Description of the larvae of the subgenus Cathoplius THOMSON of Carabus L., with a key to North African Carabus larvae (Coleoptera: Carabidae)

E. Arndt, D. Mossakowski & F. Prüser

Abstract

The larvae of Carabus (Cathoplius) asperatus (DEJEAN) (L_1, L_2) and Carabus (Cathoplius) stenocephalus LUCAS (L_1) are described for the first time. They show typical character states of the Neocarabus relationship, but contrary to other larvae of the Neocarabus group, setae are lacking on antennomere II. A key to the hitherto known North African Carabus larvae is included.

Key words: Carabidae, Carabus, Cathoplius, Neocarabus, larval morphology, larval key, North Africa

Introduction

Cathoplius THOMSON is a comparatively aberrant group of *Carabus* L., and includes two species which are restricted to a small area stretching along almost the whole of the Moroccan Atlantic coast. Both species are difficult to differentiate, especially in the Tensift region where they meet. They have very similar life histories: both species live in littoral steppes and dunes, and adults and larvae feed on snails. The species are representatives of the winter breeding type according to PAARMANN (1979). Larvae were collected in December (after the first rainfall) and reared in the laboratory in January.

This paper gives a description of the larvae of both species for the first time, and includes a short phylogenetic discussion.

Acknowledgements

We are very grateful to Dr. M.L. Luff (Newcastle-upon-Tyne) and M.G. Viker (Bremen) for proof-reading the manuscript. We are indebted to Prof. Dr. A. Casale (Sassari, Sardinia) for the loan of larval material from the Sturani collection. We also thank Mr. M. Marciniak (Bremen) for breeding the *Carabus stenocephalus* LUCAs larvae. The scientific stay in Morocco was supported by the Deutsche Forschungsgemeinschaft (Mo 153/10-1).

Material and methods

The description of *Cathoplius* larvae is based on the following material. *C. asperatus* (DEJEAN): $4L_1$, 1 exuvium L_1 , $1L_2$ (adults from Morocco, Atlantic coast N Safi); *C. stenocephalus*: $2L_1$ (adults from Morocco, Atlantic coast near Tifnite S Agadir). The adults were collected (December 1992) and the larvae reared ex ovo (January 1993) by the authors. Rearing method followed GOULET (1976). Terms of chaetotaxy follow BOUSQUET & GOULET (1984), and of microsculpture BOUSQUET (1985).

For comparison, larvae of several other *Carabus* species, including all larvae mentioned in the key, were studied.



Figs. 1 - 6: Carabus asperatus, L_1 , 1) nasale and adnasale; 2) mandible, left side; 3) urogomphi; 4) prothorax; 5) mesothorax; 6) tergit I.

Fig. 7: Carabus favieri, L₂, nasale and adnasale.

Fig. 8: Carabus melancholicus, L₂, nasale and adnasale.

All scales in mm. Numbers in Figs. 4 - 6 refer to the chaetotaxy sensu BOUSQUET & GOULET (1984).

Carabus (Cathoplius) asperatus (DEJEAN)

First instar

Habit and colouration: Body wide and flat with wide tergites, all sclerites strongly sclerotised, black.

Head width: 1.54 - 1.62 (aver. 1.58) mm (n = 4).

ARNDT et al.: Larvae of Carabus subg. Cathoplius (CARABIDAE)

Microsculpture: Mouth parts, parietale, frontale, legs and nota with isodiametral meshes, tergites and urogomphi with isodiametral to tranverse meshes, tergite IX and sternites with pointed to meshed microsculpture.

Head: Sides rounded, 6 stemmata present, coronal suture very short; setae $PA_{4,6}$ on dorsal side of parietale lacking, on ventral side of parietale only two distinct setae which are not clear enough to define; frontale with hind angles wide, egg bursters consisting of some strong spines on each side; frontal seta FR_1 lacking, FR_{26} shifted to inner side of FR_7 , $FR_{8,9}$ reduced, pore-like; nasale (Fig. 1) prominent, \pm rounded without any distinct tooth, hypodon on ventral side of nasale present; adnasale "S"-like curved (Fig. 1); mandible (Fig. 2) slender with slender retinaculum; antenna with four articles, antennomere II longest, antennomeres I and IV of equal length and shortest; antenna only with short ancestral setae $AN_{1.7}$, first two antennomeres without any setae, antennomere III with small sensorial appendage; stipes with extended setal group gMX, consisting of 45 - 50 setae; lacinia distinct with terminal seta, galea with two articles, galeomere II distinctly longer than galeomere I; maxillary palps with 4 articles, palpomere I shortest, palpomeres II and IV of same length and longest, palpomere I with some additional setae on dorsal side; prementum with several spines on dorsal side, labial palps with 2 articles, palpomere I with short additional setae on dorsal side, palpomere II longest and with two sensorial areas on a distinct divided apex.

Thorax: Pronotum (Fig. 4), mesonotum and metanotum (Fig. 5) with reduced chaetotaxy, setae $PR_{4,5,7,8,10,13}$ on pronotum lacking, $PR_{13,14}$ very short or pore-like; $ME_{2,10}$ on meso- and metanotum lacking, ME_{14} pore-like; on legs two slender claws present, tarsus slender with 6 - 9 additional setae on ventral side, tarsus 1.1 - 1.2 x longer than tibia.

Abdomen: Tergites (Fig. 6) wide with hind angles distinctly extended (lobi decurrentes), seta TE₈ lacking, TE_{1,11} pore-like or lacking, TE₇ shifted to the outer margin of hind angle, TE₉ shifted to the inner side of lobi decurrentes, TE_{9,10} small, on outer margin above seta TE₇ a short but strong additional seta TE_{α} (Fig. 6); sternites, hypopleurite and epipleurite each with 1 - 8 additional setae; urogomphi slender, little shorter than tergite IX wide, with two distinct horns (Fig. 3); seta on urogomphi very small, UR₉ preapical dorsally and pore-like.

Second instar

Same character states as in first instar, except for the following:

Head width: 2.18 mm (n = 1).

Head: Last antennomere shortest; articles of galea of about equal length; articles of labial palps of about equal length; maxillary palps with palpomere II longest, palpomeres III and IV of equal length.

Thorax: Tarsus with 8 - 12 additional setae.

Carabus (Cathoplius) stenocephalus LUCAS

Character states of C. stenocephalus are very similar to those of C. asperatus. In C. stenocephalus seta TE_{11} is developed distinctly on abdominal tergites IV - VIII. However, the variability of this character state has to be proved later. Other characters distinguishing both species could not be found.

Discussion

The subgenus *Cathoplius* has a changing taxonomical history. BREUNING (1932-1937) distinguished two large groups (*Carabi brevimandibularis* BREUNING, *Carabi longimandibularis* BREUNING) and placed *Cathoplius* as the last subgenus in the *Carabi brevimandibularis*. On the contrary, *Cathoplius* is a member of the *Neocarabus* BENGTSSON series in ANTOINE (1955) (corresponding with *Carabi longimandibularis* in most points and with *Carabi multistriati* DEUVE in part).

Referring to larval characters, subgenus *Cathoplius* clearly belongs to the *Neocarabus* group. *Neocarabus* is a probable monophyletic unit within the genus *Carabus*, because of several larval synapomorphies (\pm arched or pyramidal nasale, the S-like adnasale lobes and reduced adnasale setae) (for the definition of *Neocarabus* see TURIN et al. 1993). *Cathoplius* was probably separated very early from the rest of the *Neocarabus* group, because of its comparatively ancestral chaetotaxy (setae ME₁, ME₈, ME₉, TE₇, TE₁₁ present, and antennomere II without additional setae). However, a detailed phylogenetic analysis of the *Neocarabus* groups is reserved for a later study.

Key to North African Carabus larvae

(No constant character states could be found which separate the larvae of these species. The larva of C. (Hadrocarabus) rifensis PUTZEYS, endemic in the Rif mountains, Morocco, is hitherto unknown. However, most certainly it is very similar to the Eurycarabus larvae. Hadrocarabus larvae have two urogomphi horns of nearly same size and a very short and inconspicuous seta UR₂ on outer margin of tergite IX. Contrary to the Eurycarabus larvae examined here, Hadrocarabus have, beside setae FR₈ and FR₉, one or more additional setae on anterior margin of frontale.)

(Seta TE_{11} on abdominal tergites IV - VIII seems to be developed distinctly in *C. stenocephalus* contrary to *C. asperatus*. But this character is probably very variable and has to be examined on further material. *C. asperatus* is distributed in Morocco from the Tensift region northwards up to Larache, *C. stenocephalus* southwards to the mouth of Oued Draa in the Sahara.)

Antennomere II apical with at least one distinct seta; hypodon lacking; setae $ME_{1,8}$ on meso- and metanotum lacking, seta TE_8 on abdominal tergites I - VIII lacking, $FR_{8,9}$ on anterior margin of the frontale fully absent; setal group gMX consisting of two different parts, a dorsal field of setae which are distributed evenly and a simple row of setae along the lateral margin of the stipes....

ARNDT et al.: Larvae of Carabus subg. Cathoplius (CARABIDAE)

(No character state could be found, which separates these species reliably. C. rugosus has a wider, pyramidal nasale and a very small or absent lateral horn on the urogomphi. C. morbillosus has a slender, lance-like nasale and a greater horn on urogomphi. However, both characters are very variable, and a wide range of transition exists. C. morbillosus is distributed in Africa in Tunisia, Algeria and Eastern Morocco, C. rugosus in the Northern, Central and Eastern part of Morocco. The larva of C. aumonti LUCAS, a further Macrothorax species from Central Morocco is unknown, but most certainly is very similar to that of the other Macrothorax species.)

The larva and systematic position of *Carabus (Relictocarabus) meurguesianus* LEDOUX from Central Haut Atlas are unknown.

References

- ANTOINE, M. 1955: Coléoptères Carabiques du Maroc (Première partie). Mem. Soc. Sc. Nat. Phys. Maroc, Zool., N. S. 1, 177pp.
- BOUSQUET, Y. 1985: Morphologie comparée des larves de *Pterostichini* (Coleoptera: Carabidae): Descriptions et tables de détermination des espéces du nord-est de l'Amerique du nord. -Naturaliste Can. 112: 191-251.
- BOUSQUET, Y. & H. GOULET 1984: Notation of primary setae and pores on larvae of Carabidae (Coleoptera: Adephaga). - Can. J. Zool. 62: 573-588.
- BREUNING, S. 1932-1937: Monographie der Gattung Carabus. I-VII. Bestimmungstabellen der Europäischen Käfer, 104, 105 (1932), 106, 107 (1933), 108 (1934), 109 (1935), 110 (1937), 1610 pp.
- DEUVE, T. 1991: La nomenclature taxonomique du genre Carabus. Bibliothèque Entomolique 4, Science Nat., Paris, 196 pp.
- GOULET, H. 1976: A method for rearing ground beetles (Coleoptera: Carabidae). Coleopts. Bull. 30: 33-36.
- PAARMANN, W. 1979: Ideas about the evolution of the various annual reproduction rhythm in carabid beetles of the different climatic zones. Miscellaneous Papers 18: 119-132.
- RAYNAUD, P. 1975: Synopsis morphologique des larves de Carabus L. (Coléoptères Carabidae), connues a ce jour. Bull. Mens. Soc. Linn., Lyon 44: 209-224, 257-272, 297-328, 349-372.
- TURIN, H., CASALE, A., KRYZHANOVSKIJ; O.L., MAKAROV, K.V. & L.D. PENEV 1993: Checklist and Atlas of the genus *Carabus* L. in Europe (Coleoptera, Carabidae). - Universal Book Service, Leiden, 79pp.

Dr. Erik Arndt

Universität Leipzig, FB Biowissenschaften, AG Spezielle Zoologie, Talstraße 33, D - 04103 Leipzig, Germany

Prof. Dr. Dietrich MOSSAKOWSKI & Dipl.-Biol. Frank PRÜSER Universität Bremen, FB II, AG Evolutionsbiologie, P.O.Box 330440, D - 28334 Bremen, Germany

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Koleopterologische Rundschau

Jahr/Year: 1994

Band/Volume: 64_1994

Autor(en)/Author(s): Arndt E.

Artikel/Article: <u>Description of the larvae of the subgenus Catophilus</u> <u>THOMSON of Carabus L., with a key to North African Carabus larvae</u> (Carabidae). 21-25