

The larvae of *Amara aenea* (De Geer, 1774)  
and *Amara familiaris* (Duftschmid, 1812)  
(Coleoptera, Carabidae)

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**Summary**

In this paper the three larval instars of *Amara aenea* (DE GEER, 1774) and *Amara familiaris* (DUFTSCHMID, 1812) are described. These species have many morphological characters in common, but can be best distinguished by morphological and biometric details in the mouthparts and head capsule. Different instars can easily be distinguished by means of their head capsule width. Moreover, they show a number of differences in the chaetotaxy of the tergites and mouthparts, particularly between instar I and instars II and III. The occurrence of larvae of both species in the field is restricted to the summer in our region, which implies that both species reproduce during spring-early summer.

**Introduction**

Imagines of *Amara* species are rather difficult to identify. The identification of larvae presents even greater difficulties: of the 50 or so Central European species the larvae of only some 20 have been 'described'. LARSSON (1941, 1968) and SHAROVA (1958) presented keys to the identification of some 20 species, but, in their work, detailed descriptions are lacking or often short and inaccurate. BILY (1975) gave detailed descriptions of most larvae of the genus *Amara* belonging to the subgenus *Celia*. In our region, most *Amara* species however belong to the subgenus *Amara sensu stricto*. Only few species of this subgenus were already described in detail (BILY, 1972; BURAKOWSKI, 1967; DESENDER *et al.*, 1986). As a result the larvae of these beetles have mostly been neglected in field studies on the population biology of *Amara* species.

*Amara aenea* and *Amara familiaris* are two of the commonest *Amara*-species in Belgium. They are known to occur in different habitats, especially short-grazed grasslands and cultivated fields. Nevertheless they occur in a number of other habitat types as well and are more or less eurytopic.

This paper describes the different larval instars of both species. The larva of *Amara familiaris* was already described by SCHIÖDTE (1867). Unfortunately his extremely short

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description is of little or no use, since no drawings were added and especially since the characters he mentioned are of little or no distinctive value. Relatively recently this species was included in keys for larval carabids (LARSSON, 1941, 1968; SHAROVA, 1958). The situation for *Amara aenea* is possibly even worse. LARSSON (1941, 1968) and SHAROVA (1958) also mentioned the larva in their keys but not a single figure was added to their short descriptions. RAYNAUD (1976) described the larva of *Amara aenea* (based on one third instar only). This description is also not very useful. The single specimen studied was collected, not reared, and the figures are inaccurate. Accurate measurements of head capsule width of the different instars of both species do not exist. As far as we know, not a single author has given any details on instar identification.

Detailed larval descriptions of the three instars of these species are provided here together with data on head capsule width and on the occurrence of larvae in the field in order to obtain a more complete picture of the life cycle and main reproductive period. This paper is the second contribution in a larger study on the larvae of all *Amara* s. s. species occurring in Belgium. Larvae of *Amara curta* DEJEAN, 1828 and *Amara tibialis* (PAYKULL, 1798) are described elsewhere (DESENDER *et al.*, 1986). In the near future we plan to publish descriptions on other species together with a key for the identification of the different instars of the commonest Belgian species. Recognition of *Amara* larvae belonging to the subgenus *Amara* s. s. is summarized elsewhere (DESENDER *et al.*, 1986).

#### Material and methods

Larvae used for initial study were obtained from laboratory cultures. More details on our breeding technique are given by DESENDER *et al.* (1986). Our breeding of *Amara familiaris* however was not very successful and therefore we also used larvae of this species obtained from field samples in a dune habitat, where continuous pitfall trapping had shown that only adults of this species of *Amara* were present. In order to make detailed drawings of the larval morphology microscopic slides were prepared of several larvae cleared in clove oil. Numerous individuals of each instar in the two species were studied and the morphological characters checked for individual variation. Larvae from field samples were stored in 10% formalin solution. All larvae were measured (head capsule width) with a stereomicroscope WILD M5 with a calibrated ocular. Additional specimens of larvae, requested from foreign specialists, were not available. Data on the phenology of larvae in the field were gathered by means of pitfall trap year-cycles over several years at several sites.

#### Results

The following descriptions are based on the examination of all instars. Morphological differences observed between consecutive instars are noted in the descriptions.

1. *Amara aenea* (Plate I, II and III). Body form rather stout; broadest across the pronotum; head and pronotum yellow brown, darker than rest of body; overall shiny, only with weak microsculpture in central areas of pronotal tergites (especially visible in instar III). Head (figs 2) quadrate, with distinct cervical grooves, also on dorsal side. Ocelli present. Egg bursters (instar I) consisting of a linear ridge composed of very small blunt teeth.

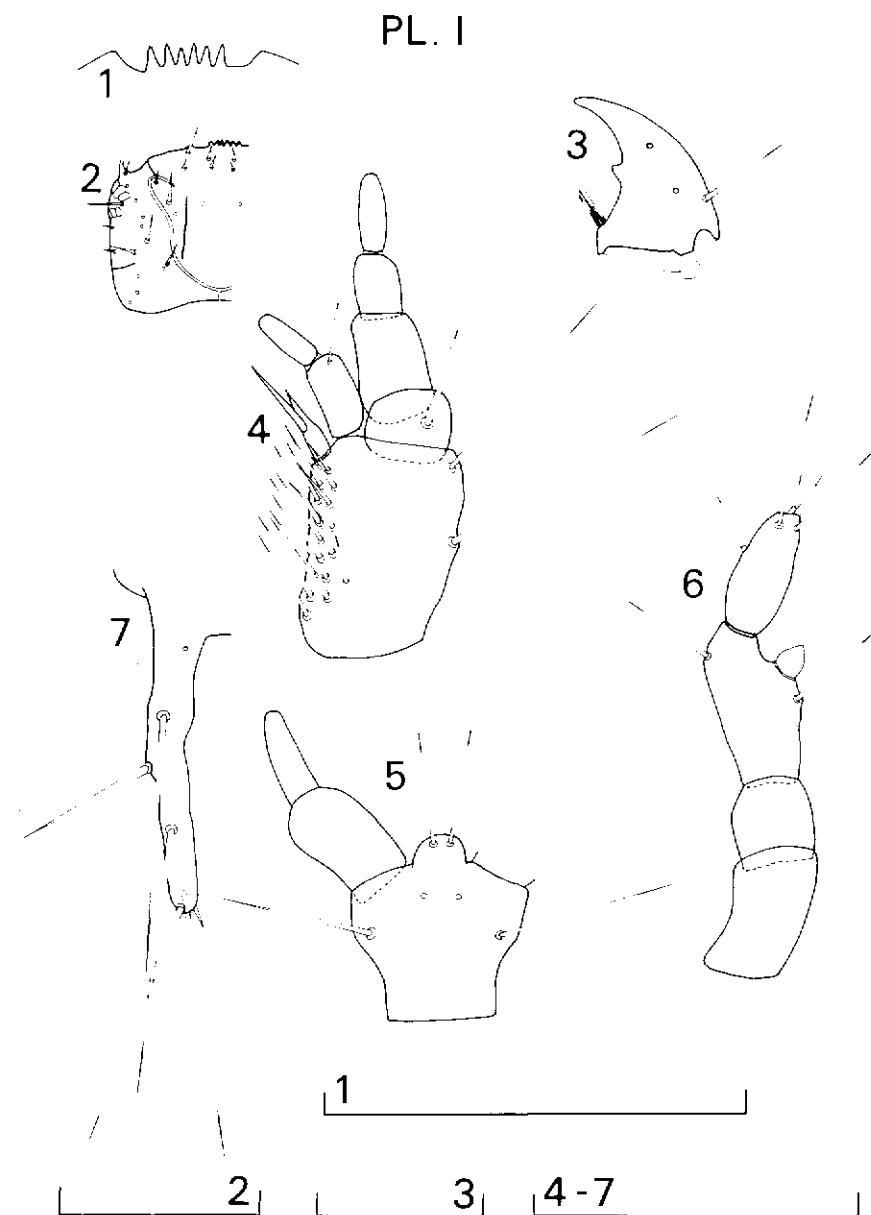


Plate I. Instar I, *Amara aenea* larva. Fig. 1: nasale; fig. 2: head capsule; fig. 3: mandible; fig. 4: maxilla; fig. 5: labium; fig. 6: antenna; fig. 7: urogomphus. All dorsal views. Scale represents 0.5 mm, except in Plate I where it represents 0.2 mm for figs 3-7.

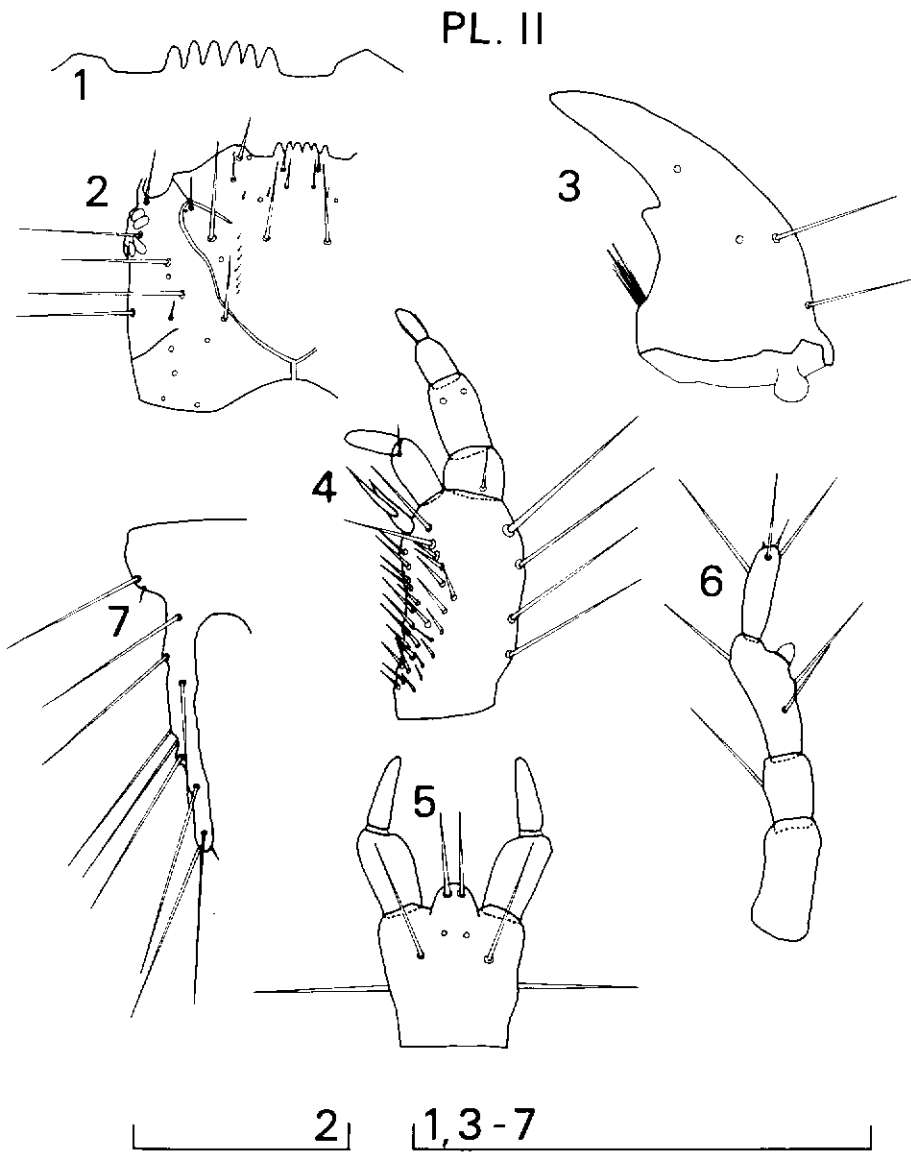


Plate II. Instar II, *Amara aenea* larva. See legend Plate I for further explanation.

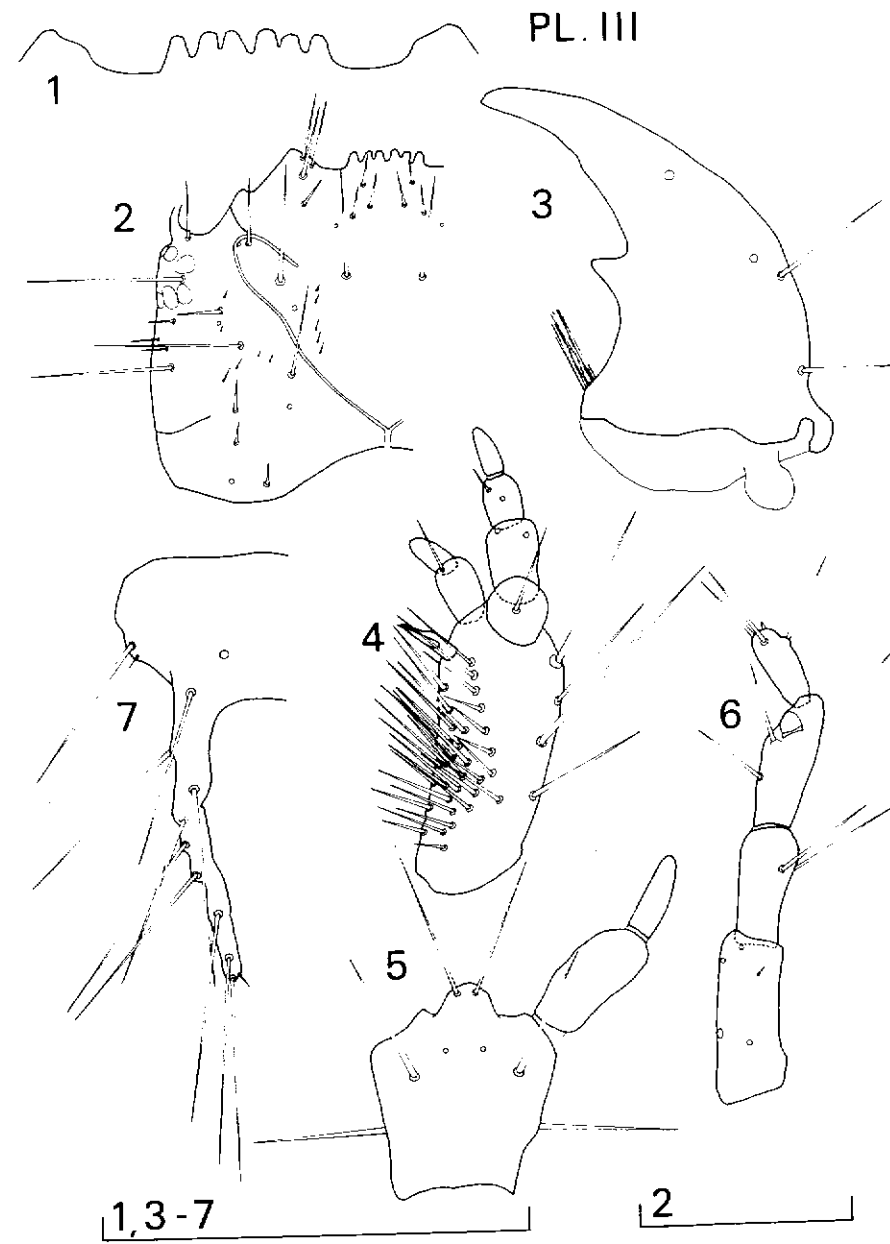


Plate III. Instar III, *Amara aenea* larva. See legend Plate I for further explanation.

Epicranial suture distinct but much shorter (about 50%) than width of first antennal segment. Nasale (figs 1) with 6 teeth: the two central teeth in instar II and III separated from each other by a small incision of less than one tooth width. Mandibles (figs 3) short and broad, less than 2 x as long as basal width, bearing one (instar I) or two (instar II and III) lateral setae in basal half; retinaculum slightly nearer to base than to apex of mandible, its apex with a more or less sharp point; distinct and multi-setose penicillus present, nearly reaching retinaculum. Maxillae (figs 4) much shorter than head, but about as long as mandibles; stipes more or less parallel-sided, less than 2 x (instar I), about 2 x (instar II) and more than 2 x as long as broad (instar III), with long setae: two (instar I) or four (instar II and III) on the latero-dorsal side, ca 16 (instar I), 29 (instar II) and 34 (instar III) on the inner dorsal side. Lacinia, with lateral seta, present, nearly as long as basal segment of galea; basal segment of palp much shorter than wide. Antennae (figs 6) somewhat shorter than head: their second segment without (instar I), with one (instar II) or two setae (instar III). Labium (figs 5) with subquadrate mentum, somewhat constricted basally, especially in instar I; dorsal surface with two setae, laterally two more setae in instar II and III; ligula blunt with two dorsal setae. Legs stout; tarsi slender, bearing apically two equal-sized claws and a pair of small dorsal setae above these claws. Abdominal tergites with setae arranged in an anterior and posterior row. Data on the chaetotaxy of the abdominal tergites are summarized in Table 1. Sternites not distinct. Cerci (figs 7) fused to ninth tergite, much shorter than head width and with 5 (instar I), respectively 9 large setae (instar II and III). Anal tube quadrate, somewhat longer than half the length of the cerci.

head widths:

instar	I		II		III	
	a	p	a	p	a	p
tergites I-VI	3	2	3(2)	3(1)	3(2)	3(1)
tergites VII-VIII	3	2	3(2)	2	3(2)	2

Table 1. Chaetotaxy on the tergites of *Amara aenea*. (a: anterior row, p: posterior row; number of large setae, number of smaller setae between brackets).

a) laboratory cultured:

instar I: n = 63,  $\bar{x} \pm 95\%$  c.l. = 0.537 mm  $\pm$  0.004 (min. = 0.503 mm, max. = 0.551 mm); instar II: n = 6,  $\bar{x} \pm 95\%$  c.l. = 0.765 mm  $\pm$  0.033 (min. = 0.707 mm, max. = 0.790 mm); instar III: n = 4,  $\bar{x} \pm 95\%$  c.l. = 1.090 mm  $\pm$  0.101 (min. = 1.006 mm, max. = 1.150 mm)

b) field collected (pasture, Belgium):

instar I: n = 12,  $\bar{x} \pm 95\%$  c.l. = 0.529 mm  $\pm$  0.011 (min. = 0.490 mm, max. = 0.549 mm); instar II: n = 16,  $\bar{x} \pm 95\%$  c.l. = 0.775 mm  $\pm$  0.011 (min. = 0.735 mm, max. = 0.804 mm); instar III: n = 7,  $\bar{x} \pm 95\%$  c.l. = 1.118 mm  $\pm$  0.039 (min. = 1.039 mm, max. = 1.177 mm)

months of occurrence with number of records (pasture, Belgium):

instar I: June (1), July (8)

instar II: July (12), September (1)

instar III: August (5), September (1)

2. *Amara familiaris* (Plate IV, V and VI).

Body form rather stout; broadest across the pronotum; head and pronotum yellow pale-brown; rest of body nearly unpigmented; overall shiny, only with weak microsculpture in central areas of pronotal tergites (especially visible in instar III). Head (figs 2) quadrate, with distinct cervical grooves, also on dorsal side. Ocelli present. Egg bursters (instar I) consisting of a linear ridge composed of very small blunt teeth. Epicranial suture distinct and nearly as long as width of first antennal segment. Nasale (figs 1) with 6 teeth: the two central teeth in instar II and III separated from each other by a small incision of less than one tooth width. Mandibles (figs 3) short and broad, less than 2 x as long as basal width, bearing one (instar I) or two (instar II and III) lateral setae in basal half; retinaculum slightly nearer to base than to apex of mandible, its apex with a more or less sharp point; distinct extra tooth at the inner top of the mandible; distinct and multi-setose penicillus present, nearly reaching retinaculum. Maxillae (figs 4) much shorter than head, but about as long as mandibles; stipes more or less parallel-sided, less than 2 x (instar I), about 2 x (instar II) and more than 2 x as long as broad (instar III), with long setae: two (instar I) or four (instar II and III) on the latero-dorsal side, ca 13 (instar I), 24 (instar II) and 26 (instar III) on the inner dorsal side. Lacinia, with lateral seta, present, nearly as long as basal segment of galea; basal segment of palp much shorter than wide. Antennae (figs 6) somewhat shorter than head: their second segment without (instar I), with one (instar II) or two setae (instar III). Labium (figs 5) with subquadrate mentum, somewhat constricted basally, especially in instar I: dorsal surface with two setae, laterally two more setae in instar II and III; ligula blunt with two dorsal setae. Legs stout; tarsi slender, bearing apically two equal-sized claws and a pair of small dorsal setae above these claws. Abdominal tergites with setae arranged in an anterior and posterior row. Data on the chaetotaxy of the abdominal tergites are summarized in Table 2. Sternites not distinct. Cerci (figs 7) fused to ninth tergite, much shorter than head width and with 5 (instar I), respectively 9 large setae (instar II and III). Anal tube quadrate, somewhat longer than half the length of the cerci.

head widths:

instar	I		II		III	
	a	p	a	p	a	p
tergites I-VI	3	2	3(0-2)	2(0-1)	3(0-2)	2(1)
tergites VII-VIII	3	2	3	2	3	2

Table 2. Chaetotaxy on the tergites of *Amara familiaris*. (a: anterior row, p: posterior row; number of large setae, number of smaller setae between brackets).

a) *field collected* (coastal dunes, De Haan, Belgium):

*instar I*:  $n = 8$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.576 \text{ mm} \pm 0.012$  (min. =  $0.549 \text{ mm}$ , max. =  $0.588 \text{ mm}$ ); *instar II*:  $n = 11$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.744 \text{ mm} \pm 0.021$  (min. =  $0.686 \text{ mm}$ , max. =  $0.784 \text{ mm}$ ); *instar III*:  $n = 35$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.964 \text{ mm} \pm 0.012$  (min. =  $0.902 \text{ mm}$ , max. =  $1.039 \text{ mm}$ )

b) *field collected* (coastal dunes, Nieuwpoort, Belgium):

*instar I*:  $n = 75$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.569 \text{ mm} \pm 0.004$  (min. =  $0.529 \text{ mm}$ , max. =  $0.608 \text{ mm}$ ); *instar II*:  $n = 80$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.747 \text{ mm} \pm 0.006$  (min. =  $0.686 \text{ mm}$ , max. =  $0.843 \text{ mm}$ ); *instar III*:  $n = 132$ ,  $\bar{x} \pm 95\%$  c.l. =  $0.983 \text{ mm} \pm 0.005$  (min. =  $0.922 \text{ mm}$ , max. =  $1.069 \text{ mm}$ )

months of occurrence with number of records (coastal dunes, Belgium):

*instar I*: June (65), July (21)

*instar II*: June (67), July (25)

*instar III*: June (57), July (100), August (13), September (2)

#### Discussion

The descriptions of the larvae of *Amara aenea* and *Amara familiaris* enable the identification of larvae caught in the field. Detailed study of the mouthparts already should allow easy recognition of the two species. The extra tooth of the inner top of the mandible in *Amara familiaris* is the most distinctive character. When comparing these two species with other species of the same subgenus (DESENDER *et al.*, 1986 and in prep.), striking differences are their relatively longer mouthparts (as compared to the head capsule), much more slender urogomphi in *Amara aenea* and *Amara familiaris* as compared to *Amara curta* and *Amara tibialis*, the distinct extra tooth at the inner mandible top in *Amara familiaris* and a rather short epicranial suture in *Amara aenea* as compared to *Amara familiaris*. Numbers of setae, whenever mentioned, mostly refer to the larger, easily observed setae. More details concerning primary setae and pores on larvae of Carabidae are given by BOUSQUET & GOULET (1984). When comparing their figures (*instar I* only) with those obtained for these *Amara* larvae, in most cases a similar number of large setae is observed. Only in *Amara familiaris* is the number of large setae in the posterior row of the tergites I-VI reduced.

Recognition of the different instars is easy when using head width but is also possible by means of the chaetotaxy (especially the presence/absence and the number of setae on the second antennal segment) and the presence or absence of egg bursters (*instar I*). Although derived from relatively few observations, the larvae obtained from the laboratory cultures seem on average a little smaller (*instar II* and *III*) as compared with field collected larvae. Conditions in laboratory breeding experiments probably are often suboptimal and may result in smaller larvae. These data however show only minor differences as compared to field collected larvae.

Finally, results on the seasonal occurrence of larvae of *Amara aenea* and *Amara familiaris* show that reproduction must be restricted to spring and summer. Hibernation thus takes place only in the adult stage, at least in Belgium.

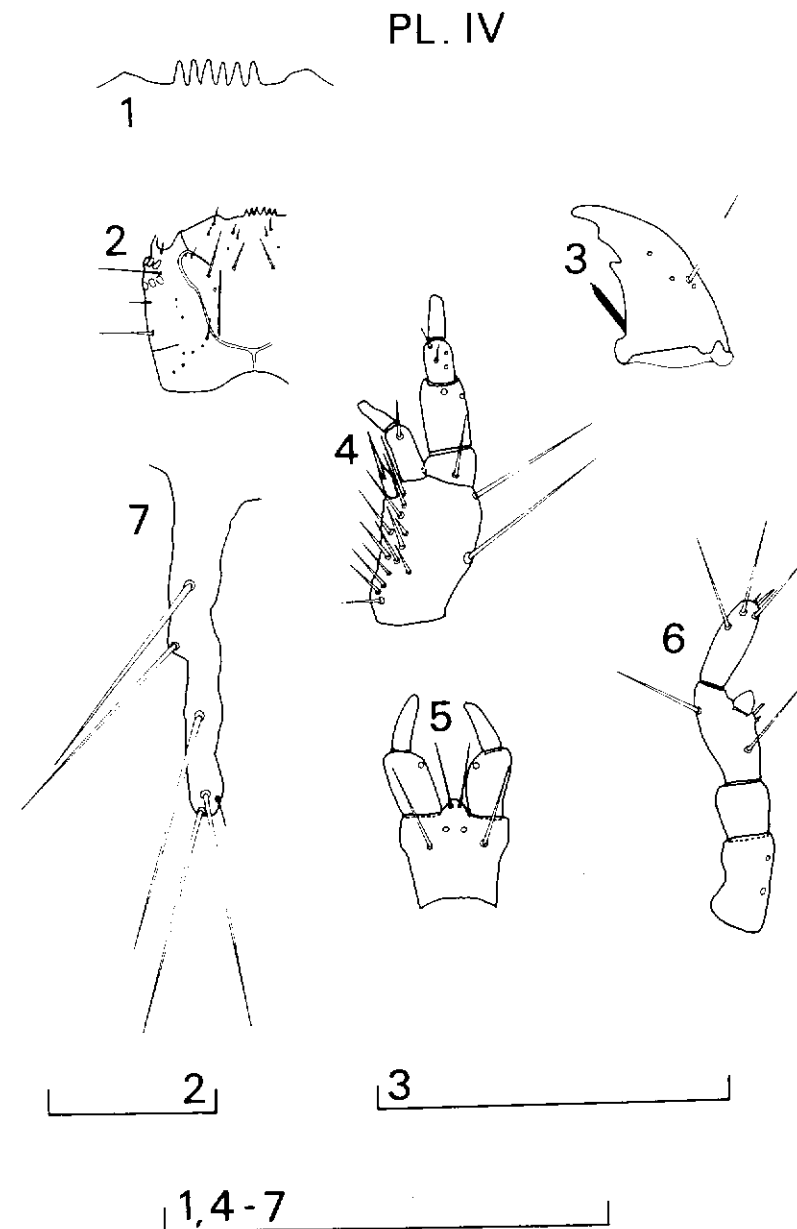


Plate IV. *Instar I*, *Amara familiaris* larva. See legend Plate I for further explanation.

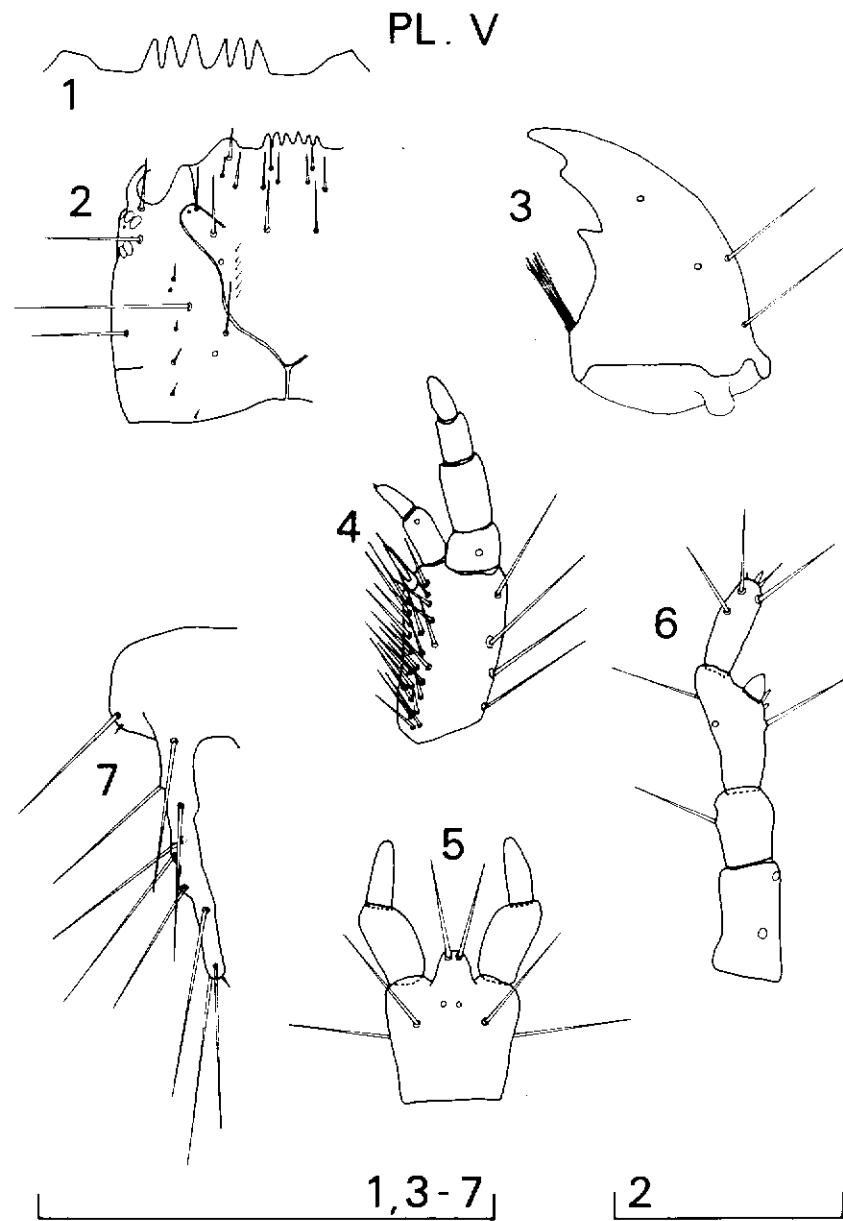


Plate V. Instar II, *Amara familiaris* larva. See legend Plate I for further explanation.

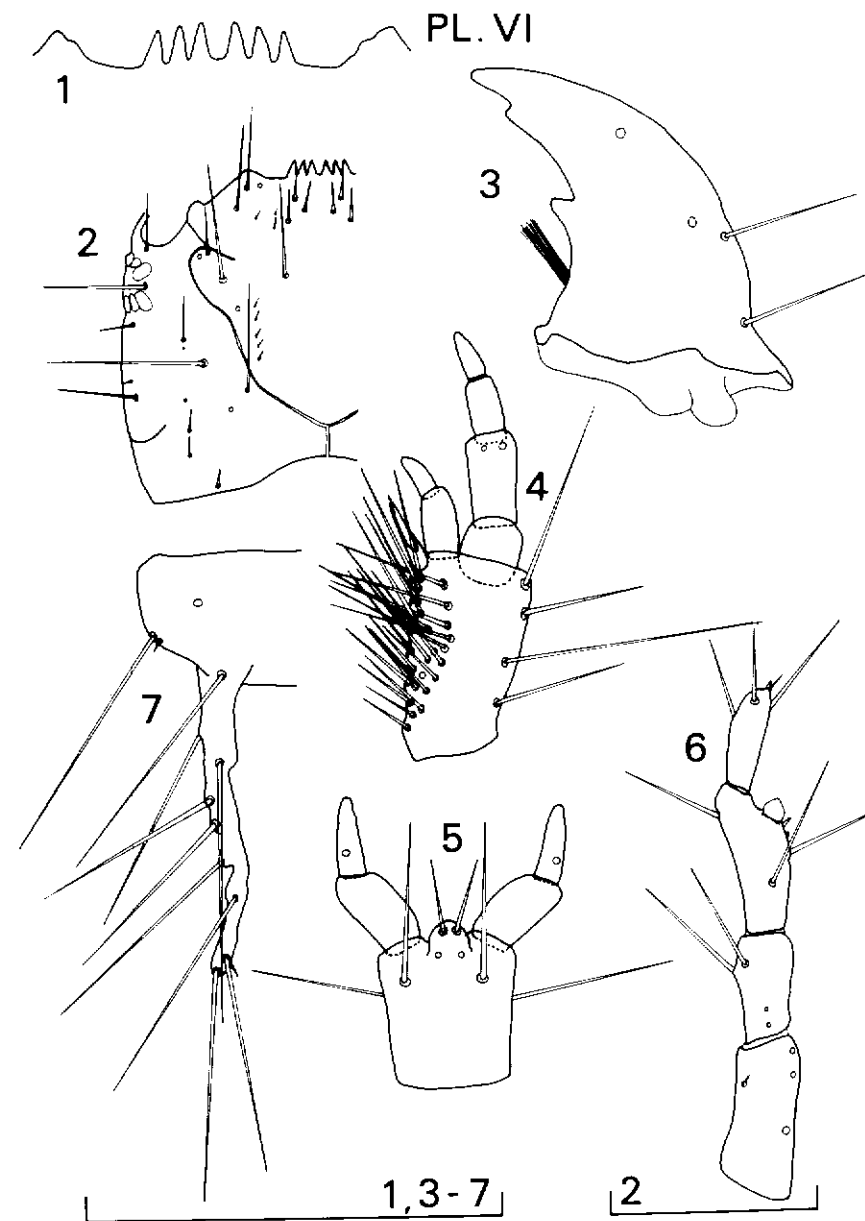


Plate VI. Instar III, *Amara familiaris* larva. See legend Plate I for further explanation.

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Description d'une nouvelle espèce de  
**Quedius** Stephens, 1832 de Belgique  
(Coleoptera, Staphylinidae, Staphylininae)

par H. BRUGE<sup>1</sup> et D. DRUGMAND<sup>2</sup>

Résumé

Description de *Quedius (Microsaurus) brieni* sp. n., mâle (Belgique).

Abstract

Description of a new species of *Quedius* (STEPH.) from Belgium: *Quedius (Microsaurus) brieni* sp. n.

L'étude des *Quedius* capturés à Vierves-sur-Viroin dans le cadre des travaux du Centre Paul BRIEN (Université libre de Bruxelles) de Treignes, nous a permis d'isoler une espèce nouvelle pour la science.

La révision des *Quedius* appartenant au groupe d'*ochripennis* et de *puncticollis* conservés à l'Institut royal des Sciences naturelles de Belgique nous a amenés à découvrir d'autres exemplaires de cette nouvelle espèce.

La distance entre les différentes localités de capture de ces insectes (Vierves-sur-Viroin, province de Namur (U.T.M. code FR 14) et Francorchamps (province de Liège (U.T.M. code GR 09)) nous permet d'augurer une assez large distribution de cette espèce en Belgique.

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