

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

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Abstract

The larvae of *Carabus* (*Cathoplius*) *asperatus* (DEJEAN) (L₁, L₂) and *Carabus* (*Cathoplius*) *stenocephalus* LUCAS (L₁) 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.

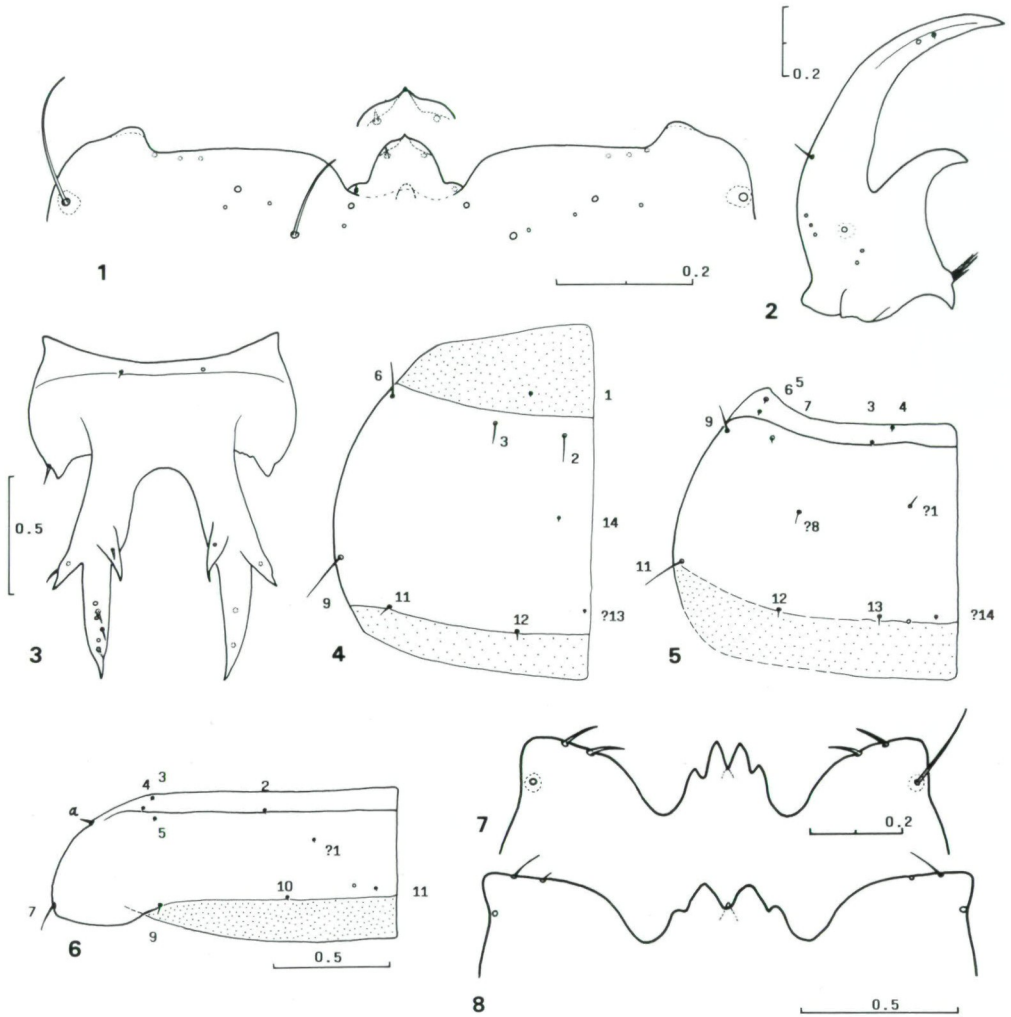
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Material and methods

The description of *Cathoplius* larvae is based on the following material. *C. asperatus* (DEJEAN): 4L₁, 1 exuvium L₁, 1L₂ (adults from Morocco, Atlantic coast N Safi); *C. stenocephalus*: 2L₁ (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*, L₁, 1) nasale and adnasale; 2) mandible, left side; 3) urogomphi; 4) prothorax; 5) mesothorax; 6) tergite 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 (Cathopi) 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).

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 FR₁ lacking, FR_{7,6} shifted to inner side of FR₇, FR_{8,9} reduced, pore-like; nasale (Fig. 1) prominent, ± 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 AN₁₋₇, 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, ME₁₄ 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 TE₁₁ 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* BENGTSOON 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

- 1 Nasale consisting of 4 distinct teeth (Figs. 7, 8).....2
- Nasale not consisting of distinct teeth, rather arched or pyramidal (Fig. 1).....3
- 2 Anterior margin of frontale from adnasal angles to the base of nasale slightly sloping (Fig. 8); hypodon visible between median teeth of nasale; urogomphi slender with two big horns of similar size *C. (Rhabdotocarabus) melancholicus* FABRICIUS
- Anterior margin of frontale from adnasal angles to the base of nasale strongly sloping (Fig. 7); hypodon not visible from dorsal side; urogomphi stout, with a big dorsal horn and a distinct smaller or absent lateral horn *C. (Eurycarabus) famini* DEJEAN
..... *C. (Eurycarabus) favieri* FAIRMAIRE

(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.)

- 3 Antennomere II without distinct setae; hypodon (on ventral side of nasale region) distinct (Fig. 1); setae ME_{1,8} on meso- and metanotum distinct (Fig. 5); seta TE₇ on abdominal tergites I - VIII distinct (Fig. 6); setae FR_{8,9} on anterior margin of frontale pore-like, but these two pores visible; setal group gMX consisting of about 50 setae which are distributed evenly on inner side of the stipes *C. (Cathoplius) asperatus* (DEJEAN)
..... *C. (Cathoplius) stenocephalus* LUCAS

(Seta TE₁₁ 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 TE₈ 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....
..... *C. (Macrothorax) rugosus* FABRICIUS
..... *C. (Macrothorax) morbillosus* FABRICIUS

(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.

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