

The Tenebrionidae of Southern Africa. XXXIII. — Description of the larvae of *Gonopus tibialis* FABRICIUS and *Gonopus agrestis* FAHRAEUS (*Gonopina*, sensu Koch 1956).

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THE TENEBRIONIDAE OF SOUTHERN AFRICA

XXXIII. -- Description of the larvae of *Gonopus tibialis* FABRICIUS and *Gonopus agrestis* FAHRAEUS (*Gonopina*, *sensu* KOCH 1956).

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(With 3 Plates and 4 Figures)

The present paper is the result of an assistantship grant awarded to Dr C. Koch, Pretoria, by the S.A. Council for Scientific and Industrial Research, and was carried out under his kind supervision. It deals with the description of the first known larvae of the genus *Gonopus*, which were reared in the Transvaal Museum's Insectarium by the late Mr. Isaac Mokgoatsane, technical assistant at the Transvaal Museum.

Both species *Gonopus tibialis* and *agrestis* occur also in South West Africa (cf. GEBIEN, H., *Abhandl. Geb. Auslandsk. Hamburg. Univ.*, 1920, 5, C, 2, pp. 116, 117).

Gonopus tibialis FABRICIUS

The description is based on a larva 35 mm long, 4 mm broad, head-capsule 3.8 mm wide (Pl. Ia). Body almost cylindrical of subequal width, fairly strongly sclerotized; sclerites subquadrate to transverse, not constricted between segments; ninth abdominal tergum strongly sclerotized latero-ventrally, disc slightly hollowed, laterally with a sharply raised ridge which flattens basally, apex round to more pointed-ovate; cuticle yellowish, glabrous, smooth, on head and ninth tergite rugose; posterior margin of segments, disc of ninth abdominal tergite and pattern on head and eighth abdominal tergum orange in fresh specimens, light brown in older alcohol material.

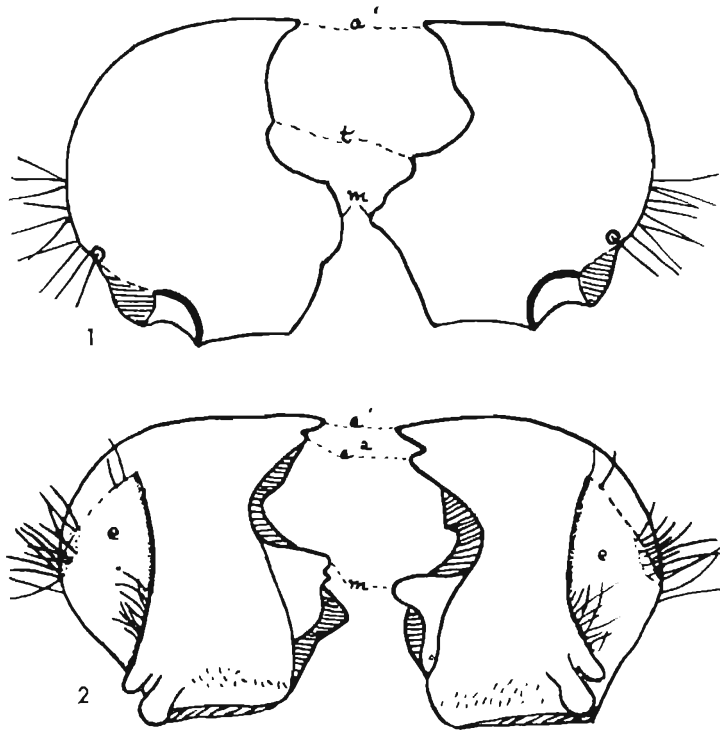
Head (P. IIIa, b. Figs. 1—3)

Convex above, twice as wide as long; frontal sutures very distinct, coronal and pleurostomal sutures faint; anterior frontal margin straight with one long, slender seta on each side; epicranial halves with a straight, obliquely sloping margin anteriorly, laterally rounded and setiferous; below the antennal insertion a group of three setae¹; on frons a pattern² composed of more or less aggregated

¹ In larvae from the size of about 8.5 mm (probably third stage) to about 23 mm (head capsule 2 mm) are found ocular spots; two which are mostly fused into one underneath the before mentioned setae, and three single ones in a transverse row laterally below the antennal insertion. The two first stages and older larvae from 24—40 mm length have no detectable ocelli.

² This pattern may be absent in younger larvae but is very distinct in older stages.

irregularly rounded spots with a light yellow centre surrounded by a dark orange or brown contour; the pattern starts from a compact base, accompanies the frontal sutures and sends two branches medianly subparallel to the former; in the transverse median line of the epicranial halves, near to frontal suture one large circular spot with darker outline is always present even in young stages, below which a seta is inserted; more laterally an aggregation of irregular spots. Clypeus trapezoidal, broadest at base, about two and a half as wide as long, the basal half rugose and more strongly sclerotized than the almost transparent smooth apical half; the posterior two-thirds of the first showing an orange semi-circle, the anterior portion ivory with eleven short, erect, orange setae and a long, slender seta on each side at the same height where the two halves meet. Labrum transverse, rounded laterally, almost two and a half as wide as long; posterior third orange; disc of anterior portion medianly with a row of orange, pointed setae a third longer than those on clypeus, exterior margin bordered by very fine, long setae. Epipharynx (Pl. IIIb) transverse-ovate; the basal sclerotized band distally prolonged into four rather short triangular processes, the exterior ones longer and curved inwardly; the anterior margin at the rotundity set with about six broad, pointed setae on each side, between them some finer and smaller setae: medianly on the anterior third a group of six sensory punctures in two vertical rows, the two lower ones on each side nearer to each other; slightly below the centre are two pointed, strongly sclerotized setae joined by a transverse row of ten small sensory punctures; medianly situated, on top of the sclerotized band are two very heavily sclerotized triangular processes which project ventrally, below them are eight sensory punctures; the lateral surface of disc is occupied by fine, equally spaced, sharply pointed minute trichoid processes, which become larger and fringe-like medianly where they border laterally the area of the median setae and sensory punctures, below the latter is a clear, subsquare area reaching up to the posterior band, and two bare stripes laterally to the anterior sensory punctures. Antennae originating from a broad articulating membrane; the first two segments tubiform of about equal length, the second one a quarter narrower, dorsally on apex with a small brown seta (sometimes broken off). main sensorium narrowly ring-shaped, open dorsally; third segment a fifth of second with two setae on top and numerous micro-processes. Mandibles (Fig. 1, 2) large showing to a great extent dorsally; apices bifid, apical teeth strongly pointed; in dorsal view shape of left and right mandible differing considerably; left mandible with a small triangular tooth between apical tooth and molar part, the latter gently rounded, hardly projecting; apical tooth on right mandible large, about a third of the whole length, the prolongation to the strongly projecting molar part goes off in a rectangle with a small dental process in front of the triangular, pointed molar; the exterior, sharply defined margin goes subhorizontally at apex thence strongly curved convexly; opposite to the molar part some setae are visible from ventrally and one seta is inserted posteriorly on the edge of dorsal disc, the sharp margin ending in front of it; in ventral view the lower apical tooth of right mandible small and almost fused with first; the molar part shows two obtuse, triangular processes; the second apical tooth of left mandible is strongly developed, the molar part has a triangularly pointed and strongly projecting process; in both mandibles the ventral excavation is extremely large, occupying nearly half of the width; on the oppo-



Gonopus tibialis F.

Fig. 1. Mandibles, dorsal view; Fig. 2. Mandibles, ventral view.

Abbreviations: a¹ and a², apical teeth; ba, basal less sclerotized part of claw; c, coxa; ca, cardo; cl, claw; e, excavation; fe, femur; gu, gula; l, ligula; m, mentum; ma, mala; pa, palpus maxillaris; pl, palpus labialis; pm, prementum; sm, submentum; st, stipes maxillaris; t, additional tooth; ti, tibiotarsus; tr, trochanter; articulating membranes stippled.

site side of the molar part a group of about ten to twelve strong setae follows the exterior margin, the last few setae meeting the latter, two setae are situated on the apex of excavation; a group of a few fine setae is found at the base and alongside the limiting ridge of the excavation; a transverse band of microsetae extends subparallel to base. Stipes of maxilla (Fig. 3) ventrally densely covered with long, slender, brownish setae, becoming shorter and more scattered interiorly; part of articulating membrane attached to submentum scaly; mala almost reaching apex of second segment of palpus, along exterior margin with strong, curved spines which correspond to a parallel row on dorsal margin and two setae just below apex; dorsal surface densely set with pointed setae; the

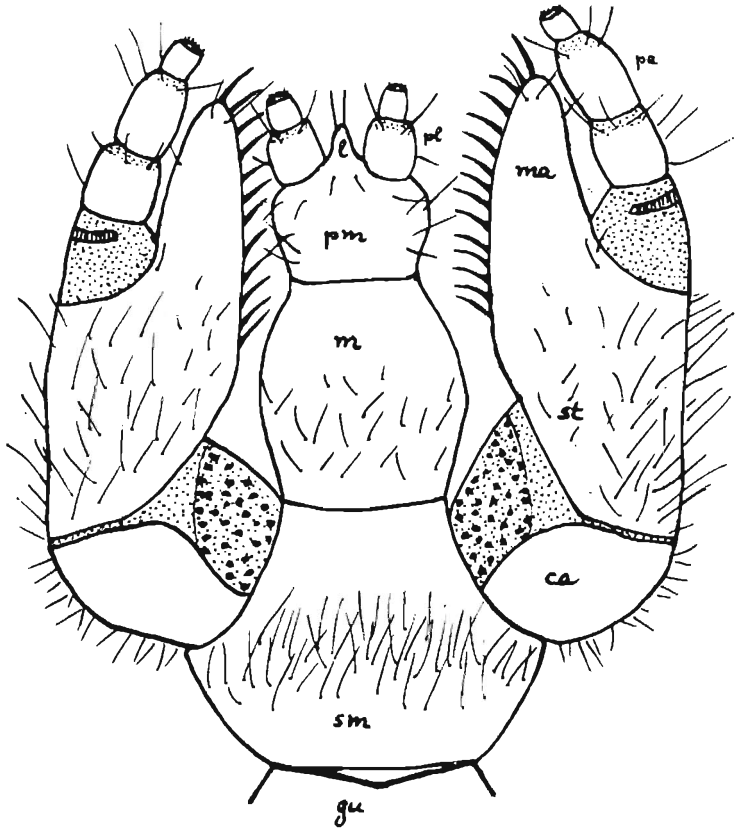
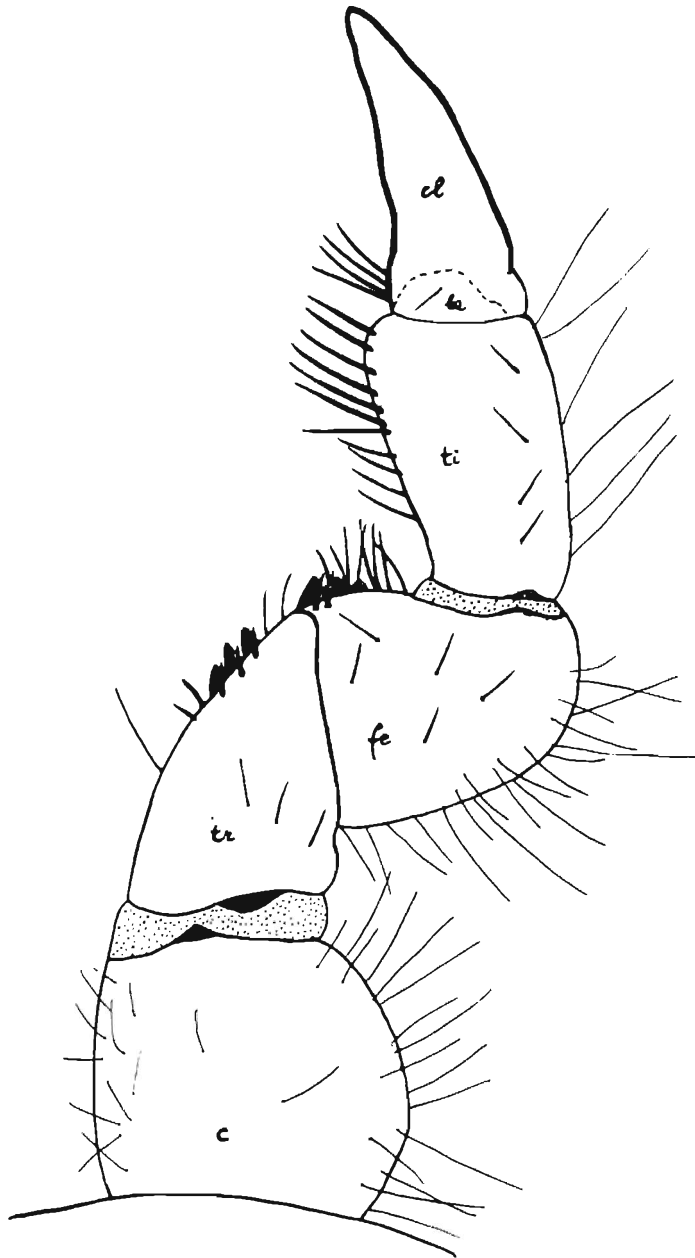
*Gonopus tibialis F.*

Fig. 3. Maxilla and labium, ventral view

three-segmented palpus with a large articulating membrane strengthened by a brownish sclerotized band; segments tubiform, the second one slightly longer and a fifth narrower than the first, the third less than half the length of the preceding one; first and second segments with a few setae along anterior margin. Submentum trapezoidal, broadest posteriorly, middle portion with very long, slender setae; mentum barrel-shaped with long pointed setae on posterior two-thirds; prementum subquadrate with two setae below ligula and a few along sides; ligula elongately dome-shaped, about as long as second segment of labial palpus, tipped with two erect setae, slightly longer than ligula itself; first segment of labial palpus stout, subquadrate with a few setae along anterior margin and sides; second segment subquadrate, half the size of first, minute processes on apex. Hypopharyngeal sclerite tricuspidate. Gula transverse-rectangular, over a half wider than long, anterior margin a quarter narrower than base, anterior third of side margin obliquely sloping until it meets the vertical two-thirds.



Gonopus tibialis F.

Fig. 4. Left fore leg, ventral view

Thorax

Pronotum large, a fourth wider than long, about twice as long as head, slightly wider than mesonotum; the latter twice as broad as long, metanotum somewhat longer; all segments yellowish with a darker transversely striped anterior and posterior (pronotum) or only posterior band. In lateral view tergite of pronotum strongly narrowing anteriorly; cuticle on all segments bare except for two pairs of setae on each side of pronotum, one shorter seta at times paramedianly nearer to anterior and posterior margin, the second pair longer and more laterally; on meso- and metanotum only the posterior setae present; a few short setae at the sides. First spiracle on mesonotum large, ovate with pointed apex towards sternum. Sternal parts of meso- and metanotum with scattered brown setae.

Legs (Fig. 4)

The front legs are considerably bigger than the other two pairs which are of subequal size, they are over a half longer and are about twice the width; front coxae near to each other and enclosed by a large unit of articulating membrane at the base which is basally and medianly densely furnished with fine, brown hairs; coxa with fine hairs on each side; trochanter with three, strongly sclerotized, triangular processes anteriorly at inner margin, in front of each a strong, pointed seta of subequal length, below the processes two longer, finer setae, medianly more to the outer margin three to four fine, pointed setae; femur with three strongly sclerotized processes on inner basal edge and setae along the inner and outer margin, the inner ones shorter and stronger, on ventral surface four to five isolated setae; dorsal surface furnished with hairs, tibiotarsus with about twelve strong setae along inner margin and a vertical row of four setae placed at a third of the width of tibiotarsus subparallel to outer margin; claw slightly longer than tibiotarsus, the basal part whitish, weakly sclerotized, on ventral surface one seta medianly, along inner margin four setae; claw falcate, strongly developed, on dorsal convexity a few setae. Mid and hind legs very similar, base of coxae free (not enclosed by articulating membrane) and separated by about the width of coxa; the latter extremely elongate, about twice as long as wide, with long fine hairs and flattened disc exteriorly, the margins of which are set with strong setae; distribution of setae on ventral surface of other segments similar to fore leg but setae stouter.

Abdomen (Pl. I b, c, Pl. IIa)

First eight terga transverse, bare apart from a paramedian and a more laterally placed bristle near posterior margin on each side; spiracles ovate, twice as wide as long in an oblique angle to longitudinal axis of body. First abdominal sternite with a semi-circular stripe of fine brown hairs anteriorly; second to seventh sternite with one seta in each corner, the eighth one (apart from this) with additional two setae at posterior margin and a few more in the posterior corner. The notum of eighth abdominal segment shows a distinct pattern, which occurs on the other segments correspondingly but is not so clearly visible; on the eighth tergite it appears more marked because the cuticle is darker, orange to brown; the pattern consists of one narrow-ovate, transverse patch anteriorly on each

side of median suture and a transverse row running obliquely downward comprising about six other patches, light in centre and surrounded by a darker contour. The area below the pattern up to the posterior margin is a darker tint, and so makes the equal distribution of small, light punctures more distinct. Ninth abdominal segment rounded, broadest at basal third, slightly wider than long, rather strongly narrowing towards apex; in lateral view disc convex at base thence slanting towards apex, which is terminated by a sharply raised rim, the latter continues further on disc laterally, towards base gradually flattening thus creating a somewhat hollowed appearance of ninth tergite; the reflected edge only limits the exterior margin of apex, on disc it runs subparallel to lateral margin and is armed apically with six strong, short dark spines¹⁾ one pair on each side of apex, the last spine separated from it by some distance and a very fine, long pointed seta medianly; a similar seta at the point where the ridge becomes more flattened; at base very fine short setae which go down laterally; a few long setae laterally below the ridge and ventrally; the cuticle of the encircled area is very rugose; ninth tergite strongly enlarged and sclerotized ventrally, occupying over two-thirds of the volume of ninth segment (lateral view) and as the ninth sternite can be retracted completely, the more strongly sclerotized tergite can close the abdomen almost perfectly and thus protect the softer parts; ninth sternite reduced, basal part densely furnished with brown setae; the pygopodia are small, coniform, the whole surface set with pointed setae.

The two species from the Southern Kalahari are easy to separate in all stages except perhaps the first two of which I had no specimens of *Gonopus agrestis* but even just moulted larvae which have not yet developed the final colouring can be distinguished by the different arrangements of tibiotarsal setae.²⁾

Larva stouter (compare Pl. Ia and measurements). Outer dorso-lateral surface of tibiotarsus bare apart from a single seta shortly in front of middle. Tint on head, eighth and ninth terga orange to light-brown. Head showing a distinct orange pattern on yellow ground (Pl. IIIa), lateral parts yellow; rarely the pattern is not recognizable because of a similar tinted background. Pronotal tergum yellow without marking (Pl. Ia). Brown patch on eighth abdominal tergum square, side margins straight. Latero-apical surface of ninth abdominal tergum yellowish, unicoloured (Pl. Ic). *Gonopus tibialis* FABRICIUS

13 larvae in different stages. 6 larvae alive. 1 pupa. 25 beetles alive. Largest larva 46 mm long, 4.5 mm broad, head-capsule 4.1 mm wide. About full-grown. Parents from Southern Kalahari (Mata-Mata), II. 1967, C. Koch.

¹⁾ The number of the apical short spines between the fine, long setae is normally four but may vary from two to six. In *G. agrestis* the normal seems to be two.

²⁾ I should like to mention that by chance originally the two species were not separated and we obtained more than 40 larvae which show all the distinct features of the two species. From 33 beetles of *G. agrestis* mixed with 27 of *G. tibialis* there are far fewer *agrestis*-like than *tibialis*-like larvae. We obtained one pupa and a second generation of beetles, all of them *Gonopus tibialis*. The two species are now kept apart, and *agrestis* again produces far fewer larvae from the same number of beetles. The description and key of course refer only to the larvae obtained after the species were separated.

Larva slenderer (compare Pl. I Ib and measurements). Outer dorso-lateral surface of tibiotarsus with a row of setae subparallel to row on dorsal ridge. Tint on head, eighth and ninth terga very intense dark reddish-brown. Head uniformly tinted, colour extending laterally. Pronotal tergum on anterior half with two large, triangular reddish-brown patches (Pl. I Ib). Colouring on eighth tergum forming a triangular marking on each side of midline extending laterally. Reddish tint on ninth abdominal tergum extending in a semicircle far down latero-apically, the two halves meeting apically (Pl. I Ic).

Gonopus agrestis FAHREUS

4 larvae of medium and about full-grown size. 3 larvae alive. 26 beetles alive. Largest larva 46 mm long, 3.8 mm broad, head-capsule 3.5 mm wide. Parents from Southern Kalahari (Mata-Mata), II. 1957, C. Koch.

The first two stages

The egg of *Gonopus tibialis* is elongate-ovate, yellowish, about 3.2 mm long and 1.5 mm wide. The first instar is white, about 4.5 mm long and 1.0 mm broad, head-capsule 0.7 mm wide. Egg-bursters are present on the posterior quarter of pronotum, medianly on meso- and metanotum and more posteriorly on the following eight segments. Clypeus with a row of four long, pointed setae on basal third; labrum with two discal setae and some along exterior margin; mandible with one seta on posterior margin (dorsal view); second segment of antenna strongly dilated; two long, pointed setae on anterior margin of frons and a few laterally; no ocelli in first and second stages, these seem to appear only in the third stage (see page 2); only one very short and fine seta on each side of the following body segments; ninth tergite rounded, broadest at base, with a few very fine, long setae on outer margin, finely wrinkled on disc; the latter slightly flattened neither ridge nor its six short spines developed.

Second-stage larva 6.5 mm long, head-capsule 0.9 mm broad, white to light-orange, already with all essential features of the older larvae.

A following paper dealing with the genus *Anomalipus* will contain a comparative study of the genera *Gonopus* LATREILLE, *Zophodes* FAHRAEUS and *Anomalipus* LATREILLE of the *Platynotini*.

REFERENCE :

- Koch, C., 1956 — Exploration Parc National de l'Upemba. — Tenebrionidae. II. Platynotini, Litoborini and Loensini. Explor. Parc nat. Upemba Miss. de Witte 40: 472 pp.

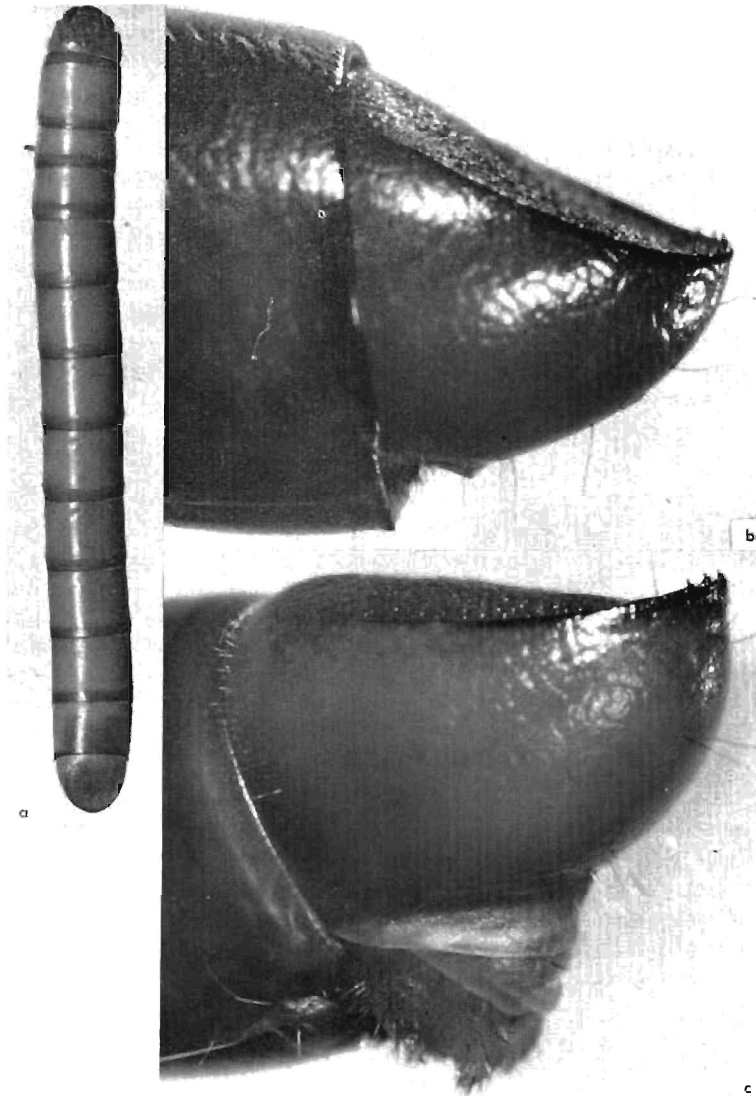


PLATE I

Gonopus tibialis.

- a) Larva in toto. X 2.7.
- b) Lateral view of part of eighth and the ninth abdominal segment, the latter strongly retracted especially ninth sternite. X 16.5.
- c) Ninth abdominal segment, lateral view, showing the reduced sternite which is not fully expanded. X 18.5.

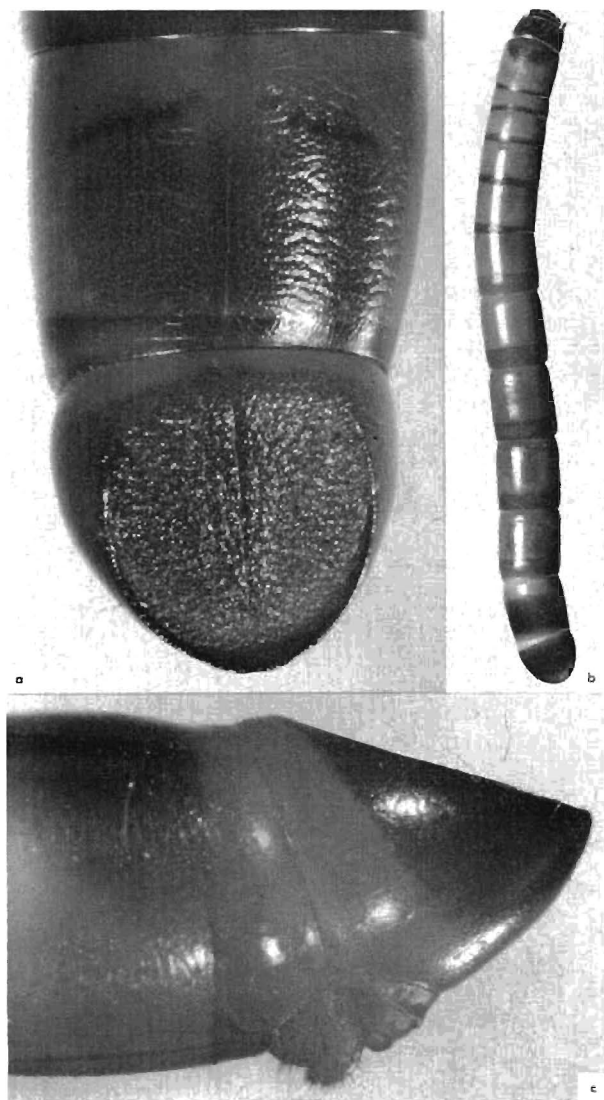


PLATE II

- a) *Gonopus tibialis*. Eighth and ninth abdominal tergites, dorsal view. x 12.7.
- b) *Gonopus agrestis*. Larva in toto showing the markings on pronotum. x 19.6.
- c) *Gonopus agrestis*. Part of eighth and the ninth abdominal segment, lateral view, showing the dark colouring extending laterally. x 11.

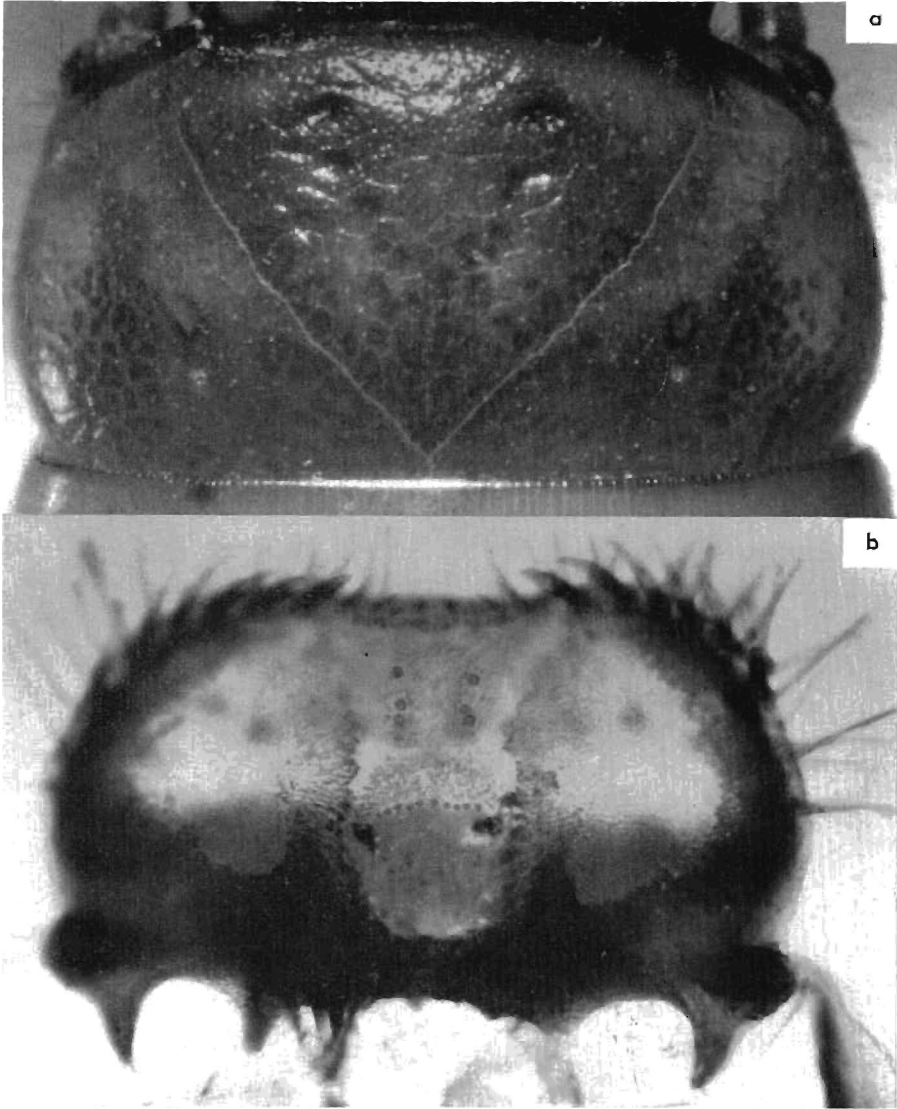


PLATE III

Gonopus tibialis.

a) Head with pattern from above. x 33.

b) Epipharynx. x 103.

Photos of the larvae in toto were taken with the Practina FX and Braun Hobby Automatic Flash, all other photos with the Reichert Fixed-Length-Camera with the Zeiss-Winkel Luminar of 25 mm focal length.