45); pereon segment 1 (Fig. 46); telson (Fig. 47); telson and left uropod (Fig. 48); flagellum of antenna (Fig. 49); pereopod 7 (Fig. 50); pleopod 1, exopodite (Fig. 51) and apex of endopodite (Fig. 52).

5. *Eubelum stipulatum* Budde-Lund, 1899.

Eubelum stipulatum FERRARA & SCHMALFUSS, 1976, p. 14, figs; FERRARA & TAITI, 1979, p. 147.
?Guineodillo munganus VERHOEFF, 1942b, p. 152, figs; FERRARA & SCHMALFUSS, 1976, p. 109; FERRARA & TAITI, 1979, p. 149.

Material examined. — Cameroon: 1 ♀, Bibundi, leg. Y. Sjöstedt, VII.1891 (NRS 5727); 2 ♂♂, 8 ♀♀, «Cameroon», collector ?, date ? (NRS 5735).



Figs 53-59. — *Eubelum squamosum* n. sp., ♂: cephalon, frontal (Fig. 53) and dorsal (Fig. 54); pereon segment 1 (Fig. 55); telson and left uropod (Fig. 56); flagellum of antenna (Fig. 57); pleopod 1, exopodite (Fig. 58) and apex of endopodite (Fig. 59).

Remarks. — Although only re-examination of the type-material can allow a safe conclusion, we think that *Guineodillo munganus* is a junior synonym of *E. stipulatum* since no differences can be discovered between the two «species». There is no doubt, however, that VERHOEFF's species belongs to the genus *Eubelum.*

Distribution. — Southern Cameroon.

6. *Eubelum tomentosum* n. sp.

Material examined. — Gabon: 1 ♂ (holotype), 1 ♀, 1 ♀ juv., Grotte de N'Doumbou, Lastourville, leg. V. Aellen and P. Strinati, 4.VIII.1957 (MHNG).

Description. — Dimensions: 6.5-7.0 × 2.8-3.0 mm. Light brown. Tergites equipped with long, fine setae. Cephalon (Figs 60, 61) with a tiny ridge across the front; eyes with 11-12 ommatidia. Pereon segment 1 (Fig. 62): inner lobe of *schisma* rounded, protruding backwards compared to the outer one. Telson (Fig. 63) with uniformly hollowed sides, slightly convex apex. Antenna with 3-jointed flagellum.

Male: pereopod 1 (Fig. 64): carpus and merus with several, sparse spines on sternal margins. Pereopod 7 (Fig. 65): basis distally with a rounded process; ischium with sternal margin straight, equipped with short spines and verrucae. Pleopod 1 (Figs 66, 67): exopodite with triangular posterior point; endopodite with a row of spines near the apex.

Remarks. — Because of the presence of tergal setae, this species is akin to *E. gabunensis* Ferrara & Schmalfuss, 1976 from which it differs in the shape of the cephalon, telson and uropods.

7. *Eubelum ubangium* (Verhoeff, 1942).

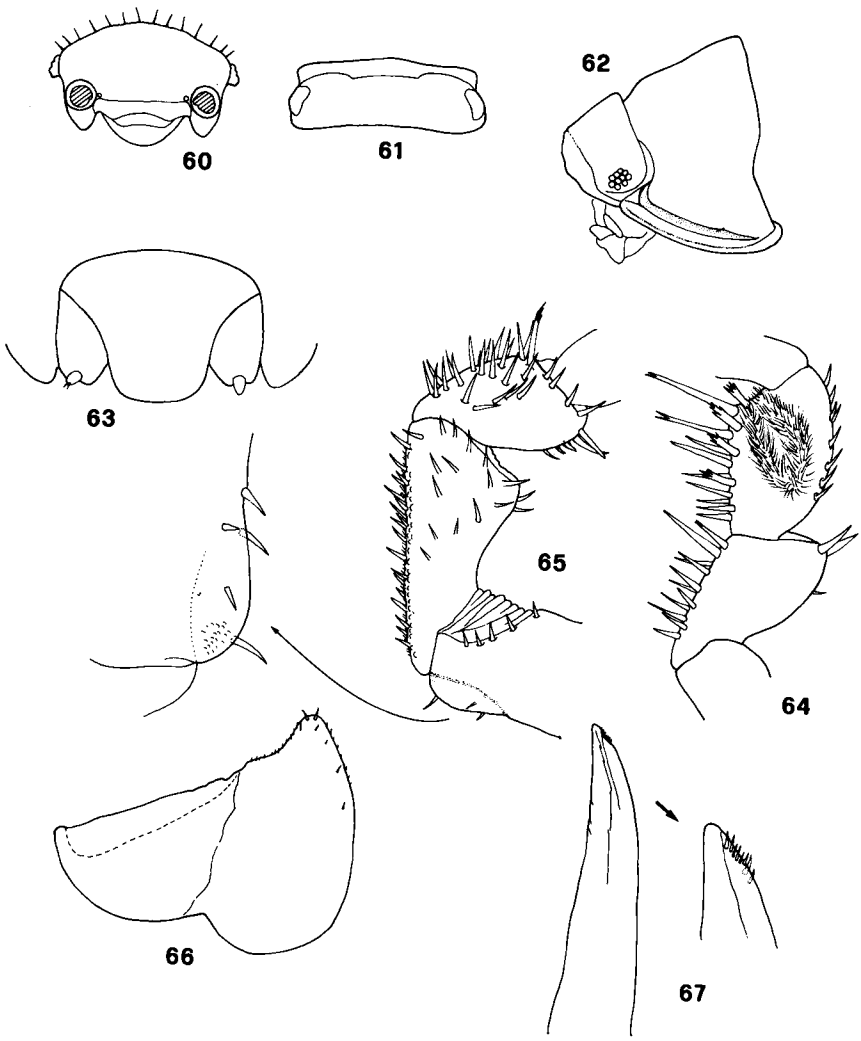
Guineodillo ubangius VERHOEFF, 1942b, p. 151, figs; FERRARA & SCHMALFUSS, 1976, p. 109; FERRARA & TAITI, 1979, p. 149.

Material examined. — Cameroon: 3 ♂♂, 2 ♀♀, 1 juv., Konbetiko, Banbara, Doume River, leg. F. Puylaert, 3.II.1976 (MRAC 54208).

Description. — Maximum dimensions: 16 × 7.7 mm. Grey with light muscular insertions. Cephalon (Fig. 68) with a continuous ridge across the front; eyes with 21-22 ommatidia. Pereon segment 1 (Figs 69, 70): inner lobe of *schisma* rounded, not longer than outer one. Pereon segments 2-3 with ventral processes as in all the species of *Eubelum*. Telson (Fig. 71) with short, rectangular distal part, truncated apex. Uropods as in *E. lubricum*.

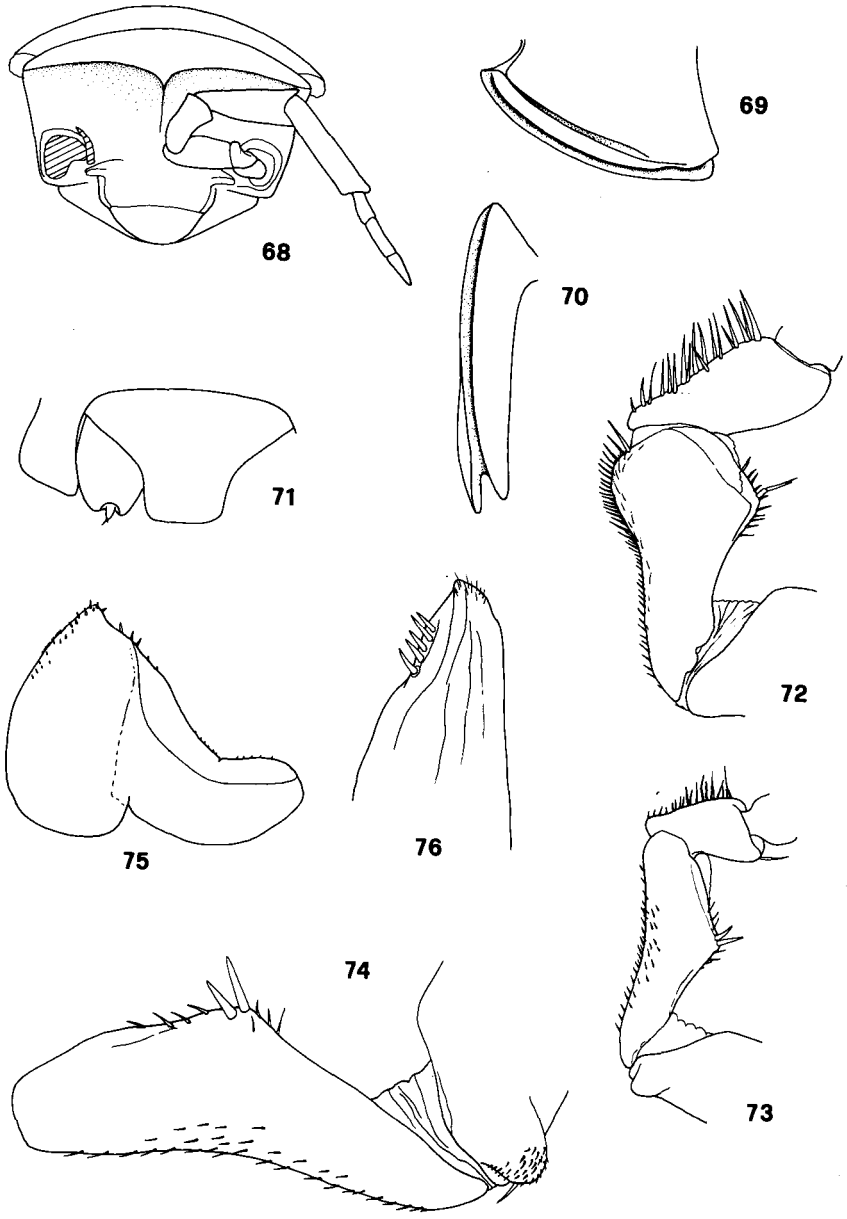
Male: pereopods 1-6 carpus and merus with brushes of spines. Pereopod 6 ischium (Fig. 72) distally enlarged. Pereopod 7 (Figs 73, 74): basis with a rounded distal process; ischium with sternal margin concave. Pleopod 1 (Figs 75, 76): exopodite with short posterior point; endopodite as in many other species of *Eubelum*.

Remarks. — Even if VERHOEFF's description of *Guineodillo ubangius* is not exhaustive we think that our specimens can be ascribed to this species. In any case there is no doubt, that *Guineodillo* and *Eubelum* are the same genus because there are no differences between the two descriptions. VERHOEFF (1942b, p. 150) claimed that an important difference is the presence in *Guineodillo* of an antennal flagellum with two segments the second of which can be divided by a «Ringfurche». This is exactly



Figs 60-67. — *Eubelum tomentosum* n. sp., ♂: cephalon, frontal (Fig. 60) and dorsal (Fig. 61); cephalon and pereon segment 1 (Fig. 62); telson and uropods (Fig. 63); pereopod 1, merus and carpus (Fig. 64); pereopod 7 (Fig. 65); pleopod 1, exopodite (Fig. 66) and apex of endopodite (Fig. 67).

what happens in *Eubelum* in which there are species with a 2-jointed flagellum (*asperius*-group) and others with a 3-jointed flagellum (*lubricum*-group). In this group nevertheless the division between 2nd and 3rd segment is always «superficial».



Figs 68-76. — *Eubelum ubangium* (Verhoeff, 1942), ♂: cephalon and left antenna, frontal (Fig. 68); pereon segment 1 (Fig. 69); lateral margin of pereon segment 1 (Fig. 70); telson and left uropod (Fig. 71); pereopod 6, ischium and merus (Fig. 72); pereopod 7, basis, ischium and merus (Fig. 73); pereopod 7 ischium (Fig. 74); pleopod 1, exopodite (Fig. 75) and apex of endopodite (Fig. 76).

C. Genus HIALLUM Budde-Lund, 1899

Type-species: *Eubelum Hilgendorfii* Budde-Lund, 1898.

Diagnosis. — Ability of conglobation; back without granulations; cephalon with small, rounded «side-lobes» and a continuous margin across the front; pereon segment 1 with lateral thickening and *sulcus arcuatus* but no *schisma*; no conspicuous endolobi on ventral parts of epimera; triangular telson with concave sides; antenna with 2-jointed flagellum; inner ramus of maxilla 1 with several penicils; only pleopod exopodites 1 with pseudotracheae (in *H. camerunicum*, ♀, they occupy the whole appendage); uropod protopodites shorter than telson, rectangular, with posterior margin excavated, exopodite inserted terminally.

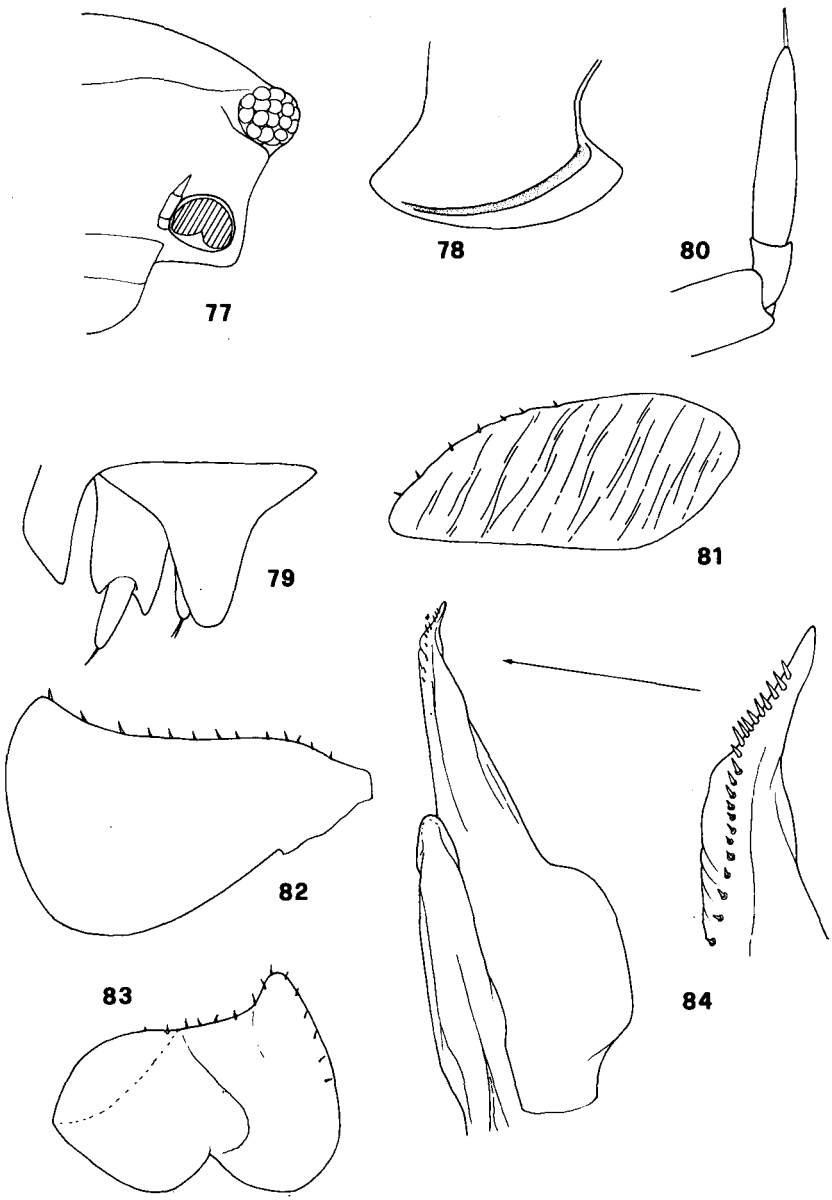
1. *Hiallum camerunicum* n. sp.

Material examined. — Cameroon: 1 ♂ (holotype), 1 ♀ juv., Kounden, Riv. Mouh (Berlese, «bois mort»), leg. F. Puylaert, 29.XII.1975 (MRAC 54206); 1 ♂, 1 ♀ ovig., very small juveniles, Kounden (Berlese, «motte d'herbes»), leg. F. Puylaert, 26.XII.1975 (MRAC 54207).

Description. — Dimensions: ♀ (ovig.) 7 mm long, ♂ (holotype) 5 mm long. Brownish. Cephalon (Fig. 77) with a tiny ridge across the front; eyes with 15-16 ommatidia. Pereon segment 1 (Fig. 78): posterior margin concave, postero-lateral angle narrowly rounded. Telson (Fig. 79) with rounded apex. Antenna (Fig. 80): second segment of flagellum 3 times longer than first. Pleopod exopodite 1 ♀ (Fig. 81): pseudotracheae occupy the whole appendage. Pleopod exopodite 2 (Fig. 82) without respiratory structures. Uropods (Fig. 79): protopodite with medial angle acute; exopodite considerably long (about 3 times longer than wide).

Male: pereopod 1 with a sparse brush of spines on carpus. Pereopod 7 without specializations. Pleopod 1 (Figs 83, 84): exopodite with triangular posterior point; endopodite with apex folded outwards, medially with a row of strong spines.

Remarks. — The new species is akin to *H. hilgendorfi* from which it differs in the absence of scale-spines and presence of a posterior point on pleopod 1 exopodite ♂. It is doubtful whether *Hiallum affine* Richardson, 1909, *H. postflavum* Richardson, 1909 and *H. rothschildi* Richardson, 1909 belong to *Hiallum*.



Figs 77-84. — *Hiallum camerunicum* n. sp.: cephalon (Fig. 77); pereon segment 1 (Fig. 78); telson and left uropod (Fig. 79); flagellum of antenna (Fig. 80); pleopod 1 exopodite (Fig. 81); pleopod 2 exopodite (Fig. 82); ♂, pleopod 1, exopodite (Fig. 83) and endopodite (Fig. 84).

D. Genus MESARMADILLO Dollfus, 1892

1. *Mesarmadillo eubeloides* n. sp.

Material examined. — Nigeria: 216 ♂♂ and ♀♀ (1 ♂, holotype), Fishpond, Univ. Ibadan, leg. S.A. Joye (BM); 1 ♀, Plateau Province, Jos, leg. A. E. Meenssen and L. Bouquiane (MRAC 51103); 1 ♀, Lagos, leg. I. L. Cloudsley-Thompson (MRAC 51530); 1 ♂, 5 ♀♀, Ibadan, leg. I. L. Cloudsley-Thompson (MRAC 51531).

Togo: 1 ♂, Cascade de Missahoé, 500 m, leg. Y. Duc, 11.VI.1963 (MRAC 51326).

Description. — Medium dimensions: 10×5.2 mm. Dark brown or iron-grey with light spots; some specimens with red cephalon. Cephalon (Figs 85, 86): about 2.4 times wider than long; front convex, frontal margin interrupted in the middle; eyes with 17-18 ommatidia. Pereon segment 1 (Fig. 87): deep *sulcus arcuatus*, enlarged posteriorly; inner lobe of *schisma*, as in all species of *Mesarmadillo*, shorter than outer one. Epimera on pleon segment 5 convergent. Telson (Fig. 88): distal part rectangular, truncated apex, rounded angles. Antenna (Fig. 89): short comparted to the other species of the genus, ratio of flagellum joints 1:1.5:1. Uropods (Figs 88, 90): protopodite ovoid; exopodite very small, inserted terminally.

Male: pereopod 1-3 (Fig. 91): a sparse brush of spines on carpus. Pereopod 7 without specialization. Pleopod 1 (Figs 92, 93): exopodite without conspicuous posterior point; endopodite with pointed apex. Pleopod 2 as in Fig. 94.

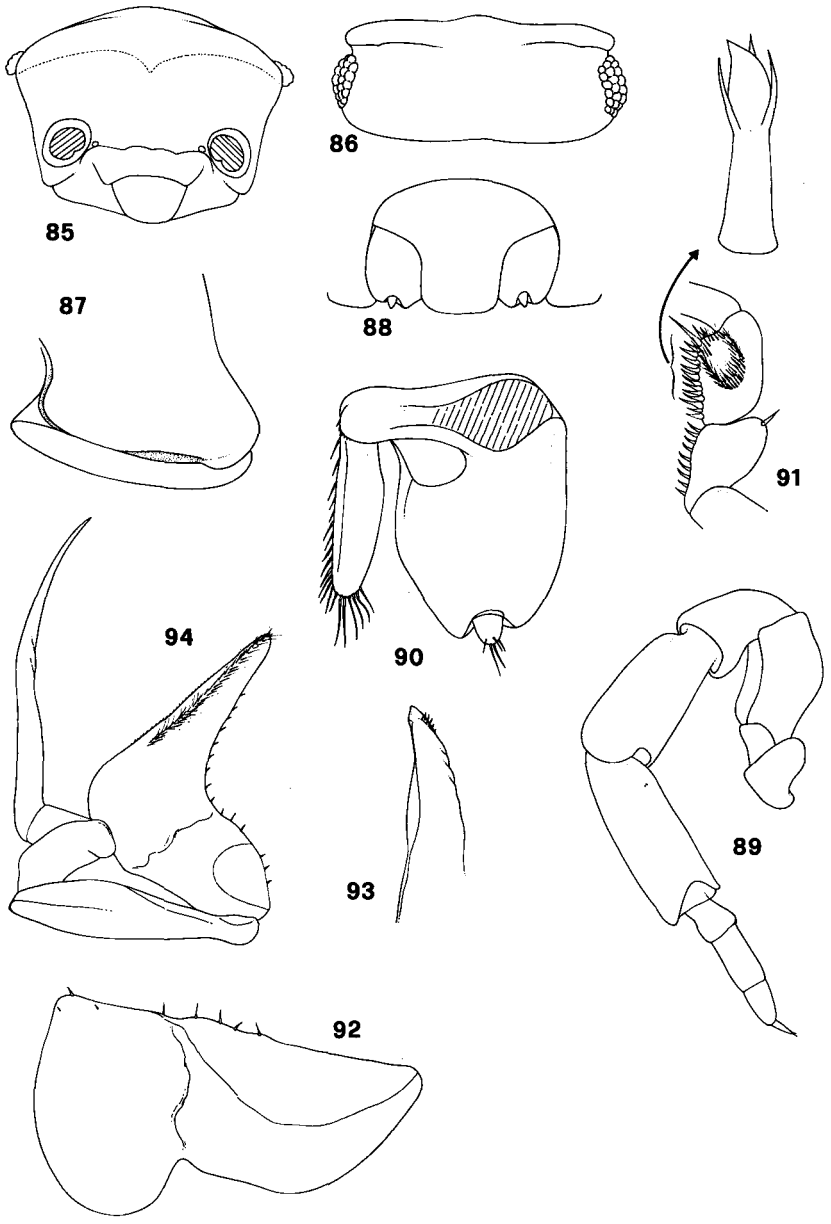
Remarks. — This species is readily distinguished from all the other species of *Mesarmadillo* by the shape of the telson and uropods.

2. *Mesarmadillo montanus* (Verhoeff, 1942).

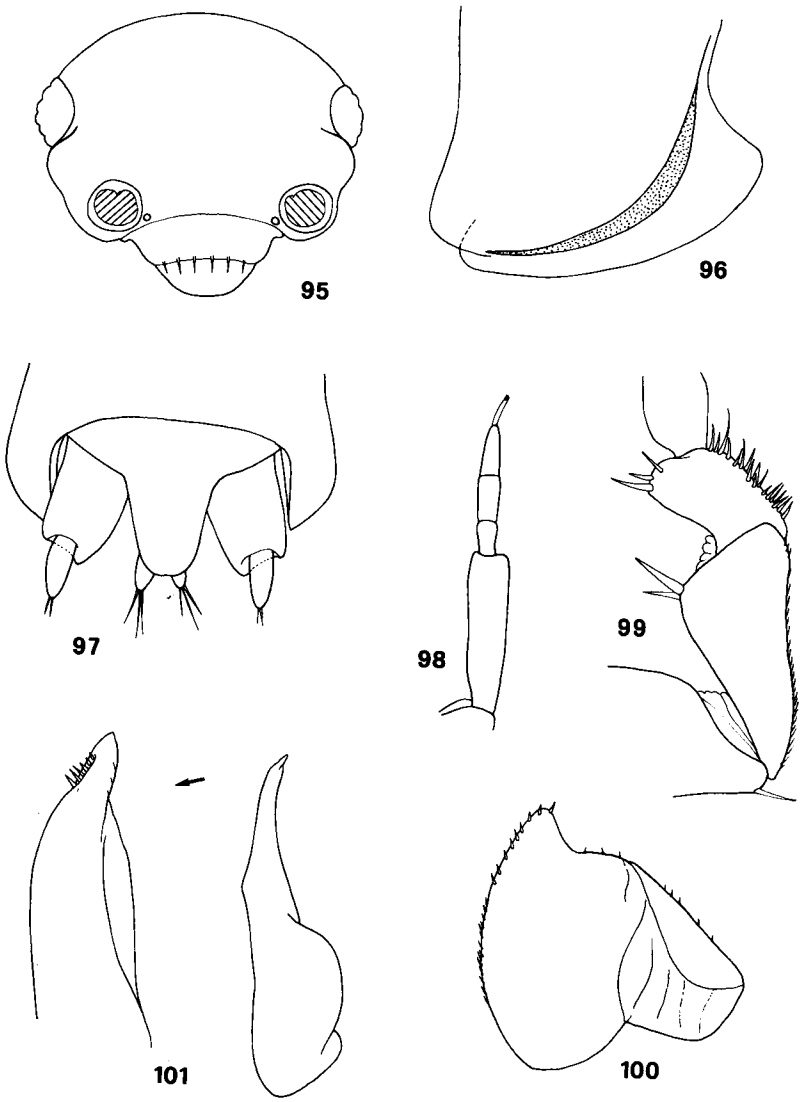
Parethelum montanum VERHOEFF, 1942a, p. 91, figs; FERRARA & SCHMALFUSS, 1976, p. 108; FERRARA & TAITI, 1979, p. 158.

Type-material re-examined. — Fernando Po: 1 ♂ (dissected and mounted on two slides), Moka am Pic von S. Isabel, 1600 m Höhe, XII.1939 (holotype, ZSM).

Remarks. — This species belongs to the genus *Mesarmadillo* of which *Parethelum* becomes a junior synonym. Unlike *P. insulanum* which proved to be a synonym of *M. quadrimaculatus*, *M. montanus* appears to be a good species.



Figs 85-94. — *Mesarmadillo eubeloides* n. sp., ♂: cephalon, frontal (Fig. 85) and dorsal (Fig. 86); pereon segment 1 (Fig. 87); telson and uropods (Fig. 88); antenna (Fig. 89); uropod (Fig. 90); pereopod 1, merus and carpus (Fig. 91); pleopod 1, exopodite (Fig. 92) and apex of endopodite (Fig. 93); pleopod 2 (Fig. 94).



Figs 95-101. — *Mesarmadillo montanus* (Verhoeff, 1942), ♂: cephalon (Fig. 95); pereon segment 1 (Fig. 96); telson and uropods (Fig. 97); antenna (Fig. 98); pereopod 7 (Fig. 99); pleopod 1, exopodite (Fig. 100) and endopodite (Fig. 101).

Since only two micropreparations are available a distinctive description is not possible. We have added the illustrations of the main characters which typify this species (Figs 95-101). We have not seen the

female specimen quoted by VERHOEFF (1942a, p. 92) which is probably deposited in the Hamburg Museum.

3. *Mesarmadillo quadrimaculatus* Budde-Lund, 1899.

Parethelum insulanum VERHOEFF, 1942a, p. 89, figs; FERRARA & SCHMALFUSS, 1976, p. 108; FERRARA & TAITI, 1979, p. 158.
Mesarmadillo quadrimaculatus FERRARA & SCHMALFUSS, 1976, p. 29, figs; FERRARA & TAITI, 1979, p. 154.

Type-material re-examined. — Fernando Po: 2 ♂♂, 2 ♀♀, 1 ♂ dissected, 1 spec. dried and pinned, «bei Mosula, 570 m Höhe in Humus und Detritus», leg. Eidmann, 6.IX.1939 (syntypes of *Parethelum insulanum* Verhoeff, 1942; ZSM).

Remarks. — Re-examination of type-material of *Parethelum insulanum* proved that these specimens are conspecific with *Mesarmadillo quadrimaculatus*.

Distribution. — Mt Cameroon region and Fernando Po.

E. Genus MICROCERCUS Budde-Lund, 1910

1. *Microcercus beroni* Taiti & Ferrara, 1981.

Microcercus beroni TAITI & FERRARA, 1981, p. 125, figs.
Microcercus sp. (= *villiersi* ?) FERRARA & SCHMALFUSS, 1976, p. 84 (the specimen from Olokemeji).

Distribution. — Nigeria.

2. *Microcercus rotundatus* (Richardson, 1907).

Ethelum rotundatum RICHARDSON, 1907, p. 237, figs; PAULIAN DE FÉLICE, 1941, p. 52; FERRARA & SCHMALFUSS, 1976, p. 74.
«Ethelum» rotundatum FERRARA & TAITI, 1979, p. 143.
Microcercus Villiersi PAULIAN DE FÉLICE, 1940b, p. 148, figs.
Microcercus villiersi FERRARA & SCHMALFUSS, 1976, p. 77, figs; FERRARA & TAITI, 1979, p. 157.
?*Microcercus Monodi* PAULIAN DE FÉLICE, 1940b, p. 150, figs.
?*Microcercus monodi* FERRARA & SCHMALFUSS, 1976, p. 84; FERRARA & TAITI, 1979, p. 156.

Material examined. — Sierra Leone: many specimens ♂♂, ♀♀, juveniles, Freetown, leg. D. Pitt, III.1975 (MRAC 53983); Freetown, Botanical Garden, leg. D. Pitt, V.1975 (MRAC 54025); Freetown, Botanical Garden, Fourah Bay College, Mount Aureol, leg. D. Olu and D. Pitt, IX.1976 (MRAC 54220); Freetown, Murray Town Village, C.M.S. Grammar School, leg. D. Olu and D. Pitt, I.1977 (MRAC 54224); same data (MRAC 54226); Freetown, Botanical Garden, Fourah Bay College, leg. D. Olu and D. Pitt, I.1977 (MRAC 54228); same data (MRAC

54230); same data, IV-V.1977 (MRAC 54422); Freetown, Mount Aureol, Botanical Garden, leg. D. Olu and D. Pitt, IV-V.1977 (MRAC 54421); Freetown, Murray Town, leg. D. Olu and D. Pitt, IV.1977 (MRAC 54424); Sierra Leone, in leaf mould, leg. M. Show, 19.VII.1971 (BM No. 170).

Remarks. — RICHARDSON (1907) described this species as *Ethelum rotundatum* on specimens from Sierra Leone. The new material agrees with RICHARDSON's description in every detail (including the collecting localities). Although the American author did not describe the male characters we think that our specimens can be reasonably ascribed to the species *rotundatus* (which certainly belongs to the genus *Microcercus*).

Moreover they correspond to *M. villiersi* Paulian de Félice, 1940 which becomes a junior synonym of *M. rotundatus*. We also suspect — from the description — that *Microcercus monodi* Paulian de Félice, 1940 corresponds to the juvenile stadium of *M. rotundatus*. In fact all the juvenile specimens of this species that we examined perfectly fit PAULIAN DE FÉLICE's description.

Distribution. — Senegal, Guinea-Bissau, Guinea, Sierra Leone, Liberia.

F. Genus PANNINGILLO Verhoeff, 1942

1. *Panningillo schultzei* Verhoeff, 1942.

Panningillo schultzei FERRARA & SCHMALFUSS, 1976, p. 104, figs; FERRARA & TAITI, 1979, p. 157.

Material examined. — Zaire: 1 ♂, 1 ♀, Equator, ter. Ikela, fôret marécageuse près du ruisseau, leg. N. Leleup, IX.1959 (MRAC 50763).

Remarks. — Although this record is not in our area of West Africa, we think it useful to add new drawings of the cephalon, interlocking structures, dactylar seta and male characters (Figs 102-109).

Distribution. — Cameroon, Zaire.

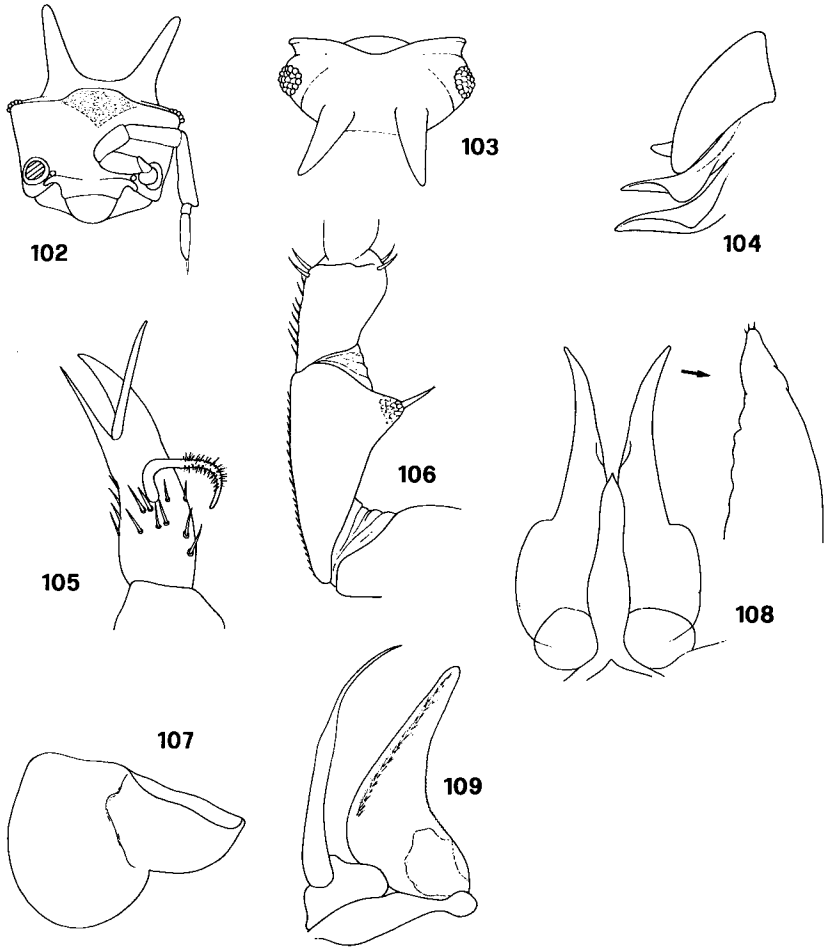
G. Genus PERISCYPHOPS Hilgendorf, 1893

1. *Periscyphops bizonatus* Budde-Lund, 1899.

Periscyphops bizonatus FERRARA & SCHMALFUSS, 1976, p. 43, figs; FERRARA & TAITI, 1979, p. 158.

Material examined. — Cameroon: 2 ♀ ♀, Buea, 800-1200 m, leg. L. Fea, VI-VII.1902 (MG).

Distribution. — Cameroon, Fernando Po.



Figs 102-109. — *Panningillo schultzei* Verhoeff, 1942, ♂: cephalon, frontal (Fig. 102) and dorsal (Fig. 103); pereon segments 1-3, ventral (Fig. 104); dactylar seta (Fig. 105); pereopod 7 (Fig. 106); pleopod 1, exopodite (Fig. 107) and endopodite (Fig. 108); pleopod 2 (Fig. 109).

2. *Periscyphops gibbosus* Budde-Lund, 1899.

Periscyphops gibbosus FERRARA & SCHMALFUSS, 1976, p. 61; FERRARA & TAITI, 1979, p. 159.

Type-material re-examined. — Cameroon: fragments of a specimen, Bileundi (mistake for Bibundi?), leg. Y. Sjöstedt, VIII.1891 (NRS).

Remarks. — The absence in this type-specimen of the cephalon, pereon segment 1 and pleopods does not allow any description or compari-

son with other species, thus we propose to consider this species a *nomen oblitum*.

3. *Periscyphops occidentalis* n. sp.

Periscyphops cooki: PAULIAN DE FÉLICE, 1941, p. 55.

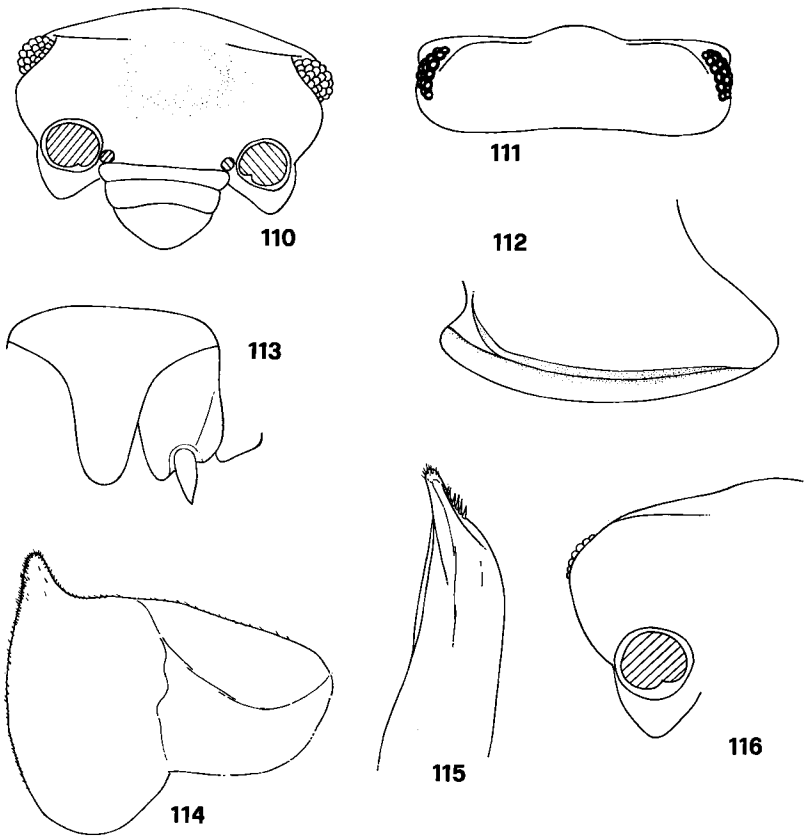
Material examined. — Sierra Leone: 3 ♂♂ (1 ♂ holotype), 5 ♀♀, 3 juv., Freetown, Botanical Garden, Fourah Bay College, Mount Aureol, leg. D. Olu and D. Pitt, IX.1976 (MRAC 54220); 3 ♂♂, 4 ♀♀, Freetown, Botanical Garden, leg. D. Pitt, V.1976 (MRAC 54025); 7 ♀♀, Freetown, Murray Town Village, C.M.S. Grammar School, leg. D. Olu and D. Pitt, I.1977 (MRAC 54224); 3 ♂♂, same data (MRAC 54226); 4 ♀♀, Freetown, Botanical Garden, Fourah Bay College, leg. D. Olu and D. Pitt, I.1977 (MRAC 54228); 1 ♂, 1 ♀, same data (MRAC 54230); ? 3 juv., Freetown, Pepel Town, leg. D. Olu and D. Pitt, IV.1977 (MRAC 54425); 1 ♂, Kissy Jetty, leg. A. R. Longhurst (BM No. 117).

Description. — Dimensions: 15-17 × 6.5-8 mm. Colour from iron-grey to violet-brown. Cephalon (Figs 110, 111): bulbous profrons, interocular line clearly visible on both sides of vertex, rounded «side-lobes»; eyes with 23-24 ommatidia. Pereon segment 1 (Fig. 112): *sulcus arcuatus* relatively narrow; postero-lateral angle rounded; a rounded endolobos on the ventral surface. Telson (Fig. 113): wider than long, distal part with slightly converging sides, rounded apex. Uropods (Fig. 113): protopodite with slightly sinuous outer margin.

Male: pereopods 1-2, a brush of spines on carpus and merus. Pereopod 7 without specializations. Pleopod 1 (Figs 114, 115): exopodite with distinct posterior point; endopodite with pointed apex equipped with tiny setae and, medially, with a row of spines.

Remarks. — This species is very close to *P. pseudosilvanus* Ferrara & Schmalfuss, 1976 from which it differs in: (i) the smaller «side-lobes» (compare Figs 110 and 116); (ii) more rounded postero-lateral angle of pereon segment 1; (iii) shorter distal part of telson; (iv) pleopod exopodite 1 ♂, with distinct posterior point. *P. occidentalis* is also akin to *P. cooki* Richardson, 1907 from Liberia from which it differs in the presence of a distinct tooth, completely absent in *P. cooki*, on the underside of pereon segment 1. Moreover none of the specimens of *P. occidentalis* shows the characteristic colouration of *P. cooki* (brown back mottled with yellow).

Surely the record of *Periscyphops cooki* from Freetown (PAULIAN DE FÉLICE, 1941) refers to *P. occidentalis*.



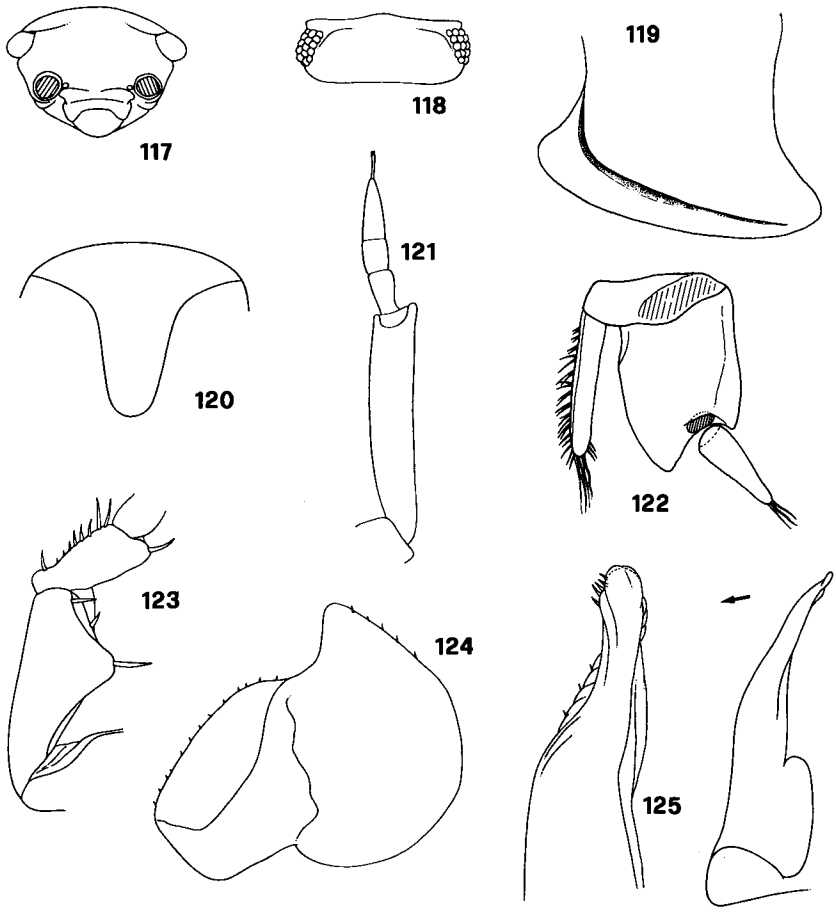
Figs 110-115. — *Periscyphops occidentalis* n. sp.: cephalon, frontal (Fig. 110) and dorsal (Fig. 111); pereon segment 1 (Fig. 112); telson and right uropod (Fig. 113); ♂ pleopod 1, exopodite (Fig. 114) and apex of endopodite (Fig. 115).

Fig. 116. — *Periscyphops pseudosilvanus* Ferrara & Schmalfuss, 1976: right side of cephalon, frontal.

4. *Periscyphops ogonensis* n. sp.

Material examined. — Togo: 2 ♂♂ (1 ♂ holotype), 1 ♀, Mt Ogon, sommet, 1020 m, savane, leg. I. Duc, 26.VI.1963 (MRAC 51327).

Description. — Dimensions: 8-8.5 × 2.6-2.9 mm. Brown with light spots; epimera of pereon segments 2 and 7 white, of pereon segment 6 black. Tergites with the usual fine setae. Cephalon (Figs 117, 118): profrons slightly protruding, small, rounded «side-lobes»; eyes with 18-20 ommatidia. Pereon segment 1 (Fig. 119): narrowly rounded postero-lateral



Figs 117-125. — *Periscyphops ogonensis* n. sp., ♂: cephalon, frontal (Fig. 117) and dorsal (Fig. 118); pereon segment 1 (Fig. 119); telson (Fig. 120); antenna (Fig. 121); uropod (Fig. 122); pereopod 7 ischium and merus (Fig. 123); pleopod 1, exopodite (Fig. 124) and endopodite (Fig. 125).

angle; no endolobos on the ventral surface. Epimera of pleon segment 5 divergent. Telson (Fig. 120): about 1.2 times wider than long, rounded apex. Antenna (Fig. 121): ratio of flagellum joints 4:3:6. Uropods (Fig. 122): medial angle protruding distinctly backwards.

Male: pereopod 1 with a brush of short spines on carpus. Pereopod 7 (Fig. 123): ischium with sternal margin straight; merus with a slight protrusion on the sternal margin. Pleopod 1 (Figs 124, 125): exopodite with conspicuous posterior point; endopodite with swollen apex.

Remarks. — This species is readily distinguished from all the other *Periscyphops* species by the male characters.

5. *Periscyphops pseudosilvanus* Ferrara & Schmalfuss, 1976.

Periscyphops pseudosilvanus FERRARA & SCHMALFUSS, 1976, p. 47, figs; FERRARA & TAITI, 1979, p. 161.

Material examined. — Nigeria: 1 ♂, 2 ♀♀ Lagos, leg. I. L. Cloudsley-Thompson, I.1965 (MRAC 51530).

Distribution. — Ghana, Nigeria.

6. *Periscyphops silvanus* Budde-Lund, 1899.

Periscyphops silvanus FERRARA & SCHMALFUSS, 1976, p. 41, figs; FERRARA & TAITI, 1979, p. 161.

Material examined. — Cameroon: 1 ♀, Longji, leg. Paschen, VI.1904 (ZMB, No. 11283).

Distribution. — Cameroon.

7. *Periscyphops squamatus* Budde-Lund, 1899.

Periscyphops squamatus FERRARA & SCHMALFUSS, 1976, p. 61; FERRARA & TAITI, 1979, p. 161.

Type-material re-examined. — Cameroon: 1 ♀, 1 ♀ (fragments only), Bibundi, leg. Y. Sjöstedt, VIII.1891 (NRS 5694).

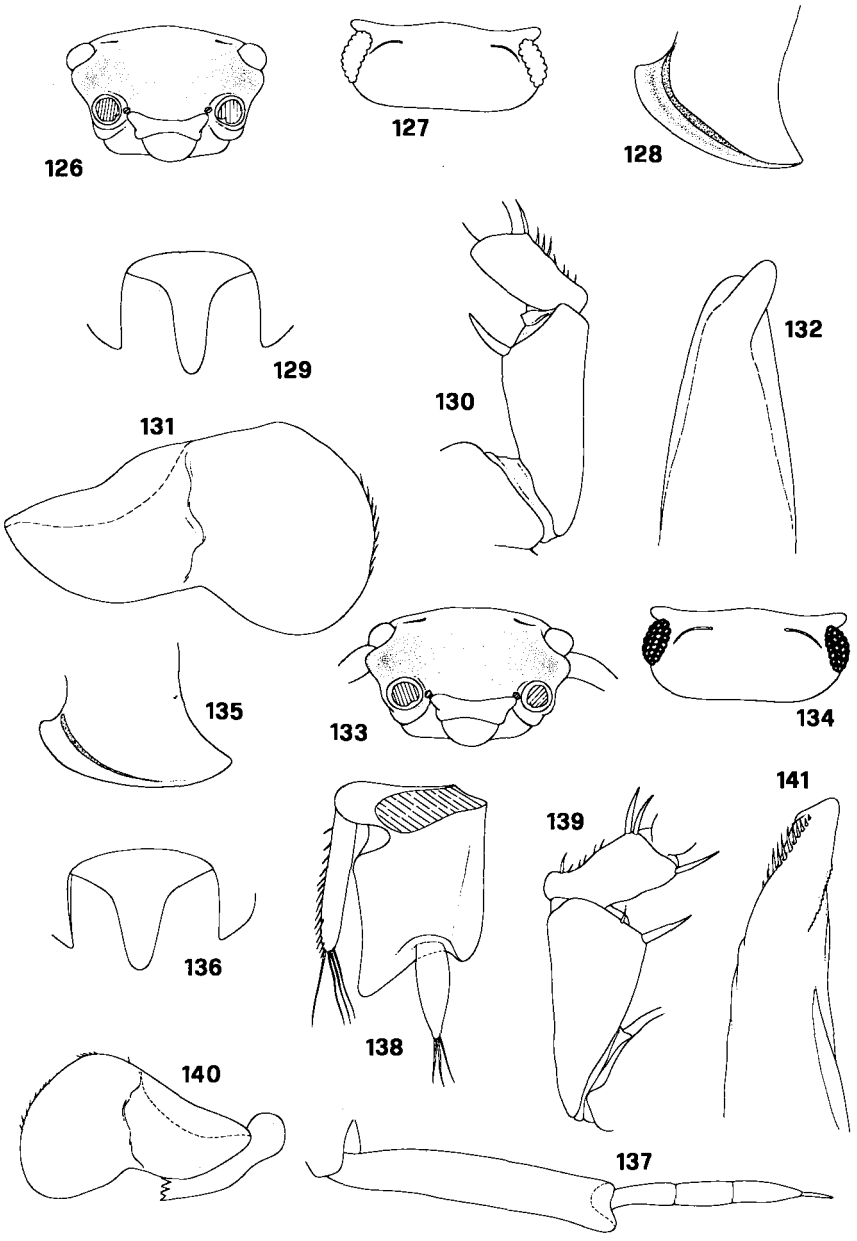
Description. — Dimensions: 7.5 × 4 mm. Colour faded by long conservation. Tergites equipped with very small scale-spines. Cephalon (Figs 126, 127): «side-lobes» rounded, protruding forwards; frontal margin visible only near the eyes; eyes with about 20 ommatidia. Pereon segment 1 (Fig. 128): thickening dorsally flattened; *sulcus arcuatus* wide and deep which disappears in the posterior third; postero-lateral angle acute; no conspicuous endolobos on the ventral surface of epimera. Telson (Fig. 129): as wide as long, narrow distal part about twice as long as basal, narrowly rounded apex. Uropods: protopodite with medial angle acute, protruding distinctly backwards.

Male: pereopod 7 (Fig. 130): ischium with sternal margin straight; merus without specializations. Pleopod 1 (Figs 131, 132): exopodite without posterior point; endopodite with a narrow elongated apical lobe.

8. *Periscyphops squamosus* Budde-Lund, 1899.

Periscyphops squamosus FERRARA & SCHMALFUSS, 1976, p. 61; FERRARA & TAITI, 1979, p. 161.

Type-material re-examined. — Cameroon: 1 ♂, Bibundi, leg. Y. Sjöstedt, VIII.1891 (NRS 5693).



Figs 126-132. — *Periscyphops squamatus* Budde-Lund, 1899, ♂: cephalon, frontal (Fig. 126) and dorsal (Fig. 127); pereon segment 1 (Fig. 128); telson (Fig. 129); pereopod 7 ischium and merus (Fig. 130); pleopod 1, exopodite (Fig. 131) and apex of endopodite (Fig. 132).

Figs 133-141. — *Periscyphops squamosus* Budde-Lund, 1899, ♂: cephalon, frontal (Fig. 133) and dorsal (Fig. 134); pereon segment 1 (Fig. 135); telson (Fig. 136); antenna (Fig. 137); uropod (Fig. 138); pereopod 7 ischium and merus (Fig. 139); pleopod 1, exopodite (Fig. 140) and apex of endopodite (Fig. 141).

Description. — Dimensions: 9 × 4.3 mm. Colour faded by long conservation. Tergites equipped with small scale-spines. Cephalon (Figs 133, 134): very similar to that of the preceding species. Pereon segment 1 (Fig. 135): thickening dorsally flattened, *sulcus arcuatus* very short, visible only anteriorly; postero-lateral angle acute; no endolobos ventrally. Telson (Fig. 136): wider than long, distal part with oblique sides, rounded apex. Antenna (Fig. 137): flagellum joints subequal. Pereopod 1 with a brush of spines on carpus and merus. Pereopod 7 (Fig. 139): ischium with sternal margin straight; merus with a distinct protuberance at the base. Pleopod 1 (Figs 140, 141): exopodite without posterior point; endopodite with a row of spines near the apex. Uropods (Fig. 138): very similar to that of *P. squamatus*.

Remarks. — This and the preceding species are very close to each other and more material is necessary for a better definition.

9. *Periscyphops tenellus* Budde-Lund, 1899.

Eubelum (Periscyphops) tenellus BUDDE-LUND, 1899, p. 17, figs.
Periscyphops tenellus FERRARA & SCHMALFUSS, 1976, p. 61; FERRARA & TAITI, 1979, p. 161.

Type-material re-examined. — Togo: 1 ♂ 3.5 mm long, «Misahöhe», leg. E. Baumann, 10.V.1894 (ZMB, No. 9671).

Remarks. — The specimen had been dried and pinned. It may be a juvenile of *P. triarticulatus*. Because of the size and mutilated condition of the specimen neither an exact determination nor an appropriate description are possible. Therefore this name should be treated as a *nomen oblitum*.

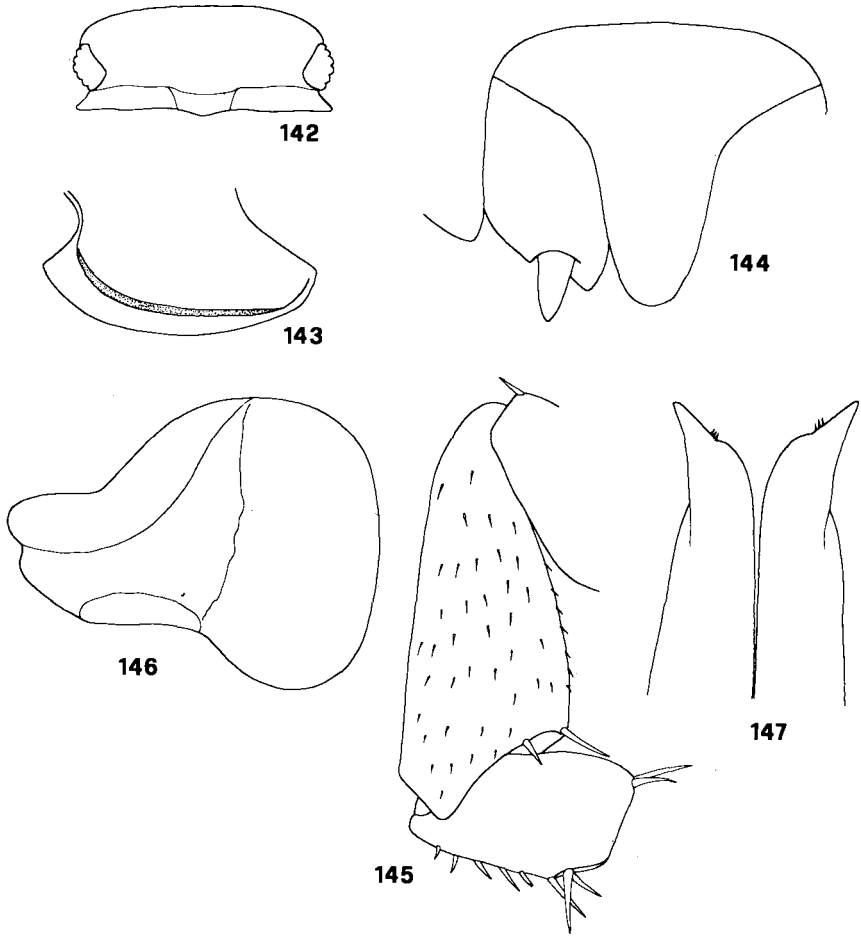
10. *Periscyphops triarticulatus* Hilgendorf, 1893.

Periscyphops triarticulatus FERRARA & SCHMALFUSS, 1976, p. 61; FERRARA & TAITI, 1979, p. 161.

Type-material re-examined. — Togo: 1 ♂ (lectotype), 2 ♀♀, Bismarkburg (= Kasanga), leg. R. Buettner, III.1891 (ZMB, No. 8697).

Material examined. — Togo: 2 ♂♂, Bismarckburg, leg. Conradt, 11.VI-18.X.1893 (ZMB, No. 9068).

Description. — Dimensions: maximum length 12 mm (♂). Colour faded by long conservation. According to HILGENDORF (1893, p. 153) it is blackish violet-brown with three rows of light dots, the first two articles of the antenna, the tip of the 5th and 1st and tip of 3rd segment of flagellum whitish. Back with usual fine setae. Cephalon (Fig. 142): pro-



Figs 142-147. — *Periscyphops triarticulatus* Hilgendorf, 1893: cephalon, dorsal (Fig. 142); pereon segment 1 (Fig. 143); telson and left uropod (Fig. 144); ♂: pereopod 7 ischium and merus (Fig. 145); pleopod 1, exopodite (Fig. 146) and apex of endopodite (Fig. 147).

frons protruding, pronounced frontal line medially interrupted as in *P. silvanus*, pronounced «side-lobes»; eyes with 14 ommatidia. Pereon segment 1 (Fig. 143): deep and wide *sulcus arcuatus*; a rounded endolobos on ventral surface; hind corner of epimeron truncated. Pereon segments 2-3 with transversal processes on the ventral surface of the epimera. Telson (Fig. 144): slightly wider than long, apex rounded. Antenna: distal article of peduncle longer than flagellum; third segment of flagellum longest.

Male: pereopod 1 with a brush of spines on carpus. Pereopod 7 (Fig.

145): ischium with sternal margin straight; merus without proximal process. Pleopod 1 (Figs 146, 147): exopodite posteriorly rounded; endopodite with pointed apex.

11. *Periscyphops variabilis* Ferrara & Schmalfuss, 1976.

Periscyphops variabilis Ferrara & Schmalfuss, 1976, p. 53, figs; Ferrara & Taiti, 1979, p. 162.

Material examined. — Togo: 1 ♀, Mount Ogon, sommet, 1020 m, leg. Y. Duc, 26.VI.1963 (MRAC 51328).

Distribution. — Ghana, Togo.

VII. IDENTIFICATION KEY TO THE WEST AFRICAN GENERA OF ONISCIDEA

Since quite a number of new species remain to be discovered in the area we do not consider it useful to produce an identification key for all the species covered. Instead, we have constructed an identification key to the genera; having found the genus, one has to check through the species descriptions. Those species which we have studied will be easily recognized by using the drawings accompanying the description.

1	Uropods not visible in dorsal view . . . . *Tylos*	
—	Uropods visible in dorsal view	**2**
2	Antennal flagellum with more than 3 joints or with such indistinct segments as to appear unsegmented . . .	**3**
—	Antennal flagellum with 3 or 2 joints	**5**
3	Eyes with more than 50 ommatidia . . . . *Ligia*	
—	Eyes with 3 ommatidia	**4**
4	Male pleopod endopodite 1 consisting of two subequal joints . . . . . *Trichoniscus*	
	(Part 2, p. 27, occurrence in West Africa extremely doubtful)	
—	Male pleopod endopodite 1 consisting of two very unequal joints . . . . . *Clavigeroniscus*	
5	Animals unable to conglobate	**6**
—	Animals able to conglobate	**25**
6	Antennal flagellum with 3 joints	**7**
—	Antennal flagellum with 2 joints	**15**

7	A supra-antennal line is present	**8**
—	A supra-antennal line is missing	**9** (1)
8	8-10 mm long; uropod endopodite inserted proximal to exopodite; littoral . . . . . *Halophiloscia*	
—	3 mm long; uropod endopodite and exopodite inserted at the same level . . . . . *Rennelloscia*	
9	Pleopod exopodite 1 with a semilunar respiratory area . . . . . *Congophiloscia*	
—	Pleopod exopodite 1 without respiratory area . . .	**10**
10	Outer ramus of maxilla 1 with simple teeth *Vandelophiloscia*	
—	Outer ramus of maxilla 1 with some cleft teeth . .	**11**
11	Endite of maxilliped with a penicil	**12**
—	Endite of maxilliped without a penicil . . *Gabunoscia*	
12	Molar penicil of mandible simple	**13**
—	Molar penicil of mandible dichotomized	**14**
13	Pereopods with a brush-like dactylar seta; uropod endopodite inserted proximal to exopodite . . . *Leonoscia*	
—	Pereopods without a brush-like dactylar seta; uropod endopodite and exopodite inserted at the same level *Zebrascia*	
14	Only *noduli laterales* on pereon segment 4 excentric; uropod endopodite inserted proximal to exopodite *Arcangeloscia*	
—	*Noduli laterales* on pereon segments 2 and 4 excentric; uropod endopodite and exopodite inserted at the same level *Togoscia*	
15	Cephalon with a bulbous protuberance (about half as long as the cephalon) on lower frontal part	**16**
—	Cephalon without a bulbous protuberance on lower frontal part	**17**
16	With vesicles between the claws of dactylopodites . . . . . *Rhyscotoides*	
—	Without vesicles between the claws of dactylopodites . . . . . *Rhyscotus*	

(1) Also *Pleopodoscia* Verhoeff, 1942 probably belongs to this group, but examination of new material is necessary for a complete generic diagnosis (see p. 62).

17	Pleopod exopodites 1-2 or 1-5 with pseudotracheae . .	**18**
—	Pleopod exopodites without pseudotracheae . . .	**22**
18	Only pleopod exopodites 1-2 with pseudotracheae . .	**19**
—	Pleopod exopodites 1-5 with pseudotracheae *Protracheoniscus*	
19	Tergites equipped with large scale-spines	**20**
—	Tergites equipped with inconspicuous scale-spines . .	**21**
20	Frontal line present . . . . . *Uramba*	
—	Frontal line missing . . . . . *Tura*	
21	Cephalon with large frontal lobes; pereon epimera 1 with concave caudal margin . . . . . *Porcellio*	
—	Cephalon without frontal lobes; pereon epimera 1 with convex caudal margin . . . . . *Porcellionides*	
22	Tergites equipped with large scale-spines or long hair-like scales; always without tubercles	**23**
—	Tergites distinctly tuberculated, equipped with inconspicuous scale-spines . . . . . *Nagurus*	
23	Scale-spines on tergites in form of a spear-head, with broad connection to the tergite . . . *Lanceochaetus*	
—	Scale-spines on tergites, if present, leaf-like, with a thin neck-like connection to the tergite	**24**
24	Frontal line present . . . . . *Niambia* (1)	
—	Frontal line missing . . . . *Trichorhina* (1)	
25	Uropod exopodite lamellar covering the gap between telson and pleon epimera 5 . . . . . *Schizidium* (presence in West Africa extremely doubtful)	
—	Uropod exopodite, if present, conical, never covering the gap between telson and pleon epimera 5	**26**
26	Lateral margins of pereon segment 1 thickened and separated from the tergites by a deep dorsal longitudinal groove (*sulcus arcuatus*)	**27**
—	Pereon segment 1 always without *sulcus arcuatus* . .	**35**

(1) The separation of *Niambia* and *Trichorhina* by this character is dubious (see Part 2, p. 72, footnote).

27	Posterolateral angle of pereon segment 1 notched (presence of *schisma*)	**28**
—	Posterolateral angle of pereon segment 1 not notched (absence of *schisma*)	**32**
28	Thickening on pereon segment 1 externally grooved along its length . . . . . *Eubelum* (1)	
—	Thickening on pereon segment 1 not grooved externally .	**29**
29	Antenna with 3-jointed flagellum . . *Mesarmadillo*	
—	Antenna with 2-jointed flagellum	**30**
30	Only pleopod exopodites 1-2 with pseudotracheae . . . . . *Congethelum*	
—	All pleopod exopodites with pseudotracheae . . .	**31**
31	Uropod protopodite with a medial longitudinal groove (coaptation for telson); pereopod 7 ischium in male with a large distal triangular process; inner ramus of maxilla 1 with two penicils . . . . . *Microcercus*	
—	Uropod protopodite without a medial longitudinal groove; pereopod 7 ischium in male without triangular process; inner ramus of maxilla 1 with 4-5 penicils . . . *Ethelum*	
32	Antenna with 2-jointed flagellum . . . *Hiallum*	
—	Antenna with 3-jointed flagellum	**33**
33	Epimera of pereon segments pointing outwards in a near-horizontal direction . . . . . *Paraperiscyphops*	
—	Epimera of pereon segments almost vertical . . .	**34**
34	Cephalon with a margined medial lobe; 5 pairs of *Periscyphis*-type pseudotracheae . . . . . *Metaperiscyphops*	
—	Cephalon without a margined medial lobe; 5 pairs of *Eubelum*-type pseudotracheae . . . . *Periscyphops*	
35	Cephalon with long spines on vertex	**36**
—	Cephalon without long spines on vertex	**38**
36	Cephalon with 2 spines . . . . *Panningillo*	
—	Cephalon with 4 spines	**37**

(1) The genus *Kameruthelum* Verhoeff, 1942 has a marginal groove as does *Eubelum*. According to VERHOEFF's definition the only difference from this genus is the presence in *Kameruthelum* of two (instead of 8-12) maxillary penicils.

37 Epimera of pereon segments 2-7 and of pleon segments 3-5 rectangular; apex of telson truncate . *Polyacanthus*

— Epimera of pereon segments 2-7 and of pleon segments 3-5 pointed; apex of telson deeply concave . . *Laureola*

38 Telson hour-glass-shaped **39**

— Telson not hour-glass-shaped **47**

39 Pleon segments 3-5 with a medial claviform protuberance . . . . . *Anchicubaris*

— Pleon segments 3-5 without medial claviform protuberance . **40**

40 Uropod protopodite not reaching outline of body *Feadillo*

— Uropod protopodite reaching outline of body . . . **41**

41 Pleon epimera 3-4 with ventral lobes **42**

— Pleon epimera 3-4 without ventral lobes **43**

42 Frontal lamina strongly protruding on vertex; telson with distal part much longer than basal one; tergites tuberculated . . . . . *Cristarmadillo*

— Frontal lamina not protruding on vertex; telson with distal part not longer than basal one; tergites smooth . . . . . *Pseudolobodillo*

43 Posterolateral angle of pereon segment 1 notched (presence of *schisma*) **44**

— Posterolateral angle of pereon segment 1 entire (absence of *schisma*) . . . . . *Cubaris*

44 No visible eyes . . . . . *Annobodillo*

— Normal eyes are present **45**

45 Frontal lamina strongly protruding on vertex . . . **46**

— Frontal lamina not at all or very slightly protruding on vertex . . . . . *Venezillo*

46 Tergites more or less strongly tuberculated; telson with two paramedian tubercles . . . . . *Tuberdillo*

— Tergites smooth; telson without tubercles *Paraxenodillo*

47 Pleon tergites strongly tuberculated . . . *Rhodesillo*

— Pleon tergites not tuberculated **48**

48 Uropod exopodite inserted dorsally on protopodite . . . . . *Synarmadillo*

— Uropod exopodite inserted terminally on protopodite . . **49**

49 Head with pronounced triangular frontal protrusion . . . . . *Togarmadillo*

— Head without frontal protrusion (front straight) . . **50**

50 Frontal margin continuous; eyes with several ommatidia . . . . . *Ethelumoris*

— Frontal margin interrupted in the middle; no visible eyes . . . . . *Gabunillo*

VIII. DISTRIBUTION OF THE WEST AFRICAN ISOPODS

In the following chapter we give a list of the recorded species for each country. It must be stressed once more that the number of species recorded for each country only reflects the intensity of collecting in that area, and does not indicate the actual number of species to be expected. The highest recorded numbers (e.g. Cameroon with 46 species) probably represent only a part of the actual number of species living in the locality.

Senegal (14)

Tylos latreillei
Ligia exotica
Ligia gracilipes
Rhyscotoides silvestrii
Halophiloscia couchi
Niambia senegalensis
? *Niambia squamata*
Porcellio laevis
Porcellio scaber
Porcellionides pruinosus
Microcercus rotundatus
Microcercus silvestrii
Microcercus senegalensis
Venezillo berlandi

Guinea-Bissau (6)

Ligia exotica
Congophiloscia bolamae
Protracheoniscus inexpectatus
Porcellio monardi
Microcercus rotundatus
? *Angaribia kunenensis*

Guinea (6)

Ligia exotica
Niambia sp. II
Ethelum africanum
Microcercus monodi
(= *M. rotundatus* ?)
Microcercus rotundatus
Synarmadillo clausus
Tuberdillo guinensis

Sierra Leone (5)

Leonoscia bicolorata
Porcellionides pruinosus
Microcercus rotundatus
Periscyphops occidentalis
Synarmadillo clausus

Liberia (12)

Ligia exotica
Mesarmadillo flavimarginatus
Mesarmadillo similis
Mesarmadillo hastatus
Mesarmadillo quadricoloratus
Mesarmadillo variegatus
Periscyphops cooki
Periscyphops brevicaudatus
Ethelum quadrimaculatum
Ethelum attenuatum
Ethelum liberiense
Ethelumoris parallelus

Ivory Coast (17)

Clavigeroniscus sassandrai
Vandelophiloscia pfaui
? *Zebrascia longicornis*
«Philoscia» lata
«Philoscia» elephantina
«Philoscia» nebulosa
«Philoscia» sassandrai
Niambia eburnea
Niambia squamata
Periscyphops sp.
Periscyphops alluaudi
Periscyphops chopardi
Mesarmadillo tuberculatus
Mesarmadillo marginatus
Mesarmadillo quadricoloratus
Synarmadillo clausus
Tuberdillo fagei

Ghana (7)

Niambia palmetensis
Aschismatius penicilliger
Mesarmadillo ghanensis
Mesarmadillo pfaui
Periscyphops dubius
Periscyphops pseudosilvanus
Periscyphops variabilis

Upper Volta (1)

Cubaris murina

Togo (13)

Rhyscotoides legrandi
Togoscia buettneri
Togoscia sp. I
Niambia sp. I
Trichorhina minima
Porcellio scaber
Porcellionides pruinosus
Mesarmadillo eubeloides
Periscyphops ogonensis
Periscyphops triarticulatus
Periscyphops variabilis
Togarmadillo nigropunctatus
Synarmadillo parvulus

Benin (1)

Porcellionides pruinosus

Nigeria (9)

Rhyscotoides moandae
Niambia squamata
Trichorhina hospes
Porcellionides pruinosus
Mesarmadillo eubeloides
Mesarmadillo albescens
Periscyphops pseudosilvanus
Eubelum pseudoasperius
Microcercus beroni

Cameroon (46)

Ligia exotica
Ligia gracilipes
«Trichoniscus» (*Fakoniscus*) *pterydicola*
«Trichoniscus» sp.
Arcangeloscia buettneroides
Arcangeloscia microphthalma
Arcangeloscia puylaerti
Congophiloscia longiantennata
Rennelloscia kohleri
Zebrascia buddelundi
Zebrascia longicornis
Zebrascia plurimaculata
«Philoscia» camerunica
Lanceochaetus camerunicus

Trichorhina sp.
Nagurus cristatus
Porcellionides pruinosus
Uramba charina
Eubelum haasi
Eubelum icarense
Eubelum squamosum
Eubelum stipulatum
Eubelum ubangium
Eubelum asperius
Ethelum gezei
Hiallum camerunicum
Mesarmadillo albicornis
Mesarmadillo quadrimaculatus
Paraperiscyphops vandeli
Kameruthelum stylifer
Fakoanum agauriae
Periscyphops bizonatus
Periscyphops camerunicus
Periscyphops haasi
Periscyphops silvanus
Periscyphops squamatus
Periscyphops squamosus
Periscyphops sp. II
Panningillo schultzei
Ethelumoris setosus
Synarmadillo albinotatus
Synarmadillo cristifrons
Synarmadillo diversus
Synarmadillo globus
Synarmadillo insulanus
Synarmadillo vicinus

Rio Muni (mainland) (1)

Eubelum asperius

Gabon (9)

Gabunoscia feai
Eubelum asperius
Eubelum gabonense
Eubelum tomentosum
Periscyphops granulosus
Periscyphops sp. I
Gabunillo coecus
Synarmadillo aelleni
Tuberdillo gabunensis

Congo (19) (1)

Ligia exotica
Ligia gracilipes
Rhyscotoides moandae
Rhyscotoides silvestrii
Congophiloscia albofasciata
Niambia squamata
Porcellionides pruinosus
Eubelum asperius
Eubelum lubricum
Eubelum minimum
Eubelum schmoelzeri
Congethelum hauseri
Microcercus ethelumoides
Cristarmadillo arcangelii
Cubaris murina
Tuberdillo bananae
Tuberdillo regulus
Tuberdillo strinatii
Polyacanthus aculeatus

Fernando Po (12)

Ligia gracilipes
Arcangeloscia sp.
Pleopodoscia isabelensis
Zebrascia longicornis
Mesarmadillo albicornis
Mesarmadillo montanus
Mesarmadillo quadrimaculatus
Periscyphops bizonatus
Ethelumoris setosus
Rhodesillo insulanus
Synarmadillo globus
Synarmadillo insulanus

Principe (8)

Porcellionides pruinosus
Eubelum asperius
Metaperiscyphops insulanus
Cubaris murina

(1) Including Cabinda and the small part of Zaire north of the Congo River.

Feadillo principensis
Laureola dubia
Pseudolobodillo fissus
Venezillo crassus

São Tomé (8-12) (1)

?*Rhyscotus globiceps*
?*Rhyscotus rotundatus*
?*Rhyscotoides moandae*
?*Niambia atracheata*
Congophiloscia saothomensis
Rennelloscia kohleri
Trichorhina hospes
Porcellionides pruinosus
Eubelum asperius
Feadillo saotomensis
Laureola dubia
Venezillo crassus

Annobon (6)

Congophiloscia annobonensis
Porcellionides pruinosus
Anchicubaris annobonensis
Cubaris (?) *maculata*
Paraxenodillo singularis
Annobodillo coecus

IX. ZOOGEOGRAPHICAL OBSERVATIONS

Excluding doubtful records (*Schizidium* sp., *Angaribia kunenensis*, *Niambia atracheata* (which has been found in the meantime on the Cape Verde islands), *Rhyscotus rotundatus*, *Rhyscotus globiceps* (2), *Rhyscotoides moandae* (3), and the species with an uncertain generic position («*Trichoniscus*» sp., «*Trichoniscus*» *pterydicola*, «*Philoscia*» *camerunica*, «*P.*» *lata*, «*P.*» *elephantina*, «*P.*» *nebulosa*, «*P.*» *sassandrai* and *Fakoanum agauriae*) the West African isopods can be divided into a number of distributional categories.

1. *Mediterranean species*

In Senegal, and only here, a few Mediterranean species are found, the littoral species *Tylos latreillei* and *Halophiloscia couchi* and *Porcellio laevis* which is commonly found living in anthropogenetic biotopes and may well have been introduced in very recent times.

2. *Introduced species*

Porcellio scaber from western Europe,
Porcellionides pruinosus of Mediterranean origin.

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(1) The species marked with ? may have been collected in Angola (Luanda). See Part 2, pp. 30, 31, 85.

(2) This species is surely known from Zaire and Angola.

(3) This species is surely known from Nigeria and Zaire.

3. *Circumtropical species of uncertain origin*

Ligia exotica, Nagurus cristatus and *Cubaris murina* probably introduced to West Africa by man in recent times, *L. exotica* being a littoral species, with ships and the other two with plants.

4. *West African species*

Except for the above-mentioned species all the others quoted in the monograph belong to this group. It must be pointed out that the eastern border of our designated area of West Africa (Congo River) is artificial and that there is no zoogeographical gap between the forest zones east and west of the river.

This group can be divided into the following distributional categories:

4a. *Species recorded only East of the Dahomey gap*

This area reaches from the Dahomey gap in the West to the upper Congo region in the East.

Arcangeloscia buettneroides
A. microphthalma
A. puylaerti
Congophiloscia albofasciata
C. longiantennata
Gabunoscia feai
Zebrascia buddelundi
Lanceochaetus camerunicus
Uramba charina
Ethelum gezei
Eubelum gabonense
E. haasi
E. icarense
E. lubricum
E. minimum
E. pseudoasperius
E. schmoelzeri
E. squamosum
E. stipulatum
E. tomentosum
E. ubangium
Hiallum camerunicum
Paraperiscyphops vandeli
Congethelum hauseri
Fakoanum agauriae
Kameruthelum stylifer
Microcercus beroni
M. ethelumoides
Mesarmadillo albescens
Panningillo schultzei
Periscyphops camerunicus
P. granulosus
P. haasi
P. silvanus
P. squamatus
P. squamosum
Cristarmadillo arcangelii
Gabunillo coecus
Polyacanthus aculeatus
Synarmadillo aelleni
S. albinotatus
S. cristifrons
S. diversus
S. vicinus
Tuberdillo bananae
T. gabunensis
T. regulus
T. strinatii

4b. *Species recorded only West of the Dahomey gap*

This area reaches from Dahomey gap in the East to Senegal in the West.

Clavigeroniscus sassandrai
Rhyscotoides legrandi
Congophiloscia bolamae
Leonoscia bicolorata
Togoscia buettneri
Vandelophilosica pfaui
Niambia eburnea
N. palmetensis
N. senegalensis
Trichorhina minima
Protracheoniscus inexpectatus
Porcellio monardi
Aschismatius penicilliger
Ethelum africanum
E. liberiense
E. quadrimaculatum
Mesarmadillo flavimarginatus
M. ghanensis
M. hastatus
M. marginatus
M. pfaui
M. quadricoloratus
M. similis
M. tuberculatus
M. variegatus
Microcercus rotundatus
M. senegalensis
M. silvestrii
Periscyphops alluaudi
P. brevicaudatus
P. chopardi
P. cooki
P. dubius
P. occidentalis
P. ogonensis
P. triarticulatus
P. variabilis
Ethelumoris parallelus
Synarmadillo clausus
S. parvulus
Togarmadillo nigropunctatus
Tuberdillo fagei
T. guinensis
Venezillo berlandi

4c. *Species recorded West and East of Dahomey gap* (1)

Ligia gracilipes (littoral)
Mesarmadillo eubeloides (Togo and Nigeria)
Periscyphops pseudosilvanus (Ghana and Nigeria)

4d. *Species recorded only from the islands of the Gulf of Guinea*

Congophiloscia annobonensis
C. saothomensis
Pleopodoscia isabelensis
Mesarmadillo montanus
Metaperiscyphops insulanus
Anchicubaris annobonensis
Annobodillo coecus
Cubaris (?) *maculata*

(1) The record of *Zebrascia longicornis* from Ivory Coast (VANDEL, 1968) is extremely doubtful.

Feadillo principensis
F. saotomensis
Laureola dubia
Paraxenodillo singularis
Pseudolobodillo fissus
Rhodesillo insulanus
Venezillo crassus

4e. *Species recorded on both the islands and the mainland* (*Porcellionides pruinosus* and *Cubaris murina* not included)

Ligia gracilipes
Rennelloscia kohleri
Zebrascia longicornis
Trichorhina hospes
Eubelum asperius
Mesarmadillo albicornis
M. quadrimaculatus
Periscyphops bizonatus
Ethelumoris setosus
Synarmadillo globus
S. insulanus

X. CONCLUSIONS

A. *Zoogeographical relationships of the West African isopod fauna*

1. *Palearctic elements*

Some Mediterranean species reach their southern limit in Senegal, i.e. *Tylos latreillei, Porcellio laevis* and *Halophiloscia couchi. Porcellio monardi* and *Protracheoniscus inexpectatus* are the only West African species of these otherwise palearctic genera. *Porcellio* is widely spread in northern Africa, whereas no other species of *Protracheoniscus* has been recorded from Africa. However, *Fossoniscus nubicus* Strouhal, 1965 from Sudan probably belongs to this genus.

2. *Circumtropical genera*

The genera *Clavigeroniscus, Rhyscotoides, Rhyscotus* and *Trichorhina* have been found in all tropical regions (*Trichorhina* also occurs in temperate regions) (1).

3. *Relationships with America*

Except for the circumtropical genera *Clavigeroniscus, Rhyscotoides, Rhyscotus* and *Trichorhina* (1) a number of genera are found in both West

(1) *Nagurus* and *Cubaris* are present in West Africa with the two circumtropical, introduced species, *N. cristatus* and *C. murina.*

Africa and South America: *Ethelum, Tuberdillo, Venezillo* and *Synarmadillo* (1). In these genera the species are very close to each other, there is no «gap» between the African and the American species. It is tempting to explain the presence of West African genera in America by the Wegener hypothesis. However the American species of *Ethelum* (one, compare FERRARA & SCHMALFUSS, 1976, p. 70), *Tuberdillo* (one, compare SCHMALFUSS & FERRARA, 1983) and *Synarmadillo* (two or three) may possibly have been introduced to America in recent time.

4. *Relationships with the Oriental Region*

The two genera *Rennelloscia* and *Laureola* connect the West African fauna with the Oriental Region. *Rennelloscia* is distributed with several species in Melanesia, India, Nepal, Mascarene islands, Seychelles, eastern Africa. *Laureola* occurs in southern Africa and Australia.

5. *African genera*

All the other genera are restricted to Africa and according to their distribution, can be divided in several groups:

a) Genera found in the tropical areas of western and eastern Africa: *Microcercus* (with a disjunctive distribution in West and East Africa; see Fig. 148 and the chapter on ecology); *Hiallum* (a montane genus with one species on Mt Cameroon, one on Ruwenzori, one on Mt Elgon, Fig. 149; the species described by RICHARDSON, 1909 probably belong to *Periscyphis*); *Eubelum* (with few species on East African mountains; Fig. 150); *Mesarmadillo* (if the records from Kenya and Ethiopia are correct). If the identifications of *Tura nigromaculata* and *Uramba charina* (SCHMOELZER, 1974) are correct these two genera also belong to this group.

b) Genera found in West and southern Africa: the genera *Niambia*, which is widespread in South and South-West Africa, *Anchicubaris* (South Africa and Zimbabwe) and *Rhodesillo* (Zimbabwe) belong to this group.

c) Genera found only in West Africa (Zaire included): the bulk of the West African isopod genera are restricted to this region: *Congophiloscia, Gabunoscia, Leonoscia, Pleopodoscia, Vandelophiloscia, Zebrascia, Arcangeloscia, Togoscia, Lanceochaetus, Kameruthelum* (2), *Congethelum, Paraperi-*

(1) For the synonymy of *Minca* = *Coxopodias* = *Synarmadillo* see SCHMALFUSS, 1980, p. 8.

(2) If not synonymous with *Eubelum*.

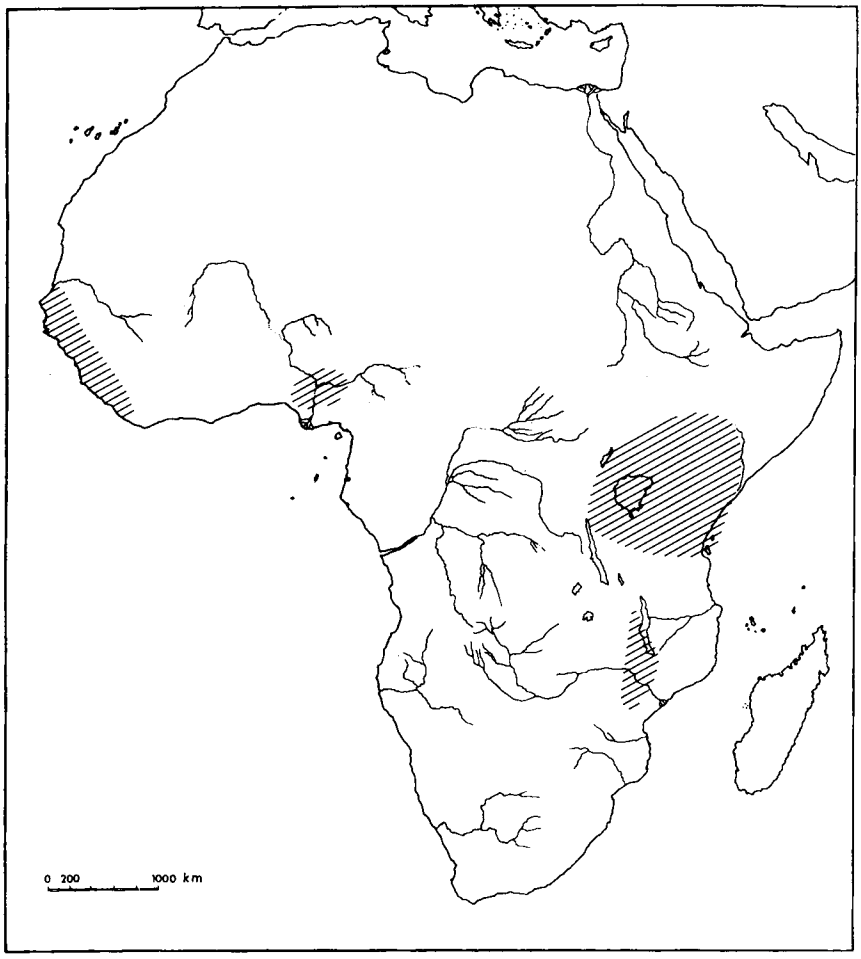

Fig. 148. — Distribution of the genus *Microcercus* Budde-Lund, 1910.

scyphops, Metaperiscyphops, Periscyphops (1), *Aschismatius, Panningillo, Polyacanthus, Feadillo, Cristarmadillo, Pseudolobodillo, Annobodillo, Paraxenodillo, Togarmadillo, Ethelumoris, Gabunillo.*

The genera *Congophiloscia, Periscyphops* and *Ethelumoris* are found on both sides of the Dahomey gap and on the islands. The genera *Arcangeloscia* and *Zebrascia* occur on the region East of the Dahomey gap and on the islands while no genera are present only on the region West of

(1) The species from eastern Africa and Madagascar certainly do not belong to this genus (Fig. 151).

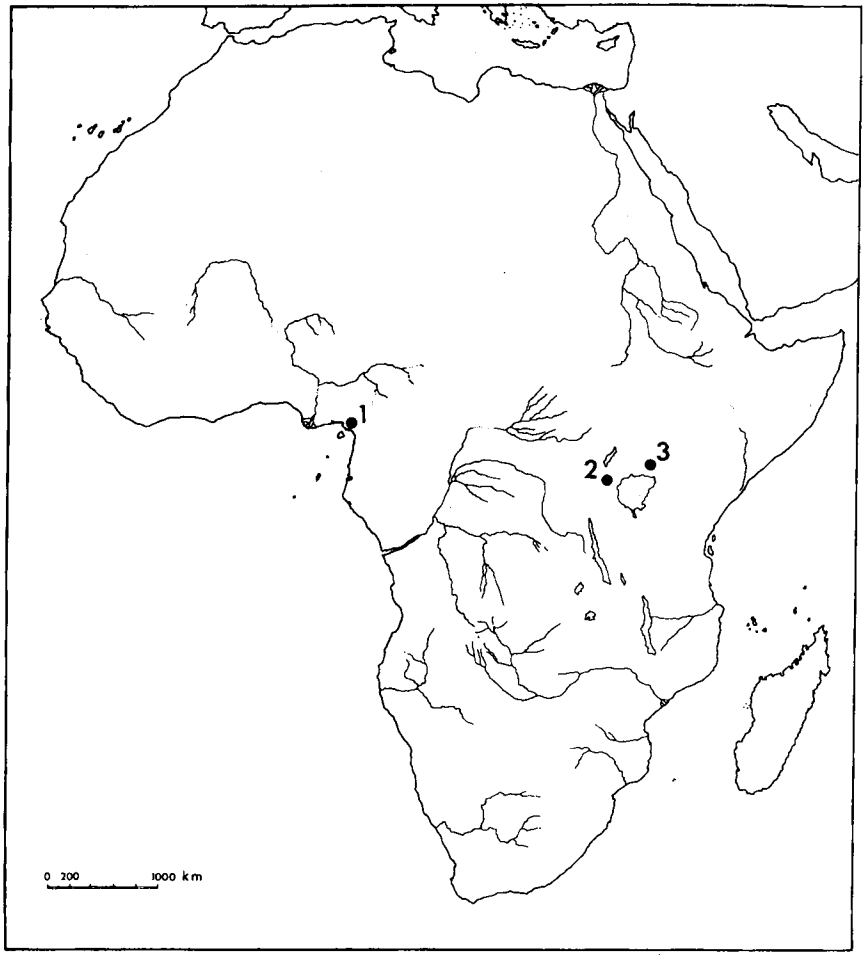

Fig. 149. — Recorded distribution of the species of the genus *Hiallum* Budde-Lund, 1899: *1, H. camerunicum* n. sp; *2, H. hilgendorfi* (Budde-Lund, 1898); *3, H. richardsoni* Paulian de Félice, 1945.

the Dahomey gap and on the islands. Five genera (*Leonoscia, Togoscia, Vandelophiloscia, Aschismatius, Togarmadillo*) are exclusive to the region West of the Dahomey gap; 10 (*Gabunoscia, Lanceochaetus, Congethelum, Fakoanum, Kameruthelum, Panningillo, Paraperiscyphops, Cristarmadillo, Gabunillo, Polyacanthus*) to the region East of the Dahomey gap and six (*Pleopodoscia, Metaperiscyphops, Annobodillo, Feadillo, Paraxenodillo, Pseudolobodillo*) to the islands.

Table 1 summarizes the distribution of the West African genera.

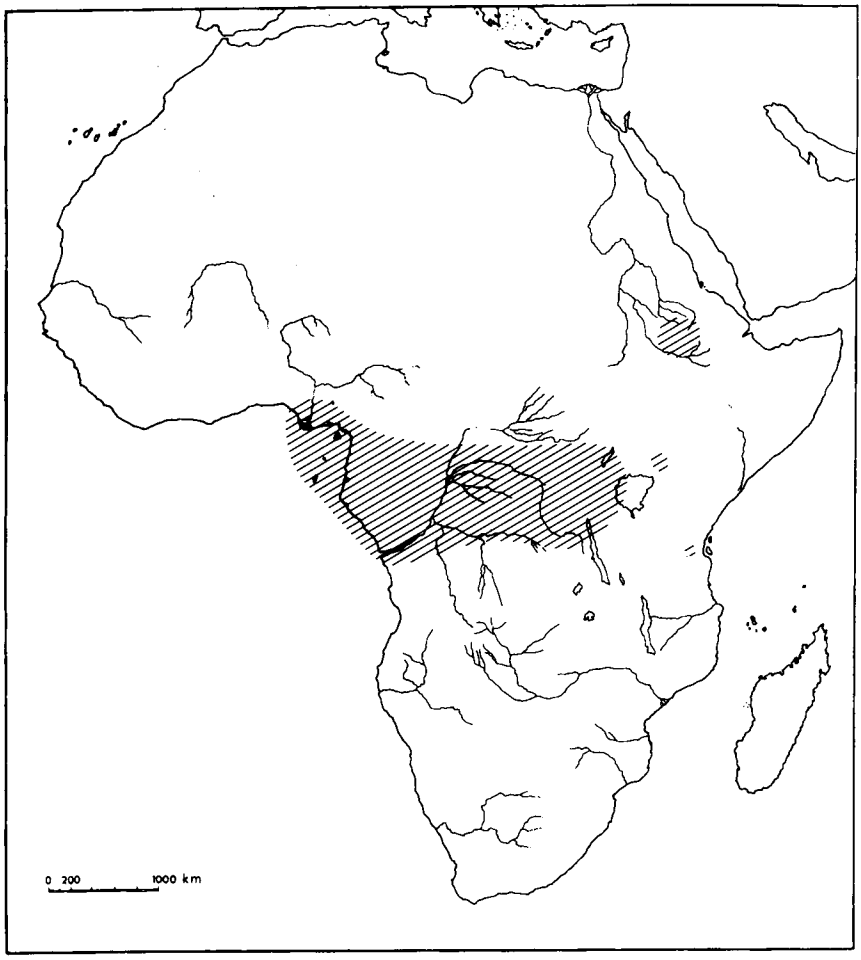

Fig. 150. — Distribution of the genus *Eubelum* Budde-Lund, 1885.

B. *The Dahomey gap*

A very conspicuous distributional boundary is formed by the so-called Dahomey gap. This gap separates a western and an eastern part of the West African forest region. The strong influence it has on the distribution of terrestrial isopods suggests that this gap must have existed for a long time as a distributional barrier (see species list). Except for the littoral species of *Ligia*, the only species bridging the gap are *Mesarmadillo eubeloides* and *Periscyphops pseudosilvanus* which are obviously restricted to the non-forest zone around the gap (Ghana, Togo and Nigeria).

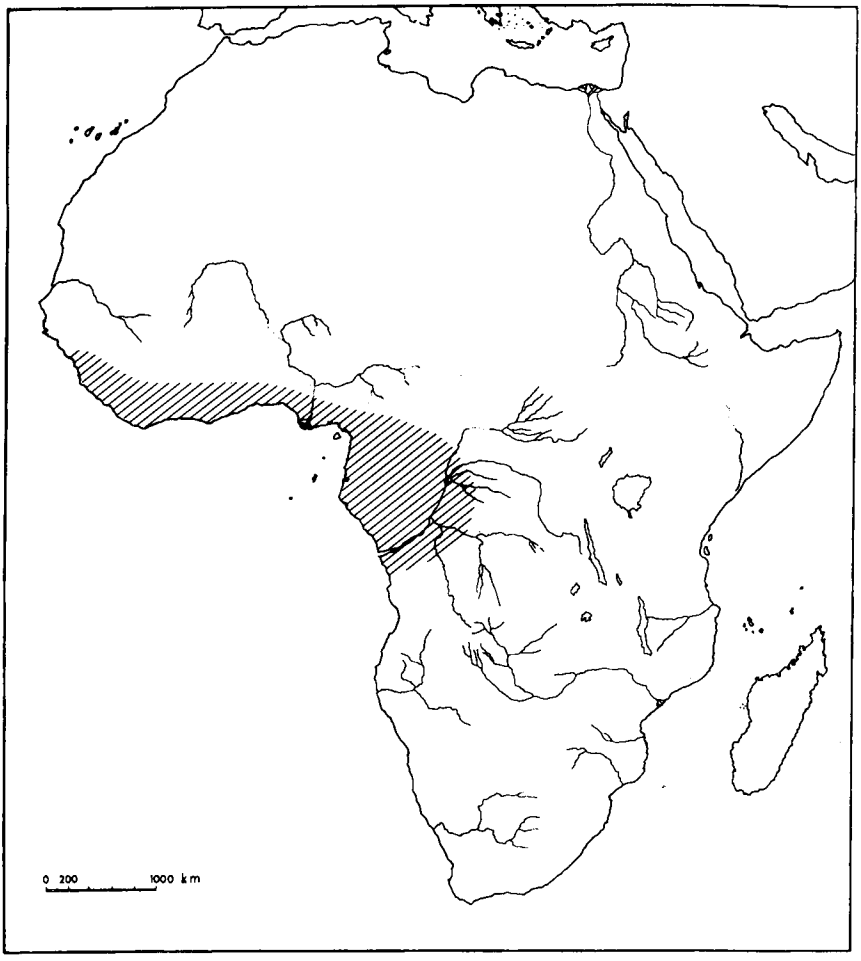

Fig. 151. — Distribution of the genus *Periscyphops* Hilgendorf, 1893.

C. *Islands endemism*

Table 2 synthesizes the distributional patterns of the isopodan fauna of the islands.

If we exclude the littoral species *Ligia gracilipes*, the cosmopolitan *Porcellionides pruinosus* and the circumtropical *Cubaris murina* all the species in common between the islands and the mainland are exclusive to the region East of the Dahomey gap. With the exception of *Trichorhina hospes* (perhaps termitophilous; from Nigeria) and the expansive *Eubelum*

Table 1.

Distribution of the West African genera.

	West of Dahomey gap	East of Dahomey gap	Islands
Arcangeloscia		+	+
Congophiloscia	+	+	+
Gabunoscia		+	
Leonoscia	+		
Pleopodoscia			+
Togoscia	+		
Vandelophiloscia	+		
Zebrascia		+	+
Lanceochaetus		+	
Aschismatius	+		
Congethelum		+	
Fakoanum		+	
Kameruthelum		+	
Metaperiscyphops			+
Panningillo		+	
Paraperiscyphops		+	
Periscyphops	+	+	+
Annobodillo			+
Cristarmadillo		+	
Ethelumoris	+	+	+
Feadillo			+
Gabunillo		+	
Paraxenodillo			+
Polyacanthus		+	
Pseudolobodillo			+
Togarmadillo	+		
	8	15	11

asperius, all the others are restricted to SW Cameroon. All the species of this group except *Rennelloscia kohleri* (which could have been overlooked because of its small size) are found on Fernando Po.

Considering the list of species it is interesting to observe:

In Fernando Po. The low degree of endemism; the presence of genera of typical eubelids such as *Periscyphops* and *Mesarmadillo* and of armadillids of the *Synarmadillo*-group; the scarcity of «typical» Armadillidae.

In Principe. The presence of an endemic genus of Eubelidae; the absence of Armadillidae of the *Synarmadillo*-group although about 50% of all the species are «typical» Armadillidae.

Table 2.

Distributional patterns of the isopodan fauna of the islands.

	Conti-nent	Fernan-do Po	Prin-cipe	São Tomé	Anno-bon
Ligia gracilipes	○	○			
Congophiloscia annobonensis					+
C. saothomensis				+	
Pleopodoscia isabelensis		+			
Zebrascia longicornis	●	●			
Rennelloscia kohleri	●			●	
Trichorhina hospes	○			○	
Porcellionides pruinosus	○		○	○	○
Eubelum asperius	○		○	○	
Mesarmadillo albicornis	●	●			
M. quadrimaculatus	●	●			
M. montanus		+			
Metaperiscyphops insulanus			+		
Periscyphops bizonatus	●	●			
Anchicubaris annobonensis					+
Annobodillo coecus					+
Cubaris (?) *maculata*					+
C. murina	○		○		
Ethelumoris setosus	●	●			
Feadillo principensis			+		
F. saotomensis				+	
Laureola dubia			+	+	
Paraxenodillo singularis					+
Pseudolobodillo fissus			+		
Rhodesillo insulanus		+			
Synarmadillo globus	●	●			
S. insulanus	●	●			
Venezillo crassus			+	+	
Total		11	8	8	6
Endemism		3	5	4	5

+ = endemism; ○ = species in common with the continent; ● = species recorded only from South-West Cameroon.

In São Tomé. The conspicuous number of species in common with the mainland which is certainly due to introduction and flourishing because of the similarity of the ecological situation (cloud forest); the characteristic armadillid-fauna, akin and often identical to that of Principe.

In Annobon. The high degree of endemism (100% if we exclude *P. pruinosus*); the absence of eubelids; the almost exclusive presence of «typical» Armadillidae.

The isopodan fauna of Fernando Po is part of the Mount Cameroon region, while that of Principe, São Tomé and Annobon is less similar to the West African (and tropical African) fauna resembling more that of southern (non-tropical) Africa.

D. *Ecology*

Even if about 160 species of Oniscidea are now known from West Africa no precise ecological data concerning these species exist, so only some tentative observations on the ecology of West African Oniscidea can be given.

1. *Littoral species*

One of the most interesting aspects of the West African oniscidean-fauna is the poverty of littoral species. In fact the only autochthonous species seems to be *Ligia gracilipes*, since *Halophiloscia couchi* and *Tylos latreillei* are only found in Senegal, while *Ligia exotica* is certainly an introduced species. Considering the richness of the littoral oniscidean-fauna of the Mediterranean this is a very striking feature.

2. *Forest species*

The great majority of the West African isopod species are forest species. Most of these probably live in the forest litter; nothing is known about niche-partitioning, stratification of species, specific adaptation. A great ecological differentiation is certainly present, as is shown for instance by *Panningillo schultzei*, which lives on leaves of forest undergrowth (FERRARA & SCHMALFUSS, 1976, p. 107).

3. *«Savannah» species*

The following species are known only from the savannah regions: *Mesarmadillo eubeloides* (from the Dahomey gap), *Periscyphops ogonensis* (from Togo) and *Venezillo berlandi* (from Senegal). Also most probably all

the *Microcercus*-species belong to this group. Certainly other species live outside the forest regions, but because of the lack of exact ecological data nothing can be said at present.

4. *Montane species*

Hiallum camerunicum and the other species of the genus *Hiallum* can be ascribed to this category.

5. *Termitophilous species*

According to SILVESTRI (1917) *Trichorhina hospes* has been collected together with *Eutermes tenebricus* Silvestri, 1914. We cannot confirm if this species is a real termitophilous since we have no data on the records from São Tomé.

6. *Cave species*

No really troglobiontic isopod species have been known from tropical Africa until recently. Faunal investigations in caves of western tropical Africa carried out by V. Aellen and P. Strinati in 1957 (STRINATI, 1960) yielded a number of isopod species. This material included one real troglobiontic species, *Gabunillo coecus* Schmalfuss & Ferrara, 1983.

XI. SYNONYMIES AND NEW COMBINATIONS ESTABLISHED IN THE PRESENT MONOGRAPH

Ligia olfersi Brandt, 1833 = *L. exotica* Roux, 1828;
Philoscia buettneri Hilgendorf, 1983 = *Togoscia buettneri*;
Leptotrichus atracheatus Schmalfuss & Ferrara, 1978 = *Niambia atracheata*;
Ethelum rotundatum Richardson, 1907 = *Microcercus rotundatus*;
Microcercus villiersi Paulian de Félice, 1940 = *M. rotundatus*;
Microcercus monodi Paulian de Félice, 1940 = ? *M. rotundatus*;
Guineodillo ubangius Verhoeff, 1942 = *Eubelum ubangium*;
Guineodillo hebetatus Verhoeff, 1942 = *Eubelum asperius* Van Name, 1920;
Guineodillo munganus Verhoeff, 1942 = *Eubelum stipulatum* Budde-Lund, 1899;
Guineodillo Verhoeff, 1942 = *Eubelum* Budde-Lund, 1899;
Kamerunillo sulcatus Verhoeff, 1942 = *Synarmadillo globus* Budde-Lund, 1908;
Kamerunillo Verhoeff, 1942 = *Synarmadillo* Dollfus, 1892;
Parethelum insulanum Verhoeff, 1942 = *Mesarmadillo quadrimaculatus* Budde-Lund, 1899;
Parethelum montanum Verhoeff, 1942 = *Mesarmadillo montanus*;
Parethelum Verhoeff, 1942 = *Mesarmadillo* Budde-Lund, 1899;

Synarmadillo feai Ferrara & Schmalfuss, 1976 = *S. cristifrons* (Hilgendorf, 1893);
Synarmadillo nigropunctatus (Hilgendorf, 1893) = *Togarmadillo nigropunctatus*;
Eubelum minimum Schmoelzer, 1974 (*nomen preoccupatum*) = *Eubelum schmoelzeri* Ferrara & Schmalfuss, 1976.

Nomina oblita proposed in the present monograph:

Periscyphops gibbosus Budde-Lund, 1899;
Periscyphops tenellus Budde-Lund, 1899.

XII. LIST OF THE SPECIES TREATED IN THE MONOGRAPH

SUMMARY

In this 4th Part of our review of West African terrestrial isopods 37 species have been studied including the re-examination of the type-specimens of species described by HILGENDORF, BUDDE-LUND and VER-

HOEFF. Two genera *Leonoscia* (Philosciidae) and *Congethelum* (Eubelidae) and 10 species are new. An identification key for all the genera treated is given together with comments on the distribution and ecology of the West African isopod fauna.

ZUSAMMENFASSUNG

Im diesem vierten Teil unserer Bearbeitung der Landisopoden West-Afrikas (zwischen Senegal und Kongo-Mündung) werden 37 Arten behandelt. Das untersuchte Material besteht aus Typen-Exemplaren einiger von HILGENDORF, BUDDE-LUND und VERHOEFF beschriebenen Arten, aus unveröffentlichten Aufsammlungen aus den Museen von Tervuren, London, Genf, Sofia und aus Aufsammlungen, die von deutschen Kollegen getätigt wurden. Zwei Gattungen (*Leonoscia*, Philosciidae und *Congethelum*, Eubelidae) und 10 Arten werden hier als neu beschrieben. Ein Bestimmungsschlüssel für die behandelten Gattungen wurde zusammengestellt. Ein zoogeographischer und ein ökologischer Abriss der Landisopoden-Fauna West-Afrikas ist angeschlossen.

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