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## Description of the larva of *Anaedus camerunus* GEBIEN (Coleoptera: Tenebrionidae, Lupropini)

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### Abstract

The larva (ultimate and penultimate instar) of *Anaedus camerunus* GEBIEN is described in detail. A short discussion of the phylogenetic relationship between Lupropini and Lagriinae based on larval morphological characters is given.

Key words: Tenebrionidae, *Anaedus*, Lagriinae, Lupropini, larvae, phylogeny

The systematic placement of the tropical Tenebrionid genus *Anaedus* BLANCHARD has been changed several times since it was described in 1845. Recent coleopterologists consider the genus as a part of the tribe Lupropini placed in the subfamily Adeliinae (ARDOIN 1961) or in the subfamily Lagriinae (DOYEN et al. 1989, KWIETON 1982). Final conclusions on the systematic position of this group are probably not possible without investigation of larval characters. The purpose of this study is to give a detailed description of the larva of an African *Anaedus* species and to improve the knowledge of the groups in question.

### Material and methods

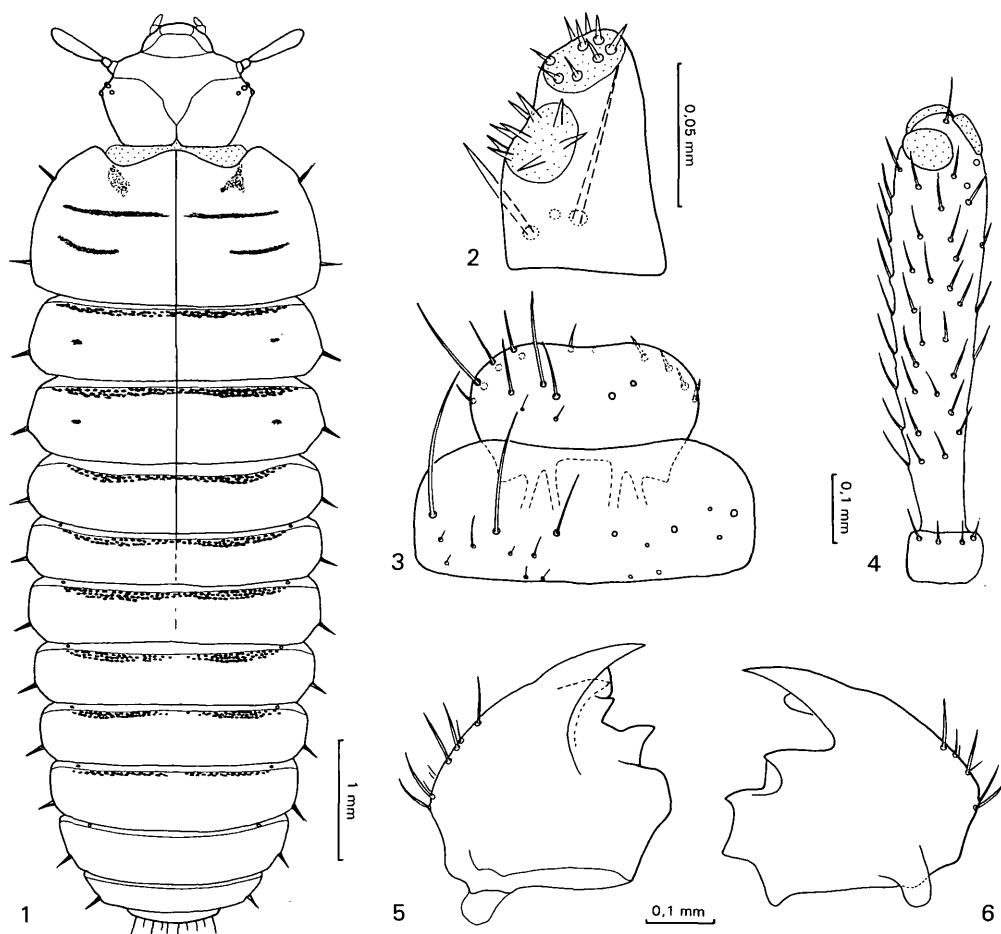
Five larvae of *Anaedus camerunus* GEBIEN (2 specimens of ultimate and 3 of penultimate instar) were collected by the author together with adults in the Réserve Naturelle Forestière de Kigwena in southern Burundi near the lake Tanganyika in February 1992. The determination of the species was verified in comparison with 3 paratypes of *Anaedus camerunus*, but the holotype was not available and all paratypes are females. There is little doubt that the larvae and adults belong to the same species because only these larvae and adults were abundant in the habitat. For comparison one larva of *Anaedus* sp. (Costa Rica, San José) and larvae of 12 further Tenebrionid tribes were studied: Lagriini, Penetini, Blaptini, Bolitophagini, Tenebrionini, Akinini, Scaurini, Crypticini, Diaperini, Opatrini, Platyscelini and Pimeliini. All larvae are deposited in the collection of the author with the exception of *Anaedus* sp. (coll. Deutsches Entomologisches Institut, Eberswalde). The material was examined after impregnation with glycerin on a microscope slide using microscopes by Carl Zeiss Jena (magnification 40 - 400x).

### Description of the larva

**General appearance:** Body flat, onisciform, strongly sclerotized (Fig. 1); all sclerites brown.

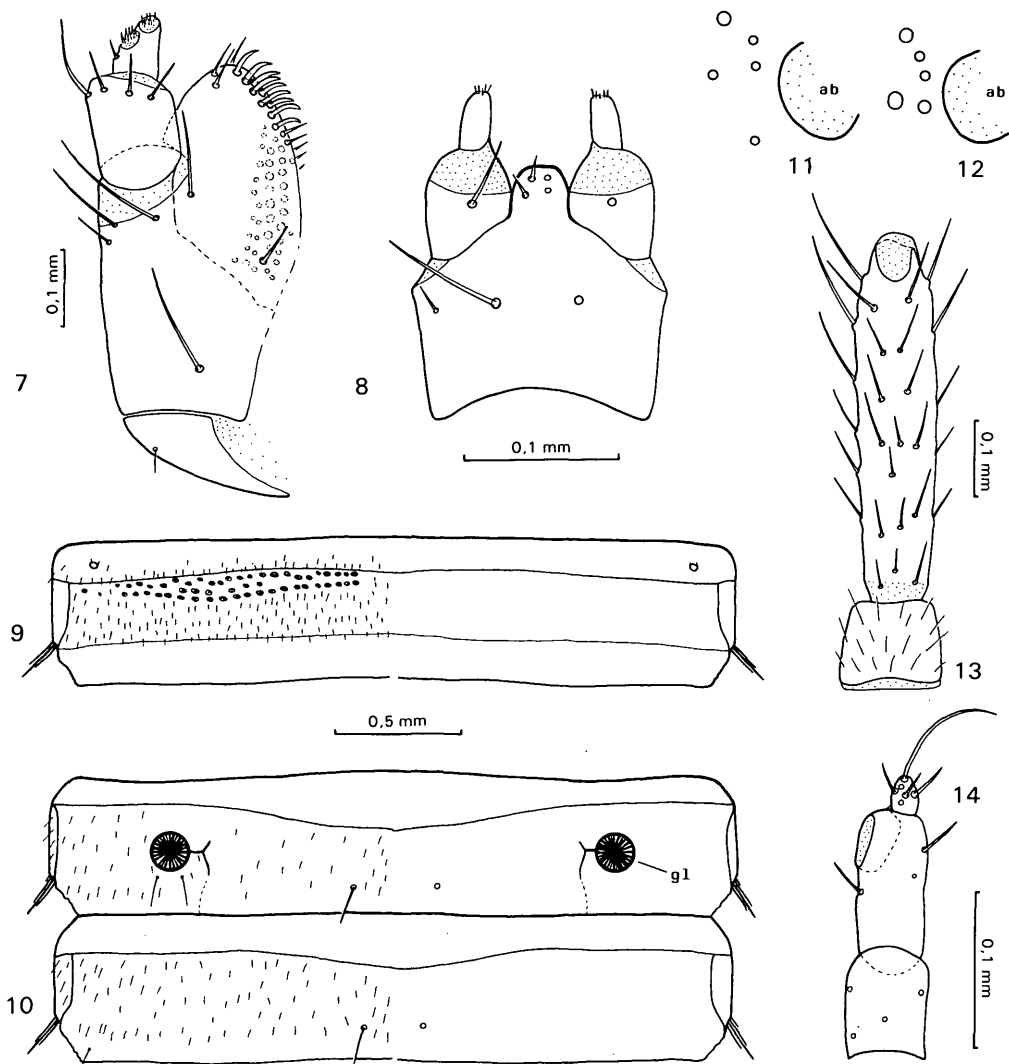
**Measurement:** Head width: 0.97 - 1.12 mm (penultimate instar), 1.23 - 1.24 mm (ultimate instar); body length: 6.0 (penultimate) - 7.2 mm (ultimate instar); body width: 2.0 (penultimate) - 2.5 mm (ultimate instar).

**Microsculpture:** Parietale with granulate microsculpture ventrally and posterodorsally; thoracic and abdominal sclerites granulate ventrally and dorsolaterally; whole surface of praescuta granulate.



Figs 1 - 6: *Anaedus camerunus*, ultimate instar; (1) habitus; (2) last segment of maxillary palpus (ventral view); (3) labrum and clypeus; (4) right antenna; (5) left mandible; (6) right mandible.

**H e a d:** Head capsule rounded laterally, neck constricted; dorsal side of head capsule multisetose, parietale with two long and numerous short setae dorsally, ventral side with long setae only anteriorly, with very short setae posteriorly; 5 stemmata present, 4 in anterior position, 1 in posterior position (Fig. 11); coronal suture long, distinct; labrum, clypeus and frons separated, frontoclypeal suture distinct; labrum rounded, anterior margin with 4 pairs of hairs on dorsal side and 4 pairs of bristles on ventral side, 2 pairs of hairs (penultimate instar) or more (ultimate instar) in the centre (Fig. 3); antenna nearly as long as head capsule, 2-segmented, basal segment short with sparse hairs apically; second segment about 8 times longer than basal, with thin hairs on entire surface and 3 lenticular sensorial areas apically (Fig. 4); wide sclerotized band present between base of antenna and base of mandible; mandibles with two cutting edges on inner side, each with at least one distinct tooth (retinaculum), mola present basally, a group of 8-15 setae present on outer margin of mandibles (Fig. 5, 6); maxilla with large mala and comparatively small 2-segmented palpus (Fig. 7), apical segment shorter than basal segment, lateroventrally with two sensorial areas (Fig. 2), mala with extended setal group dorsally and apically (Fig. 7); labial palps small, 2-segmented, ligula distinct, with two pairs of setae apically (Fig. 8); hypopharyngeal sclerome symmetrical with well developed anterior angles.



Figs 7 - 11: *Anaedes camerunus*, ultimate instar; (7) right maxilla (ventral view); (8) labium; (9) abdominal tergite IV; (10) abdominal sternites III, IV (gl - glands); (11) position of stemmata (schematic, ab = base of antenna).

Figs 12 - 13: *Lagria hirta* L., last instar; (12) position of stemmata (schematic, ab = base of antenna); (13) left antenna.

Fig. 14: *Clamoris crenata* MULSANT, last instar, left antenna. All scales in mm.

**T h o r a x:** Thoracic tergites, pleurites and sternites fused; tergites with a dark cell-like structure (cf. abdominal tergites, Fig. 8) anteriorly and numerous short and fine setae; pleurites with group of 3 long setae in one row (cf. abdominal epipleurites, Fig. 9); thoracic sternites with numerous short and fine setae; legs slender, femur nearly as long as tibiotarsus, femur and tibiotarsus multisetose, but setae on tibiotarsus longer and stronger; claw about 0.3 times as long as tibiotarsus with one pair of unequal setae.

**A b d o m e n:** Tergites (Fig. 9), pleurites and sternites (Fig. 10) fused into dorsoventrally

depressed annuli; position of pleural suture indicated only by an indistinct keel; tergites with dark, celllike structures anteriorly (Fig. 9), tergites I-VIII with numerous short and fine setae, tergite IX with short and long setae, urogomphi absent; epipleurites (fused with sternites and tergites) with a posterior row of 3 long setae (Fig. 9, 10); spiracles elliptical (segment I) or more or less rounded (segments II- VIII), smaller than thoracic spiracle; spiracle I on ventral side, spiracles II-VIII on dorsal (!) side, close to lateral margin of praeternites; abdominal segments I, II and III with large circular glands ventrally; transverse, sclerotized bars at medial margin of glands visible (Fig. 10), glands covered with a ring of ventrally directed hairs, 2 (penultimate instar) or 3 (ultimate instar) long setae present posterior to the glands; all sternites with numerous short and fine setae, centre of sternite I with several long setae, centre of sternite II without long setae, centre of sternites III-IV with one pair of long setae, apical sternites with an increasing number of long setae.

### Differences between *Anaedes camerunus* and *Anaedes* sp.

The larva of *Anaedes* sp. from Costa Rica differs from that of *Anaedes camerunus* in the following character states: (i) tergites nearly without setae, with pointed to multipointed microsculpture; (ii) sternites with less setae, but in similar arrangement; (iii) glands on abdominal segments I-III smaller. Antennae, maxillae and labium of the specimen were lacking and could not be examined.

### Ecological Data

Larvae and beetles live in leaf litter of tropical forests. Both, larva and adults were abundant and could be captured along roads during February (short dry season).

### Discussion

BÖVING & CRAIGHEAD (1931) first noticed the similarities between larvae of Lupropini and Lagriinae and included the genera *Anaedes* BLANCHARD, *Paratenetus* SPINOLA and *Luprops* HOPE in the Lagriinae. However, they gave no descriptions and very few figures, making it difficult to estimate the placement of *Paratenetus* and others with the help of larval characters. The genera *Luprops* (see HAYASHI 1964) and *Anaedes* share several apomorphic characters in the larval stage with Lagriinae (including Goniaderini; for the larval description of *Goniadiera* PERTY see COSTA & VANIN 1981): (i) two-segmented antennae with one or more extended sensory areas at the top (Fig. 4, 13; Tenebrionid larvae usually have three-segmented antennae, Fig. 14); (ii) characteristic arrangement of five stemmata. Anterior group of 4 stemmata, 1 stemma in posterior position (Fig. 11, 12; most Tenebrionidae have 6 or 0 stemmata); one of the anterior stemmata is distinctly shifted ventrally in *Anaedes* and *Luprops* compared to the other genera; (iii) strongly sclerotized and multisetose onisciform body; (iv) urogomphi reduced to little hooks or absent. In contrast to the conclusion of WATT (1974) the sclerotized epicranial bridge between the base of the mandible and the base of the antenna in the larvae of Lupropini and Lagriinae is probably plesiomorphic even though most Tenebrionid larvae lack this bridge. However, an epicranial bridge occurs in other families of Heteromera. Based on larval morphological characters Lupropini clearly belongs in Lagriinae. Common derived characters which indicate a relationship between Lupropini and Adeliini are absent in *Laena starcki* REITTER (BYZOVA 1958). However some of the non-described Adeliini larvae seem to have characters similar to those of the Lupropini (Doyen, personal communication).

DOYEN et al. (1989) mentioned the possible strong relationship between *Anaedes* and Goniaderini. Larvae of *Goniadiera* have a similar position of abdominal spiracles, glands on the

abdominal ventrites I - III and urogomphi absent, which could be common derived characters. Probably *Anaedes* has to be transferred to Goniaderini. However, it is necessary to find the larvae of other genera of Goniaderini to solve this problem. A pair of lateral swellings on abdominal segments I and III (HAYASHI 1964: 29) is autapomorphic for *Luprops* (HAYASHI 1964).

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### Zusammenfassung

Die Larve (letztes und vorletztes Stadium) von *Anaedes camerunus* GEBIEN wird detailliert beschrieben. Die phylogenetische Verwandtschaft zwischen Lupropini und Lagriinae wird unter Benutzung larvalmorphologischer Merkmale diskutiert.

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