



Pre-imaginal stages of *Cychrus schmidt* Chaudoir, 1837, and *Cychrus semigranosus* Palliardi, 1825, with a key to the larvae of the European *Cychrus* species (Coleoptera: Carabidae)

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Abstract

Among the several European and Asiatic species belonging to the genus *Cychrus* Fabricius, the pre-imaginal morphology is known just for a few of them. In the present work the larval morphology of *Cychrus schmidt* and *C. semigranosus* is described. The morphology of the first species is unique due to its chaetotaxy, which is completely different from that of all of the other *Cychrus* larvae described so far. The latter are characterized by completely glabrous thoracic and abdominal tergites. In *C. schmidt*, the tergites are covered by several long setae, a feature never recorded in other Carabidae Carabinae species. Basing on actual knowledge, a preliminary identification key of the European larvae of the *Cychrus* genus is provided. In the present contribution, the pupa of *C. schmidt* is also described; this is the first pupa of a species belonging to the *Cychrus* genus to be depicted. Moreover, new data on the biology of *C. schmidt* were collected from a laboratory breeding programme.

Key words: Biological notes, Ground beetles, Larval morphology, Pupa

Introduction

The monophyletic tribe Cychrini, within the subfamily Carabinae (Coleoptera, Carabidae), is a very homogeneous group widely spread throughout Eurasia and North America (Deuve 1997; Cavazzuti 2010). In Europe, this tribe only includes the genus *Cychrus* Fabricius, 1794.

Cychrus schmidt Chaudoir, 1837 is an oriental-alpin element, endemic to the Julian and Karawanke Alps, Carnia, Styria, Carinthia and Carniola, close to *C. hampei* Gestro, 1874, the vicariant species in the Dinaric-Balkan chain. *Cychrus schmidt* is an orophylic species, a typical inhabitant of alpine pastures between 1700 and 2700 m a.s.l., sub-lapidicolous in grasslands, close to snowfields and streams, along moraines and debris. Throughout its range of distribution, this species is associated with the gastropod Helicidae *Arianta chamaeleon chamaeleon* (L. Pfeiffer, 1868) (Müller 1926; Casale *et al.* 1982; personal observation of the author on the Mangart Mountain) on which it feeds. Nevertheless, under controlled breeding conditions it can adapt itself well to other Gastropoda.

Cychrus semigranosus Palliardi, 1825, is a species with a wide geographical distribution, ranging from the region of Podolia (south-western Ukraine) throughout Transylvania, Banat, Croatia, Bosnia and Herzegovina, Montenegro, Serbia and Macedonia to central and southern Albania (Logara), as far south as northern Greece (Zygos in Pindus Mts. and Olympus Mt.) and eastwards into the more eastern part of the High Balkan (Krstec, east of Šipka). It is a woodland element spread throughout both humid and xeric forests, from lowland areas up to around 2000 m a.s.l. In the northern part of its range this species also occurs at lower altitudes; in the south, it is a mountain species, inhabiting subalpine and alpine zones of higher Balkan mountains; thus, in the southern part of its range, this species is more or less isolated in individual mountain groups and tends to form local races (Mařan 1940). The larvae of *C. semigranosus* here examined and described belong to the ssp. *pindicus* Mařan, 1940 (= *graecus* Breuning, 1967) (in the sense of Mandl 1989 and Cavazzuti 2010, treated as valid, not unavailable name as in Lorenz 2005).

In the present work, the larval stages of *C. schmidt* and *C. semigranosus* are described and complete the scarce information available on the young stages of species of the *Cychrus* genus. The peculiar features of the larva of *C. schmidt* are stressed: its chaetotaxy differs substantially from that of all of the other larvae of the genus *Cychrus* described so far, in which the thoracic and abdominal tergites are completely glabrous. In contrast, in this species the tergites have a very hairy appearance and are provided with a series of long setae.