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Description of larvae of two closely related species *Cassida palaestina* Reiche, 1858 and *Cassida rubiginosa* Müller, 1776 (Coleoptera: Chrysomelidae: Cassidinae)

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Abstract

Larvae of two closely related species *Cassida palaestina* Reiche, 1858 and *Cassida rubiginosa* Müller, 1776 are described in detail including SEM microstructures. First instars are extremely similar with no clear diagnostic characters, larvae of *Cassida palaestina* are slightly more contrastingly coloured than larvae of *C. rubiginosa*, the latter having darker scoli, basal part of supra-anal processes and legs. Last instars differ in very subtle but constant characters: lateral scoli of *C. palaestina* are slightly shorter than those of *C. rubiginosa*, in *C. palaestina* tops of the lateral branches are armed apically with an elongate cauliflower-shaped sensillum while in *C. rubiginosa* tops of the lateral branches are more often armed with a pointed seta than with an elongate cauliflower-shaped sensillum, and cauliflower-shaped sensilla on tergites are less elongate in *C. palaestina* than in *C. rubiginosa*. These differences accompanied by distinguishing characters of adults and their distribution range indicate that both taxa are probably vicariant species with partial parapatric occurrence. *Centaurea behen* is a new host plant for *C. palaestina*.

Key words: Coleoptera, Chrysomelidae, Cassidinae, Cassidini, *Cassida palaestina*, *Cassida rubiginosa*, morphology of immatures, *Centaurea behen* L

Introduction

Larvae of tortoise beetles are poorly known. Until now immatures of only 250 of approximately 2900 known species have been described (Świętojańska 2009). Many of old descriptions are superficial and only less than 50 use detailed characters, including chaetotaxy, microsculpture and details of the first instar. Only few papers have given comparative character or have discussed the problem of similarity of immatures of very closely related species (e.g. Świętojańska 2005 a, 2005 b; Świętojańska & Borowiec 2007 a, 2007 b).

Cassida palaestina Reiche, 1858 and *Cassida rubiginosa* Müller, 1776 are members of the most speciose genus of the subfamily Cassidinae (with 431 described species) which includes a lot of closely related species that are difficult to identify and are often with a doubtful species status. Both taxa belong to the coherent group of Palaearctic species characterized by a narrow clypeus and sharp basal corners of the pronotum. The group comprises also *Cassida alpina* Bremsi-Wolf, 1855, *C. algerica* Lucas, 1849, *C. angustifrons* Weise, 1891 and *C. deflorata* Suffrian, 1844. Although immatures of all these species, except *C. angustifrons*, have been described (summarized by Świętojańska 2009) only the description of the first instar larva of *C. rubiginosa* (Świętojańska 2004) meets a modern standard of description as proposed by Borowiec & Świętojańska (2003). Adults of *C. palaestina* and *C. rubiginosa* are similar superficially and the only constant distinguishing character is the colour of femora—mostly black in *C. rubiginosa* and completely yellow in *C. palaestina* (*Cassida palaestina* ab. *nigrofemorata* Spaeth, 1926 with partly black femora is in our opinion a distinct species). Male genitalia of both species, like in many other members of the genus *Cassida*, are not diagnostic. Both species differ also in their distribution range. *Cassida rubiginosa* is widely spread in the whole Palaearctic Region while *C. palaestina* is

116), the head (Figs 38, 39, 45, 46, 56, 81) and legs (Figs 36, 37) are the same in both species. There are also no differences in the structure of mouthparts (Figs 40–44, 47–51, 60–62, 85–92) and antennae (Figs 59, 83, 84). Six pairs of stemmata are present in both species (Figs 38, 39, 45, 46, 58). Anal turret is two-segmented in both species (Figs 80, 101). Spiracles in both species gradually shortened posteriorly (Figs 79, 99, 100). The head is covered with pointed setae in both species (Figs 38, 39, 45, 46, 57, 82) similarly to legs (Figs 36, 37). Tergites of both species are covered with cauliflower-shaped sensilla (Figs 63–67, 102–107) which are less elongate in *C. palaestina* than in *C. rubiginosa*. In both species pro-, meso- and metasternum and the first three abdominal sternites have medially pointed setae and cauliflower-shaped sensilla laterally (Figs 68–72, 108–113). The remaining abdominal sternites possess cauliflower-shaped sensilla (Figs 73, 74, 114–116).

Discussion

Adults of *Cassida rubiginosa* and *C. palaestina* appear superficially similar, but both species differ in their geographic distribution and habitat preferences. *C. rubiginosa* is an eurytopic species, as it has a wide distribution within the Palearctic Region (it was also introduced and established in NE Canada and USA), a wide host plant spectrum and lives in various habitats from wet to dry. *C. palaestina* is a less eurytopic species, distributed only in the eastern part of the Mediterranean Subregion, the Near East and Central Asia and has a narrower spectrum of host plants (Borowiec & Świętojańska 2013). Although in some countries (e.g. Armenia, Turkey, Iran, Kazakhstan) both species are known to occur, label data of studied specimens suggests that in countries of sympatric occurrence they are separated by habitat. *Cassida rubiginosa* is restricted to higher elevations and rather wet localities while *C. palaestina* prefers lowland localities of semi-dry character. Thus, we hypothesise that both taxa represent vicariant species or parapatric occurrence.

Our studies on first and last instars larvae confirm a very close affinity between both species and suggests that they are sister species. Differences between the first instar larvae of the two species are very subtle. Larvae of *Cassida palaestina* are slightly more contrastingly coloured than larvae of *C. rubiginosa*, the latter having darker scoli, basal part of supra-anal processes and legs. Last instar larvae are also very similar but in *C. palaestina* in alive specimens the integument is bright yellow, lateral scoli are slightly shorter than in *C. rubiginosa* and lateral branches of the scoli are armed apically with an elongate cauliflower-shaped sensillum while in *C. rubiginosa* alive specimens have a ground colour ranging from pale green to brownish (in populations from mountains of the Central Europe integument sometimes is almost black) and the lateral branches of the scoli are armed apically with a pointed seta. Cauliflower-shaped sensilla of tergites are less elongate in *C. palaestina* compared to those in *C. rubiginosa*. Our studies on larvae of other Palearctic species in the tribe Cassidini suggest that taxa from arid habitats generally have shorter lateral scoli and shorter cauliflower-shaped sensilla as a possible adaptation to reduce water loss (Świętojańska & Borowiec 2007 b, 2013).

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