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Previous volumes (2010-2018): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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SOME ORIBATEI FROM GHANA.
X. THE FAMILY LOHMANNIIDAE

BY

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INTRODUCTION.

The characteristic features of genera included in the family Lohmanniidae have reviewed by Grandjean (1950), Kunst (1959), and Balogh (1961). The last-cited work includes a key to the identification of 12 genera, and also a catalogue of the species within each of these genera.

Six genera belonging to this family are represented in Ghana. These comprise a new genus Haplacarus, together with the genera Mixacarus Balogh, Meristacarus Grandjean, Papillacarus Kunst, Annectacarus Grandjean, and Torpacarus Grandjean.

Descriptions given below include the place-names of the sampling localities from which the specimens were recovered. Earlier publications (Wallwork 1960, 1961) have provided a detailed list and a map of these localities.

DESCRIPTIVE TERMS.

The term "epimeral setae", used in previous descriptions in this series, is henceforth replaced by the term "coxisternal setae" in accord with modern usage. Likewise "infracapitulum" replaces "hypostome", except in cases (i.e. certain primitive oribatids) in which the hypostome is distinctly separated from other elements of the ventral surface of the gnathosoma.

Characteristic features of a number of genera of the family are the transverse "streaks" on prodorsum and notogaster. These have been designated "sillons rubanés transversaux" (Grandjean 1950) or alternatively "fossulae vittiformes transversales" (Balogh 1960). I propose to refer to these structures as notogastral bands. Grandjean (1950) has suggested that these bands are evidences of

1. Research supported by National Science Foundation Grant № G 20860.

true segmentation of the notogaster in the family Lohmanniidae. The most primitive example in this respect is *Meristacarus porcula* Grandjean 1934, which retains 10 bands, dividing the notogaster into 11 segments. These segments comprise 5 "false" segments which are glabrous, and 6 segments bearing setae, namely C, D, E, F, H, and PS. Following Grandjean's interpretation the notogastral bands are designated s_1-s_10 from anterior to posterior; "false" segments are designated FS_1-FS_2; true segments are designated in the usual manner, C, D, E, etc.

The complete sequence for segments and bands from anterior to posterior is then: FS_1; s_1; C; s_2; FS_2; s_3; D; s_4; FS_3; s_5; E; s_6; F; s_7; FS_4; s_8; H; s_9; FS_5; s_10; PS. This system of notation, which is illustrated in Figure 1, is adopted where applicable, in the following descriptions; notations used in describing chaetotaxy of the legs follow Grandjean's concept of parallel homology.

**Mixacarus Balogh 1958.**

The genus is characterized as follows; genital plates not divided by transverse suture; pre-anal plate large, rectangular, much wider than long; adanal and anal plates separated by a longitudinal suture; 4 adanal setae; 2 anal setae; neotrichy lacking; rounded areae porosae and dorsal transverse bands present (Balogh 1961). The type species is *M. integer* Balogh 1958, described from Angola.

**Mixacarus chapmani** n. sp. (Figs. 1-5).

Collected in Ghana: 27 adults, 7 tritonymphs, 2 deutonymphs. Most specimens, particularly the adults, are strongly contracted. The measurements given below thus represent the dimensions in the contracted state.

Adult. — Average body length: 835.3 μ (range: 800.8 μ-877.8 μ). Average body width: 509.9 μ (range: 492.8 μ-539.0 μ). Type locality: Aburi.

**Description of holotype.** — Body length: 816.2 μ; body width: 523.6 μ. Body colour: yellow brown; integument with a fine punctate microsculpture. Figures 1 and 2 show dorsal and ventral views of holotype.

**Prodorsum.** — Retraction has resulted in the strongly chitinised posterior margin of the prodorsum being located beneath and posterior to the insertions of notogastral setae e_1; this posterior margin is designated "bp" in Figure 1. The posterior third of the prodorsum is covered by the notogastral tectum, the anterior margin of which extends to the level of the pseudostigmata and the insertions of the interlamellar setae. The prodorsal transverse band is located posterior to the level of the insertions of the interlamellar setae; this band can be seen clearly through the thin overlying notogastral tectum. Several circular areae porosae are present on the prodorsum; these are arranged as shown in Figure 1. Rostral tectum is entire, without incision, forming a broad hood over and
around the gnathosoma. Rostral, lamellar, anterior and posterior exopseudostigmatic, and interlamellar setae are located as in M. integer. These setae are finely barbed, and have the following lengths in the holotype:

- Rostral setae (ro) .............................................. 108 µ
- Lamellar setae (la) ........................................ 115 µ
- Anterior exopseudostigmatic setae (exa) ................ 63 µ

**FIG. 1.** *Mixacarus chapmani* n. sp. Adult. Dorsal view.

- ro = rostral setae; la = lamellar setae; exa = anterior exopseudostigmatic setae; ss = sensillus; exp = posterior exopseudostigmatic setae; in = interlamellar setae; bp = posterior limit of prodorsum; c1, c2, c3; d1, d2, d3, e1, e2, f1, f2, h1, h2, ps1 = notogastral setae; im = notogastral fissure; (FS1 + C), FS2, D, FS4, E, F, FS4, H, FS5, FS = notogastral “segments”; s1, s2, s3, s4, s5, s6, s7, s8, s9, s10 = notogastral bands.
Posterior exopseudostigmatic setae (exp) ................................ 112 $\mu$
Interlamellar setae (in) .................................................. 175-200 $\mu$
The sensillus is markedly pectinate, with 10 branches.

**Notogaster.** — Broadly oval in shape, convex, bearing 16 pairs of setae, 9 transverse bands, and numerous circular areae porosae.

Notogastral band $s_1$ is lacking; the 9 bands present represent $s_2$-$s_{16}$. Consequently segment $F_{S_1}$ is not separated from segment $C$ by a band. Band $s_4$ is incomplete in the mid-line; all the remainder are complete in the holotype. Circular areae porosae are present in all segments except $F_{S_3}$ and $F_{S_4}$; they are numerous in segments ($F_{S_1} + C$), $F_{S_2}$, $E$, $F$, $H$, and $P_S$; they are restricted to a small number situated near the lateral margins in segments $D$ and $F_{S_9}$. Notogastral setae are arranged in a similar manner to those of *M. integer*, with the exception of setae $e_2$ which appear to be located in segment $F_{S_3}$ in Balogh's figures (Balogh 1960, 1961). These setae are located in segment $E$ in *M. chapmani*, and the insertion on each side is very close to the notogastral fissure im. My notations for setae on the posterior part of the notogaster differ from those of Balogh (1960, 1961), for I consider that seta which Balogh designates $h_1$ as being seta $p_1$ (this seta is located in the segment PS). Furthermore, setae designated $p_{S_1}$, $p_{S_2}$, and $p_{S_3}$, by Balogh, are here considered to be setae $p_{S_3}$, $p_{S_2}$, and $h_3$, respectively (Figure 2). Balogh's setae $h_3$ and $h_5$ become $h_1$ and $h_2$ according to this interpretation which follows Grandjean's (1950) notation for other genera in this family. The relative lengths of notogastral setae appear to be similar to those described for *M. integer*; setae $e_1$, $e_2$, $d_1$, $d_2$, and $f_1$, are 50-60 $\mu$ long in holotype; setae $e_3$, $d_3$, and $f_2$, are 175 $\mu$ long; setae $e_4$ and $e_5$ are 35 $\mu$ long.

**Ventral region.** — Infracapitulum with 4 pairs of barbed setae, designated $h$, $m_1$, $m_2$, and $a$ (Figure 2). Several circular areae porosae are present posterior to the level of the insertions of setae $h$.

The palp has the form typical of *Lohmannia lanceolata* (see Grandjean 1950); the chaetotaxy is expressed in the formula (o-1-0-3-10), solenidion w not included. Suture between femur and genu is indistinct. The terminal trifid organ is present on the palpal tarsus.

The adoral region of the gnathosoma is shown in Figure 5. Adoral setae $o_{r_1}$, $o_{r_3}$, and $o_{r_3}$, are leaf-like structures, thin and transparent; setae $o_{r_4}$ overlap considerably in the mid-line. The general form of these setae is similar to that in other genera of this family.

Coxisterna I-IV are distinct on the ventral surface of the podosoma; coxisternal setal formula is (3-1-3-4); setae are arranged as shown in Figure 2. Coxisterna I bear 4-7 circular areae porosae in the holotype.

Details of the genito-anal region are very similar to those described for *M. integer*. Aggenital plates are small triangular structures, located antero-lateral to genital plates. Genital plates without transverse suture; each plate with 10 setae, comprising 4 long antiauxial setae, and 6 shorter paraxial setae. Pre-anal plate
broadly rectangular, much wider than long, only very slightly convex posteriorly. Adanal plates each with 4 long smooth setae; anal plates each with 2 shorter smooth setae; the more posterior pair of anal setae is located at the level of the insertion of the most posterior pair of adanal setae.

Fig. 2. — *Mixacarus chapmani* n. sp. Adult. Ventral view. 

*a, m, s, h = gnathosomal setae; 1a, 2a, 3a, 3b, 4a, 4b, 4c, 4d = coxisternal setae; ia, ih, ip, ips = notogastral fissures; ps1, ps2 = notogastral setae. Other notations as in Fig. 1.*

Fissures *ia* and *ih* are clearly seen in ventral view, due to the ventral curvature of the notogaster; fissures *ip* and *ips* are more difficult to see; fissure *ips* is located on the outer margin of the adanal plicature band.

Legs. — A conspicuous ventral ridge is present on femora I and II (Figure 3); this is not developed on femora III and IV.
Fig. 3-5. — *Mixacarus chapmani* n. sp. Adult.

3: Leg I. Antiaxial view. 4: Tarsus IV. Antiaxial view. 5: Adoral setae (or₁, or₂, or₃) and lateral lips (L.L.).
The dorsal seta d on genu I is closely associated with solenidion \( \sigma^s \), and is located between the two solenidions \( \sigma' \) and \( \sigma^s \).

The chaetotaxy of tarsi I-IV is represented by the formula (17-13-12-12) ; this formula includes the famulus e, which is reduced to a short knob-like structure on tarsus I, but does not include solenidions \( \omega_1 \) I, \( \omega_2 \) I, or \( \omega_1 \) II; solenidion \( \omega_1 \) is remote from seta \( ft' \) on tarsus I; solenidion \( \omega_2 \) is lacking on tarsus II. Figures 3 and 4 show antiaxial views of leg I and tarsus IV respectively. Chaetotaxy of the tarsi may be summarised as follows (notations in parentheses indicate paired setae):

**Tarsus I**:
- Setae: \( (ft) \), e, (tc), \( it' \), \( (\phi) \), \( (u) \), \( (a) \), s, \( m^s \), \( n' \), \( (pv) \) = 17.
- Solenidions: \( \omega_1 \) and \( \omega_2 \).

**Tarsus II**:
- Setae: \( (ft) \), (tc), \( (\phi) \), \( (u) \), \( (a) \), \( (pv) \) = 13.
- Solenidion: \( \omega_1 \).

**Tarsi III and IV**:
- Setae: \( (ft) \), (tc), \( (\phi) \), \( (u) \), \( s \), \( a' \), \( (pv) \) = 12.

Setae \( it' \), \( (\phi) \), \( s \), and \( m^s \), on tarsus I are eupathidial. Setae \( (\phi) \) are quite distinct on all tarsi; \( \phi' \) (paraxial on I-II, antiaxial on III-IV) is larger than \( \phi^s \). All tarsi are monodactyle; claws III and IV with a short tooth.

This pattern of chaetotaxy of tarsi I-IV corresponds to the basic or "total" chaetotaxy for the family Lohmanniidae. *Mixacarus chapmani* resembles *Lohmannia lanceolata* in this respect.

**Variations among paratypes.** — These are slight and usually involve characters of the dorsal surface. The lamellar setae are usually shorter than the interlamellar setae (as in the holotype), although in some specimens there is little difference in the lengths of these setae. Lamellar setae are never longer than interlamellar setae (as appears to be the case in *M. integer*). Sensillus usually has 10 pectinations, but this number may be reduced to 8 or 9. The number of notogastral bands, locations and lengths of notogastral setae, and distribution of circular areae porosae on nogoaster are constant features; notogastral band \( s_4 \) is frequently incomplete in the mid-line, as in *M. integer*.

Features of the ventral surface are relatively constant. Coxisternal formula (3-1-3-4) is notably constant in the paratypes, and this feature forms an important distinction between this species and *M. integer*. One specimen has an extra seta on coxisternum I on one side; this is probably an anomalous development. One paratype possessed only 9 genital setae on one plate, the other plate being normal; the seta was missing from the antiaxial row.

**Deutonymph.** — Measurements of the two specimens are as follows:

1. Length: 539.0 \( \mu \); width: 385.0 \( \mu \).
2. Length: 539.0 \( \mu \); width: 354.2 \( \mu \).

The body and legs are pale in colour, weakly chitinised.
Dorsal surface. — General features resemble those of the adult. Rostral setae (92 μ long) are shorter than lamellar and interlamellar setae (135 μ long). Sensillus with 8 pectinations. Prodorsal and notogastral transverse bands developed as in the adult. Dorso-sejugal articulation between prodorsum and notogaster is not protected by a notogastral tectum; the articulating membrane is seen as a pleated skin. Notogaster bears 16 pairs of setae, arranged as in the adult. The distribution of circular areae porosae on the notogaster also resembles that of the adult, i.e. these structures are lacking only in segments FS3 and FS4. The areae porosae are seen clearly in this developmental stage as small clumps of circular pores.

Ventral surface. — The principal differences between the deutonymph and the adult in the family Lohmanniidae involve the number of coxisternal setae, the number of genital setae, and the number of tactile genital organs. The deutonymph of *M. chapmani* follows the general developmental pattern described by Grandjean (1950) in having coxisternal setal formula (3-1-3-3), 5 pairs of genital setae, and 2 pairs of tactile genital organs. Coxisternum IV generally does not bear seta 4d in the deutonymph; typically this seta appears in the tri tonymph. One specimen of *M. chapmani* possesses this seta on one side in the deutonymph; this is regarded as a premature development. The aggenital and pre-anal plates are not evident. Genital plates are relatively small, strongly rounded anteriorly, paraxial margins with interlocking teeth. Other details of the ventral surface resemble those of the adult.

Tritonymph. — Average length : 662.0 μ (range : 646.8 μ-677.6 μ). Average width : 452.0 μ (range : 431.2 μ-470 μ).

The tritonymph can be distinguished from the adult by its smaller size, and pale-coloured, weakly chitinised body. It can also be recognised by the presence of 8 genital setae on each plate. In other respects the two stages are very similar. Coxisternal setal formula for the tritonymph is (3-1-3-4); adanal-anal formula is 4+2. Dorsally the dorso-sejugal articulation is still clearly visible, the articulating membrane being pleated, as in the deutonymph. Sensillus bears 8 pectinations.

Distribution of *M. chapmani* in Ghana. — Aburi (5 adults); Mabang (13 adults); W. shore of Lake Bosumtwi (2 adults); Essuboni Forest Reserve (2 adults, 7 tritonymphs, 2 deutonymphs); Akotoasubiente (2 adults); Duayaw-Nkwanta (3 adults).

Remarks. — *M. chapmani* is closely related to *M. integer* Balogh from Angola and the Congo. The principal difference between the two species is in the coxisternal setal formula; this is (4-1-4-4) in *integer* (see Balogh 1960, p. 90; 1961, p. 38, fig. 16), in contrast to (3-1-3-4) in *chapmani*. In *M. hamanni* Balogh 1961 from Java the formula appears to be (3-1-4-5) (see Balogh 1961, p. 39, fig. 18). This character may then afford a useful basis for comparison of species in this genus. In other genera in this family the coxisternal setal formula appears to be more constant. Other differences between *chapmani* and *integer* are slight, and may involve body size and the relative lengths of lamellar and interlamellar setae.
The genus \textit{Mixacarus} is closely related to \textit{Meristacarus}; both these genera possess several characters which may be regarded as primitive. \textit{Meristacarus} retains notogastral band 1, and would appear to be more primitive than \textit{Mixacarus} in this respect. The latter genus has retained the pattern of "total" chaetotaxy on all tarsi, and resembles \textit{Lohmannia} in the retention of this primitive character.

\textit{M. chapmani} is named in honour of Dr. R. F. CHAPMAN, Birkbeck College, University of London, who collected many soil samples for me in Ghana.

\textit{Meristacarus} Grandjean 1934.

This genus is easily identified by the absence of anal setae. Genital plates are not divided; pre-anal plate is much wider than long; adanal and anal plates are separated by a longitudinal suture; 4 pairs of adanal setae. Other features of generic importance include the absence of dorsal neotrichy, and the presence of transverse bands and circular areae porosae. Type species: \textit{M. porcula} Grandjean 1934 from Central America.

\textit{Meristacarus porcula} Grandjean 1934.

Collected in Ghana: 3 adults.
Average body length: 898.3 μ (range: 862.4 μ-939.4 μ).
Average body width: 549.3 μ (range: 539.0 μ-569.8 μ).

The three specimens resemble the type species in most respects and are undoubtedly conspecific. They are slightly smaller, on the average, than the Central American specimens.

Balogh (1958, 1961) has used the character of the dorsal setae to distinguish between \textit{M. porcula} and \textit{M. africanus} Balogh 1958 from Angola (notogastral setae denticulate in \textit{porcula}, glabrous in \textit{africanus}). I would consider this feature of doubtful taxonomic value in view of Grandjean's (1934) remarks that the denticulation may be lacking or difficult to see in \textit{M. porcula}. Notogastral setae are finely barbed in the Ghana specimens, although when viewed under low magnifications they appear glabrous.

\textbf{Distribution of \textit{M. porcula} in Ghana.} — Essuboni Forest Reserve (2 adults); Ofin Headwaters Reserve (1 adult).

\textit{Haplaearus} n. gen.

This genus is closely related to \textit{Millotacarus} Balogh 1961, but differs principally in the possession of only one anal seta on each paraproctal plate (the term "paraproctal plate" is used here to denote the fused adanal and anal plates). The fusion of adanal and anal plates is complete, and there is no longitudinal suture.
Adanal-anal setal formula is (4+1); in *Millotacarus* the adanal-anal setal formula is (4+2). The two genera may also be distinguished by the cerotegumental microsculpture. A detailed list of the generic characters of *Haplacarus* will be given after the description of the type species, *H. foliatus* n. sp.

**Haplacarus foliatus** n. gen n. sp. (Fig. 6-11).

Collected in Ghana: 1 adult, 1 tritonymph.
Type locality: Nsawam (2 mi N. on Bunso Rd.).

**Description of holotype.** — Length of body: 677.6 μ; width: 323.4 μ. Colour of body and legs: yellow-brown. The body is enveloped in a fine transparent cerotegument, beautifully ornamented with a microsculpture of knob-like, refractive papillae. These are regularly arranged and each papilla measures 3.5 μ in diameter. This microsculpture is absent from the prodorsal and notogastral transverse bands, from antiaxial margins of ventral plates (infracapitulum, coxisterna, genital and paraproctal plates), and from dorsal surfaces of the legs. The integument lying beneath the cerotegument bears a fine microsculpture of regular punctuations; this is clearly seen on parts of the body where the papillate microsculpture is lacking on the cerotegument. Dorsal and ventral views of the holotype are given in Figures 6 and 7.

**Prodorsum.** — Rostral tectum is entire, not incised. Lateral margins of prodorsum have an angular contour. Rostral setae inserted close together on dorsal surface of rostrum, 3-4 times longer than their mutual distance. All prodorsal setae are markedly foliate and bear short barbs; rostral, lamellar, and posterior exopseudostigmatic setae measure 85-90 μ long; interlamellar and anterior exopseudostigmatic setae are slightly longer, measuring 105 μ. Sensillus is pectinate, with 10-12 branches. There is a broad prodorsal transverse band posterior to the pseudostigmatic region.

**Notogaster.** — There are 32 notogastral setae; neotrichy is absent; all setae are markedly foliate, usually smooth, without barbs (Figure 9). The setae measure 80-100 μ; setae ps are rather thicker than the remainder and have strongly incurved tips. Notogaster bears 10 transverse bands, which are represented by clear areas of the cerotegument devoid of papillae. The arrangement of these bands shows a striking resemblance to that described for *Millotacarus granulatus* Balogh 1961.

**Gnathosoma.** — The arrangement of adoral setae is shown in Figure 8; the setae are foliate, thin and transparent. The infracapitulum bears 4 pairs of setae comprising setae a, m1, m2, and h; these setae are also foliate.

**Ventral region of podosoma and genito-anal region.** — Coxisternal setal formula is (3-1-3-4); these setae are arranged in the usual manner (Figure 7). Aggenital plates are distinct, triangular in shape, located at the anterolateral
margins of the genital plates. Genital plates undivided, without transverse suture; 10 setae on each plate comprising 4 antiaxial and 6 paraxial. Pre-anal plate broadly rectangular, much wider than long. Anal and adanal plates fused, without longitudinal suture; 4 adanal setae and 1 anal seta on each plate; adanal setae foliante; anal setae shorter and more slender than adanals; most posterior adanal seta on each plate is thicker than the remainder and has a strongly incurved tip (Figure 10). Fissures i$a$, i$p$, and i$h$, seen clearly in ventral view; fissure i$p$s was not observed.

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**Fig. 6-7.** *Haplacarus foliatus* n. gen., n. sp. Adult.

6: Dorsal view. 7: Ventral view. Notations as in Fig. 1-2.
Legs. — The main features show strong resemblances to those of Lohmannia lanceolata. A ventral ridge is present on femora I and II; this ridge is lacking or very poorly developed on femora III and IV. Chaetotaxy for tarsi I-IV is "total", and is expressed by the formula (17-13-12-12), as in L. lanceolata. Seta n' on tarsus I is difficult to observe, as is seta p" on tarsi III and IV. Solenidion \( \omega_1 \) I is not associated with seta \( ft' \), and solenidion \( \omega_2 \) II is lacking. All tarsi are monodactyle.

Tritonymph. — Length of body: 600.6 \( \mu \); width: 338.8 \( \mu \).

This form is essentially similar to the adult in the dorsal aspect, although the foliate nature of the dorsal setae is less pronounced. Features of the ventral view are shown in Figure II. Aggenital and pre-anal plates are poorly differentiated. Genital plates relatively smaller and more rounded than in the adult.

Distribution of H. foliatus in Ghana. — Nsawam (2 mi N. on Bunso Rd.) (1 adult, 1 tritonymph).

The genus Haplacarus. — The list of generic characters given below is necessarily a tentative one, based as it is upon a single species. The following features have been used elsewhere (Grandjean 1950; Balogh 1961) in compiling generic diagnoses in the family Lohmanniidae, and are considered here for this reason:

1. Prodorsal and notogastral transverse bands present.
2. 32 notogastral setae; neotrichy absent.
3. Cerotegument with papillate microsculpture.
4. Coxisternal setal formula (3-1-3-4).
5. Genital plates entire; transverse suture absent.
6. Pre-anal plate broadly rectangular; much wider than long.
7. Adanal and anal plates fused; without longitudinal suture; adanal-anal formula. (4 + 1).
8. Femora I and II with ventral ridge; femora III and IV without ventral ridge or with ventral ridge poorly developed.
9. Solenidion \( \omega_1 \) I not associated with seta \( ft' \).
10. Solenidion \( \omega_2 \) II lacking.
11. Tarsi I-IV have "total" chaetotaxy expressed by the formula (17-13-12-12).

Remarks. — Haplacarus shares with only one other genus so far described (Dendracarus Balogh 1961) the rather unusual possession of a single anal seta on each paraprostal plate. The genus Torpacarus (see later) carries 5 setae on each paraprostal plate, but it is difficult to decide whether these represent 5 adanal setae or 4 adanal and 1 anal; the former supposition appears more likely. The position of the anal seta in Dendracarus indicates that this is the more posterior of the anal setae (\( = an_1 \)); the more anterior seta (\( = an_2 \)) apparently being lost during evolutionary development. The opposite is the case in Haplacarus, where the single anal seta probably represents the more anterior one (\( = an_2 \)). Dendracarus and Haplacarus also differ in several other important characters.

As indicated earlier, Haplacarus appears to be closely related to Millotacarus Balogh 1961. Close resemblances between these two genera include the arrangement:
Fig. 8-11. — *Haplacarus foliatus* n. gen., n. sp.

8 : Adult. Adoral region (seta *or* 1 removed on right side). 9 : Adult. Notogastral seta *e* 3.
10 : Adult. Adanal seta *ad* 1. 11 : Tritonymph. Ventral view. Notations as in Fig. 1-2 and 5.
of transverse notogastral bands; the coxisternal setal formula, the absence of a transverse genital suture, the form of the pre-anal plate, and the fusion of adanal and anal plates.

**Papillacarus** Kunst 1959.

The genus is characterized as follows: genital plates divided by a transverse suture; pre-anal plate longer than broad; anal and adanal plates separated by a longitudinal suture; 4 pairs of adanal setae; 2 pairs of anal setae; notogastral neotrichy present. The type for the genus is *Lohmannia murcioides* var. *aciculata* Berl. BALOGH (1961) has also described a species, *P. ramosus*, from Java.

**Papillacarus angulatus** n. sp. (Fig. 12-16).

Collected in Ghana: 4 adults, 2 tritonymphs.

**Adult.** — Average body length: 537.5 μ (range: 523.6 μ-554.4 μ). Average body width: 254.1 μ (range: 246.4 μ-261.8 μ). Type locality: Achimota.

**Description of holotype.** — Length: 523.6 μ; width: 246.4 μ. Figures 12 and 13 show dorsal and ventral views of holotype. Colour of body: yellow-brown. Dorsal and ventral surfaces of the body and the legs are covered by a thin cerotegument which is markedly papillate. The chitinous integument beneath the cerotegument is finely and regularly punctate. The reticulate microsculpture of the integument found in *P. aciculatus* is lacking in *P. angulatus*, and this forms an important specific difference between the two species.

**Prodorsum.** — The holotype is strongly contracted and the posterior third of the prodorsum is covered by a thin notogastral tectum. The rostral tectum is very thin, forming an incomplete covering over the mouth parts; the maxillae are not covered anteriorly and project very slightly. The transparent structure of the rostrum makes it necessary to view this using the oil immersion technique; the anterior margin is truncate, although slightly uneven; the lateral margins are sub-parallel. Lateral margins of prodorsal shield have an angular contour, which appears to be emphasized by the ventral curvature of the leading edge of this shield. Rostral setae inserted close together on each side of the mid-line; longer than their mutual distance, tips strongly curved. The prodorsal setae are 60-70 μ long (rostral setae slightly shorter than the others); all setae are conspicuously barbed. Sensillus pectinate, bearing 11-15 branches; branches of sensillus usually lying along stem of organ, and difficult to count accurately. A prodorsal band is present, traversing the posterior part of the prodorsum, behind the insertions of the interlamellar setae. Areae porosae are absent.

**Notogaster.** — Truncate anteriorly; anterior margin indistinct; lateral margins almost parallel; rounded posteriorly. Notogastral neotrichy particularly evident near posterior margin; 58 notogastral setae are present. All setae are conspicuously barbed. Notations assigned to these setae generally follow Grandjean’s
(1950) system for Annectacarus mucronatus, with the single exception of the designation of the seta $h_2$ in Figure 12; the corresponding seta in A. mucronatus is given.

The particular notation $m$. The homologies are uncertain and the notation in Figure 12 is tentative. Lengths of notogastral setae are as follows:

$$
\begin{align*}
&c_1 \text{ and } e_1 & 25 \mu \\
&d_1 & 30 \mu \\
&c_2, e_2, f_1 & 35-40 \mu \\
&d_2 \text{ and } f_2 & 50-60 \mu \\
&c_3, d_2, h_{1-3}, p_{s1-3}, r & 70 \mu 
\end{align*}
$$

Fig. 12-13. — Papillacarus angulatus n. sp. Adult.
12: Dorsal view. 13: Ventral view. Notations as in Fig. 1-2.
The small supernumerary setae near the posterior margin of the notogaster measure 15-20 μ long. There are 5 transverse bands present on the notogaster, corresponding bands s₂, s₃, s₄, s₇, and s₈, of *Meristacarus porcula*. Bands s₃ and s₈ are complete in the mid-line, the remainder are not. Three superficial ridges are also present; these are more difficult to see than the bands. The origin of the ridges is not immediately evident; they may correspond to notogastral bands. Similar structures are present in *Torpacarus omittens* Grandjean 1950.

**Gnathosoma.** — Infracapitulum with 6 pairs of setae, comprising setae a, m₁, m₂, m₃, and h; there is maxillicoxal neotrichy. Setae a are unbranched, simple setae, the remainder are branched (Figure 13). Adoral setae or₁, or₂, and or₃, typically thin and leaf-like; arranged as shown in Figure 15.

**Ventral region of podsoma and genito-anal region.** — Coxisterna I and II show neotrichy; the full coxisternal setal formula is (9-4-3-4). Setae nearest the mid-line on coxisterna I, II and III are simple; all the remaining coxisternal setae are barbed. Aggenital plates small but distinct, triangular in shape, located in the usual positions. Genital plates divided unequally by a transverse suture; genital setal formula is (5+5) on each side; all setae are barbed. Pre-anal plate longer than wide, typically as shown in Figure 14. Anal and adanal plates separated by a longitudinal suture; 4 pairs of adanal setae; 2 pairs of anal setae; all setae markedly barbed. Notogastral fissure ia is a broad crescent-shaped structure, clearly seen in ventral view due to the ventral curvature of the notogaster. Fissures ip and ih were not seen clearly; fissure ips is small, located in the adanal plicature band.

**Legs.** — All femora possess a ventral ridge. The chaetotaxy of tarsi I-IV is expressed by the formula (17-11-10-10). Figure 16 shows antiaxial view of leg I. Tarsus I has 5 eupathidial setae: i₄', (ϕ), mₑ and s; solenidions ω₁ I and ω₂ I are present, the latter being closely associated with seta ϕₑ. The famulus e is a short truncate stump. Solenidions ω₁ II and ω₂ II are also present; ω₂ is inserted between the insertions of ϕₑ and ϕₑ on this tarsus. Setae (ϕ), i₄', mₑ and n₄', are lacking on tarsus II. Tarsi III and IV lack seta a₄'; the remaining setae are the same as on tarsus II. Tarsal chaetotaxy is summarised as follows:

Tarsus I:

Setae: (ϕ), (ϕ), i₄', (ϕ), (u), s, mₑ, n₄', (a), (ϕv), e = 17.
Solenidions: ω₁ and ω₂.

Tarsus II:

Setae: (ϕ), (ϕ), (u), s, (a), (ϕv) = 11.
Solenidions: ω₁ and ω₂.

Tarsi III and IV:

Setae: (ϕ), (ϕ), (u), s, a₄', (ϕv) = 10.
All tarsi are monodactyle; each claw bears a conspicuous tooth.
Fig. 14-16. — *Papillacarus angulatus* n. sp. Adult.
14 : Preanal plate. 15 : Adoral region. 16 : Leg. I. Antiaxial.
Tritonymph. — Length: 469.7 μ; width: 246.4 μ. Very similar to the adult, but can be distinguished by the light-coloured, weakly-chitinised body and legs, and the presence of 8 pairs of genital setae. Genital plates divided, suture weak; genital setae (5+3) on each side; the most posterior genital seta is simple, longer than the remainder. Aggenital and pre-anal plates not chitinised.

Dorsally, the nymph has the full complement of setae; dorsal setae with fewer branches than those of the adult. Sensillus not markedly pectinate, but bears two rows of short barbs. The dorso-sejugal articulation is pleated in the usual manner.

Distribution of P. angulatus in Ghana. — Achimota (3 adults, 1 tritonymph); Nsawam (2 mi N. on Bunso Rd) (1 adult, 1 tritonymph).

Remarks. — P. angulatus differs from P. aciculatus (Berl.) in having uniformly punctate microsculpture of the integument, and weaker notogastral neotrichy. Other differences between the two species may include weaker gnathosomal neotrichy in angulatus (a second hypostomal seta is lacking), and the shape of the pre-anal plate.

Künst (1959) makes no mention of transverse prodorsal and notogastral bands in P. aciculatus; the presence of these structures in P. angulatus renders it necessary to modify Balogh’s diagnosis of the genus (Balogh 1961) in respect to this character. Künst (1959) has noted that Papillacarus is closely related to Cryptacarus Grandjean 1950. This relationship is confirmed by the leg chaetotaxy, and also by the presence of a ventral ridge on each femur. Solenidion ω2 II is retained and there is a close association between ω2 I and seta ft" in both genera. These characters are also possessed by members of the genera Annectacarus and Torpacarus. The formula for the chaetotaxy of tarsi I-IV is (17-11-9-9) in Cryptacarus, and (17-11-10-10) in Papillacarus; the difference is accounted for by the suppression of seta a" on tarsi III and IV in Cryptacarus.

Annectacarus Grandjean 1950.

The genus is characterized as follows: genital plates entire, not divided by transverse suture; adanal and anal plates fused, not separated by a longitudinal suture; adanal-anal setal formula (4+2); notogastral neotrichy present. The type for the genus is A. mucronatus Grandjean 1950.

Annectacarus insculptus n. sp. (Fig. 17-18).

Collected in Ghana: 18 adults.

Adult. — Average body length: 495.8 μ (range: 477.4 μ-523.2 μ). Average body width: 260.2 μ (range: 251.4 μ-277.2 μ). Type locality: Dominasi.

Description of holotype. — Length: 508.2 μ; width: 261.8 μ. Colour of body: light brown. The microsculpture of the integument consists of a reticulum of
polygons superimposed upon which is a series of fine punctuations; this ornamentation is particularly distinct on the notogaster; it is not evident on the prodorsum or ventral surface. Figures 17 and 18 show dorsal and ventral views of the holotype.

Prodorsum. — The rostral tectum has two incisions anteriorly, and bears 3 sharp points. Rostral setae are inserted on a transverse chitinised ridge; all prodorsal setae are 60-70 μ long, finely barbed. Pseudostigma broadly cup-shaped; sensillus pectinate, with 11 branches. Two areae porosae are located between the pseudostigmata.
Notogaster. — There are 42 notogastral setae (i.e. notogastral neotrichy.), Notations used in Figures 17 and 18 generally follow Grandjean (1950) for Annectacarus mucronatus, except that I have used the notation h₂ instead of m. Grandjean points out that it is probable that seta h₂ has been replaced by two setae, namely m and n, during development. Setae c₁, d₁ and e₁ are short smooth setae; the remaining notogastral setae are lanceolate, with proximal half thickened, distal half tapering to a fine tip; all setae are barbed. The lengths of notogastral setae in the holotype are as follows:

- c₁, d₁, e₁ ................................................. 20 μ
- e₂, n ................................................. 40-50 μ
- f₂, h₂, h₃, r, fₕs₁, fₕs₂, fₕs₃ .................................. 65 μ
- fₙ, h₄, b₁, b₂, b₃ ........................................... 80-90 μ

Grandjean (1950) noted that “sillons rubannés transversaux” are lacking in A. mucronatus, their place being taken by a number of “dénivellations”. The distinction between these two terms is not clear to me, and I use the term “notogastral band” for these structures in Annectacarus. The structures in question (which occur also in Papillacarus angulatus) are refractive ribbon-like bands, which appear to be punctate or porous. I can distinguish no difference between these and the notogastral bands of Meristacarus and Mixacarus. Areae porosae are also present on the notogaster; the distribution of bands and areae porosae is given in Figure 17. The fissure im is located near the insertion of seta e₂ on each side of the notogaster.

Gnathosoma. — Adorai setae (3 pairs) are thin and leaf-like; the general form of these setae is very similar to that described above for Papillacarus angulatus, although setae or are longer and more conspicuous in the present species. There is gnathosomal neotrichy, the infracapitulum bearing 6 pairs of setae; setae a are smooth, without barbs; the remainder are strongly barbed and thickened. The palp has the usual form and the setal formula (0-1-0-1-0-1).

Ventral region of podosoma. — There is neotrichy on coxisterna I and II, but not on III and IV; the coxisternal setal formula is (6-4-3-4); paraxial setae are short and smooth, the remainder, except for a single pair inserted antiaxially on coxisterna I, are barbed. In all these respects the species resembles A. mucronatus. A further resemblance between the two species is found in the presence of an area porosa on each coxisternum.

Genito-anal region. — Aggenital plates conspicuous, triangular in shape. Genital plates undivided, each with 10 finely barbed setae, comprising an antiaxial row of 4 and a paraxial row of 6 shorter setae. Preanal plate broadly square in outline. Adanal and anal plates fused, without longitudinal suture; adanal-anal formula (4+2); setae long and finely barbed; adanal setae lanceolate. The fissure ia is seen in ventral view as a narrow slit in the reflexed humeral region of the notogaster; fissures ih and ip are located as shown in Figure 18; fissure 1p was not seen clearly
in the holotype, but was observed in several paratypes, located near the adanal plicaature band.

Legs. — All femora bear a ventral ridge. All tarsi are monodactyle, each claw bearing a distinct tooth. The chaetotaxy of tarsi I-IV is very similar to that of *Annectacarus mucronatus*, although I had difficulty in establishing the presence of seta \( p' \) on tarsi II, III, and IV; this seta is small and weakly developed in *A. mucronatus* (see Grandjean 1950). Setal formula for tarsi I-IV is \( (17-13-10-10) \), including seta \( p' \). It is of interest to note that seta \( p'v' \) is inserted at the same level as, or distal to, the insertion of \( pv' \), on tarsi III and IV, in both *A. mucronatus* and *A. insculptus*. Solenidion \( \omega_2 \) I is closely associated with the seta \( \beta' \); solenidion \( \omega_2 \) II is present.

**Distribution of *A. insculptus* in Ghana.** — Dominasi (5 adults); Essuboni Forest Reserve (5 adults); Somanya (6 adults); Achimota (1 adult); Shai Hills (1 adult).

**Variations among paratypes.** — The only variable character noted involved the number of setae on the infracapitulum. One specimen had 7 setae on one side, 6 on the other; in three cases only 5 setae were found on one side, the other side being normal with 6 setae.

**Comparison with *A. mucronatus*.** — The principal difference between the two species involves the length of notogastral setae \( c_2, d_2, f_2, b_2, b_3 \). These are appreciably longer than the centro-dorsal setae \( c_1, d_1, e_1 \) in *insculptus*, and are conspicuously thickened and barbed; in *mucronatus* these setae are only slightly longer than the centro-dorsal setae, and are slender, smooth or minutely barbed. The two species are obviously closely related.

**Annectacarus sejugatus** n. sp. (Fig. 19).

Collected in Ghana: 3 adults.

Adult. — Average body length: 490.2 \( \mu \) (range: 477.4-500.5 \( \mu \)). Average body width: 251.5 \( \mu \) (range: 246.4-261.8 \( \mu \)). Type locality: Achimota.

**Description of holotype.** — This species resembles the previous one in many details. The two main distinguishing features are the much shorter length of notogastral setae \( b_1, b_2, \) and \( b_3 \), and the absence of neotrichy on the infracapitulum.

Notogastral setae of the \( b \) series are short, curved, barbed setae, measuring 20 \( \mu \) long. They are appreciably shorter than the corresponding setae in *A. insculptus*. The infracapitulum bears 4 pairs of setae, comprising setae \( a \) (one pair), setae \( m_1 \) and \( m_2 \) (one pair each), and setae \( h \) (one pair). The distribution of these setae is shown in Figure 19, which is a composite Figure of dorsal and ventral views of the holotype. The holotype bears 5 setae on one side of coxisternum II; this appears to be an anomalous development, and is not repeated in the other two specimens. The coxisternal setal formula is \( (6-4-3-4) \).
Dorsally, the most anterior transverse band on the notogaster is lacking. This groove is present in *A. insculptus* and is complete in the mid-line.

**Distribution of *A. sejugatus* in Ghana**: Achimota (3 adults).

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**Fig. 19.** *Annectacarus sejugatus* n. sp. Adult. Dorsal (left) and ventral (right) views. Notations as in Fig. 1-2.

*Torpacarus* Grandjean 1950.

*Grandjean* (1950) characterized the genus as follows: genital plates entire, not divided by transverse suture; pre-anal plate overlapping anal plates; no anal plates; all femora bear a ventral ridge; notogastral transverse bands lacking. Further discussion of the generic characters will be given after the species descriptions.
The type and only species previously described in the genus is *T. omittens* Grand-jean 1950. Four sharply distinct species occur in Ghana. One of these strongly resembles *T. omittens* and is regarded as conspecific with it; the other three are new species and are described below as *T. foveolatus*, *T. magnus* and *T. cinctus*.

**Torpacarus foveolatus** n. sp. (Fig. 20-24).

Collected in Ghana: 13 adults.

Adult. — Average body length: 627.5 μ (range: 569.8 μ-646.8 μ). Average body width: 281.0 μ (range: 261.8 μ-308.0 μ). Type locality: Akuse.

**Description of holotype.** — Length: 646.8 μ; width: 277.2 μ. Colour of body: golden-brown. The microsculpture of the integument covering the dorsal and ventral surfaces of the body is a reticulum of polygonal figures; this is quite distinct on the prodorsal, notogastral, and coxisternal regions; it is not evident on the legs. The integument covering the body and legs is also finely punctate. This pattern of microsculpture is very similar to that described by GRANDJEAN (1950) for *T. omittens*.

**Prodorsum.** — Rostral tectum entire, without incision; sub-rostral tooth located on dorsal surface of rostral tectum a short distance behind the anterior margin; this tooth is less distinct than in *T. omittens*. Lateral margins of prodorsum are broadly rounded, not angular. Prodorsal setae with occasional barbs or entirely smooth; rostral, lamellar, and anterior exopseudostigmatic setae are more strongly barbed than interlamellar and posterior exopseudostigmatic setae; setae generally measure 60-70 μ, posterior exopseudostigmatic setae slightly longer. Sensillus is pectinate, with 11 branches. The prodorsum bears a transverse band posterior to the level of the pseudostigmata; a pair of areae porosae is located in this region also.

**Notogaster.** — There are 32 notogastral setae, smooth or with occasional barbs. The lengths of the setae are as follows:

- $c_1, d_1, d_2, e_1$: 15-20 μ
- $c_2, f_1$: 35 μ
- $h_1$: 65 μ
- $c_3, e_2$: 75-90 μ
- $d_3, h_2, h_3$: 90 μ
- $p_2$: 105 μ
- $p_3$: 120 μ

A conspicuous feature of the notogaster, indicated in the species name, is the presence of circular areae porosae arranged in transverse rows, as shown in Figure 20. Six rows are present, and these appear to correspond, in position at least, to transverse notogastral bands $s_2, s_3, s_4, s_5, s_6, s_7, s_8$ of *Meristacarus porcula*. A similar series
of transverse notogastral rows composed of circular areae porosae has been described in the genus *Javacarus* Balogh 1961. True notogastral bands are lacking.

Notogastral fissure *im* is located near to the insertions of setae *e*₂; fissures *ia*, *ih*, and *ips* are seen in ventral view (Figure 21).

**Gnathosoma.** — The infracapitulum bears 4 pairs of setae comprising setae *a* (one pair), setae *m*₁ and *m*₂ (one pair each), and setae *h* (one pair). Setae *m*₄ are compound setae with long spine-like branches; setae *m*₁ and *h* are barbed; setae

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**Fig. 20-21.** — *Torpacarus foveolatus* n. sp. Adult. 20: Dorsal view. 21: Ventral view. Notations as in Fig. 1-2.
are smooth, without barbs. Three pairs of adoral setae, similar in every respect to those of *T. omitens* (i.e. *or*₃ is relatively small). The mandible (Figure 22) resembles that of *T. omitens*; the fixed article bears 4 teeth, only 2 of which can be seen in the Figure; seta *chb* is well developed; seta *cha* is lacking; the movable article bears a rather rounded projection (8). The palpal formula is (0-0-0-0-2-9);

![Figure 22](image)


Ventral region of podosoma. — Coxisternal setal formula is (3-1-4-4), as in *T. omitens*. Coxisternum III has retained the primitive seta 3d; this seta is retained in all of the 26 cases examined (i.e. 13 specimens). Coxisternal setae 3b, 3c, and 3d are compound setae with long spine-like branches (Figure 23), and are similar in.
appearance to setae $m_2$ on the infracapitulum; the remaining coxisternal setae are smooth or barbed.

Genito-anal region. — Genital plates without transverse suture; 10 genital setae on each plate. Pre-anal plate much wider than long, with lateral margins rounded. Anal plates lacking or fused with adanalns. Five pairs of adanal setae, compound with long spine-like branches; these setae become progressively longer posteriorly (i.e. adanal setae $ad_4$ are twice as long as $ad_5$).

Legs. — All femora bear a ventral ridge. All tarsi are monodactyle; tarsal claw without tooth. Tarsal chaetotaxy expressed by the formula (\(r_5-t_3-t_t-t_t\)) for tarsi I-IV. Solenidion $\omega_1$ I has a characteristic bulb-like dilation about half-way along its length; solenidion $\omega_2$ I is long and closely associated with seta $ft''$. Solenidion $\omega_2$ II is retained. Setae $p'$ and $p''$ are large barbed structures on tarsus II, and $a'$ is much smaller than $a''$ on this tarsus (Figure 24). The tarsal chaetotaxy is summarised below:

Tarsus I:
- Setae: ($ft$), $e$, ($tc$), ($\phi$), ($u$), ($a$), $m''$, $s$, ($pv$) = 15.
- Solenidions: $\omega_1$ and $\omega_2$.

Tarsus II:
- Setae: ($ft$), ($tc$), ($a$), ($u$), $s$, ($\phi$), ($pv$) = 13.
- Solenidions: $\omega_1$ and $\omega_2$.

Tarsi III and IV:
- Setae: ($ft$), ($tc$), $p'$, ($u$), $s$, $a'$, ($pv$) = 11.

Distribution of *T. joveolatus* in Ghana. — Akuse (10 adults); Essuboni Forest Reserve (1 adult); Achimota (1 adult); Mabang (1 adult).

Variations among paratypes. — The numbers of genital and adanal setae are rather variable. Two specimens showed asymmetrical distribution of genital setae (9 setae on one plate, 10 on the other). One case was observed of the asymmetrical distribution of adanal setae (4 setae on one plate, 5 on the other). One paratype had 6 adanal setae on each plate. I am inclined to believe that this represents an unusual development of adanal setae. Grandjean (1950) has discussed the significance of 5 adanal setae in the genus *Torpacarus*, pointing out that 4 of these appear in the protonymph, and one (the most anterior) appears in the deutonymph (the anal segment appears at this stage also). The alignment of the most anterior seta suggests that this is adanal rather anal, for it is a continuation of the adanal row. An additional argument in favour of this hypothesis is that the anterior anal seta is never located in front of the most anterior adanal seta ($ad_4$), but rather is found between $ad_4$ and $ad_5$ in the presently-known members of the family Lohmanniidae. The sixth adanal seta noted above probably represents an unusual development of adanal neotrichy, for it is inserted in the adanal row anterior to adanal setae $ad_5$. 
Comparison with *T. omitens*. — The species differs from Grandjean’s type species in a number of important respects. Notogastral setae $c_2$, $d_2$, $f_1$ and $h_1$ are appreciably shorter than in *T. omitens*. The presence of transverse rows of circular areae porosae on the notogaster of *T. foveolatus* is another distinguishing character. It is of considerable interest to note, however, that the transverse sutures which these rows of areae porosae possibly represent (i.e. $s_2$, $s_3$, $s_4$, $s_5$, $s_7$ and $s_8$) are present in the nymphal stages of *T. omitens*. The compound setae with spine-like branches found on the infracapitulum, coxisterna III and adanal plates in *foveolatus* also distinguish this species from *omittens*. The tarsal setal formula differs from that of *omittens* in the retention of seta $a'$ on tarsi III and IV.

**Torpacarus magnus** n. sp. (Fig. 25).

Collected in Ghana: 1 adult.

**Description of holotype.** — Length of body: 693.0 μ; width of body: 338.8 μ. Colour of body: red-brown. Dorsal view of holotype is shown in Figure 25. The reticulate microsculpture is less distinct than in *T. foveolatus*.

**Prodorsum.** — Rostral tectum entire, without incision, anterior margin truncate. Sub-rostral tooth poorly developed. Lateral margins of prodorsum broadly rounded. Prodorsal setae markedly lanceolate, barbed, appreciably longer than the corresponding setae in *T. foveolatus*. Rostral setae are 75 μ long, the remainder are 120-130 μ long. Sensillus is pectinate, with 9 branches. A transverse band is present on the prodorsum; this is more conspicuous than in *T. foveolatus*. Areae porosae are also present on the prodorsum; their distribution is shown in Figure 25.

**Notogaster.** — There are 32 notogastral setae; setae $c_1$, $d_1$, $d_2$, $e_1$ are short slender setae; the remainder are markedly lanceolate, with occasional barbs. Lengths of setae are as follows:

<table>
<thead>
<tr>
<th>Setae</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c_2$, $d_1$, $d_2$, $e_1$</td>
<td>35-40 μ</td>
</tr>
<tr>
<td>$c_3$, $e_2$</td>
<td>103 μ</td>
</tr>
<tr>
<td>$c_2$, $d_2$, $f_1$</td>
<td>120-130 μ</td>
</tr>
<tr>
<td>$f_2$, $h_1$, $h_2$, $h_3$, $p_s_1$, $p_s_2$, $p_s_3$</td>
<td>160 μ</td>
</tr>
</tbody>
</table>

Transverse rows of areae porosae are present on the notogaster, although these are less distinct than in *T. foveolatus*. There is also a fine superficial line, designated *mt*, as in *T. omitens*.

**Ventral surface.** — This is very similar to that of *T. foveolatus*. One slight difference may involve the adanal setae; the main axis of each compound seta is longer and more tapering in *T. magnus*.

**Legs.** — All femora with a ventral ridge; solenidion $ω_1$ I with bulb-like dilation; $ω_2$ I is associated with seta $f′$; $ω_2$ II is retained; tarsal chaetotaxy is expressed
by the formula (15-13-11-11) for tarsi I-IV. *T. magnus* resembles *T. foveolatus* in all these features.

**Distribution of *T. magnus* in Ghana.** — Mabang (1 adult).

**Remarks.** — *T. magnus* appears to be closely related to *T. foveolatus*; the two species can hardly be distinguished on the basis of characters of the ventral surface and chaetotaxy of the legs. The structure of the dorsal setae affords a distinguishing character, for the prodorsal and notogastral setae (except for the centro-dorsal setae) are lanceolate in *T. magnus* and appreciably longer than the corresponding setae in *T. foveolatus*. 

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**Fig. 25.** — *Torpucarcus magnus* n. sp. Adult. Dorsal view. Notations as in Fig. 1-2.
Torpaeurus cinctus n. sp. (Fig. 26).

Collected in Ghana: 1 adult.

Description of holotype. — Length of body: 654.5 μ; width of body: 292.6 μ. This species is remarkable in that the features of the dorsal surface (except for the length of notogastral setae \( d_2 \), and the presence of areae porosae) are very reminiscent of \( T. \) omitens, whereas ventrally the species cannot be distinguished from \( T. \) foveolatus and \( T. \) magnus.

Fig. 26. — Torpaearus cinctus n. sp. Adult. Dorsal view. Notations as in Fig. 1-2.
Colour of body and legs: yellow-brown. Reticulate microsculpture is well developed on prodorsum and notogaster. Figure 26 shows dorsal view of holotype.

**Prodorsum.** — Rostral tectum slightly indented anteriorly; sub-rostral tooth indistinct. Lateral margins of prodorsum more angular in outline than in *T. foveolatus*. Prodorsal setae are long and slender, barbed basally, with fine tapering tips; rostral setae measure 65 μ long; remainder are 70-90 μ long. Sensillus pectinate, with 9-12 branches. Prodorsal transverse band clearly marked.

**Notogaster.** — There are 32 notogastral setae, smooth, tapering distally; setae on anterior part of notogaster are slender; posterior setae slightly lanceolate. Lengths of setae as follows:

<table>
<thead>
<tr>
<th>Seta</th>
<th>Length (μ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c₂</td>
<td>75</td>
</tr>
<tr>
<td>c₃</td>
<td>85-90</td>
</tr>
<tr>
<td>e₂</td>
<td>105</td>
</tr>
<tr>
<td>d₂</td>
<td>120</td>
</tr>
</tbody>
</table>

Areae porosae on notogaster are less distinct than in *T. foveolatus*, particularly on the anterior part of the notogaster. Two superficial lines are present, corresponding to *mt* and *nt* in *T. omitens*.

**Ventral surface and legs.** — Similar in every respect to *T. foveolatus*.

**Distribution of *T. cinctus* in Ghana.** — Essuboni Forest Reserve (1 adult).

*Torpacarus omitens* Grandjean 1950.

Collected in Ghana: 1 adult.

Length of body: 569.8 μ; width of body: 261.8 μ.

The single specimen is somewhat smaller than GRANDJEAN's specimens, but in all other respects the Ghana form resembles the form from South America.

The species may be distinguished easily from the other species in this genus described from Ghana. The notogastral setae *d₄* are as long as setae *d₄* in *omitens*; setae *d₃* are only as long as setae *d₄* in the species described earlier in this paper. The superficial lines on the notogaster, designated *mt*, *nt*, and *pt*, by GRANDJEAN (1950) are clearly seen; the lines *nt* and *pt* are not joined in the Ghana specimen. A transverse row of circular areae porosae is present at the level of the insertions of setae *c₁* and *c₂* on the notogaster.

Ventrally, setae *m₂* on the infracapitulum, coxisternal setae *3b*, *3e*, and *3d*, and the adanal setae are barbed; they do not have the compound, spine-like structure of the corresponding setae on *T. foveolatus*, *T. magnus* and *T. cinctus*.

**Distribution of *T. omitens* in Ghana.** — Dominasi (1 adult).

The genus *Torpacarus*. — The discovery of new species of this genus from Ghana enlarges our knowledge of the group as a whole. The generic diagnosis given by
Balogh (1961) may be modified slightly in the light of these findings. The presence of areae porosae is demonstrated in the species described above, and these structures appear to be fairly consistent (although Grandjean (1950) did not observe them in his specimens of T. omitens). The prodorsal transverse band also appears to be a generic character, and evidences of segmentation are present on the notogaster in adult and nymphal forms. These evidences may appear as transverse grooves or dénivellations (see Grandjean 1950, p. 126) or as transverse rows of areae porosae, in the adult. They are more clearly defined as sutures in the larva and nymphs (see Grandjean 1950, p. 129 and Fig. 5 E). The coxisternal setal formula (3-1-4-4) is constant in the species examined, and may be included as a generic character.

REFERENCES