

Observations on *Dermatopelte budensis* Erdös & Novicky, 1951 (Hymenoptera: Chalcidoidea, Eulophidae), a parasitoid of *Zygaena* Fabricius, 1775 (Lepidoptera: Zygaenidae)

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Synopsis

Dermatopelte budensis is a koinobiont parasitoid, probably ectophagous, of larvae of species of *Zygaena*, behaving sometimes as a solitary parasitoid of small pre-diapause caterpillars which were soon killed, and sometimes as a gregarious parasitoid of larger larvae which survived long enough to spin their cocoons as if for pupation. New host and distribution records are given for *D. budensis*, and a morphologically rather distinct form is discussed.

Key words: Lepidoptera, Zygaenidae, *Zygaena*, parasitoids, Hymenoptera, Eulophidae, *Dermatopelte budensis*, *Rhicnopelte*.

Introduction

Dermatopelte Erdös & Novicky was described with a single included species, *D. budensis* Erdös & Novicky, 1951, in Erdös (1951). This remains the only known Palaearctic species, although Burks (2004) has described two Nearctic representatives of the genus.

Dermatopelte is referable to the tribe Eulophini in Eulophinae (Gauthier *et al.*, 2000). It belongs to a group of genera, formerly placed in Elachertini, which have complete mesoscutal notaulices and sublateral scutellar grooves that curve and unite in front of the apex of the scutellum (Fig. 3), an antennal flagellum (Figs 4, 5) of one distinct anellus, four funicle segments and two (not three as sometimes stated) claval segments. Within this group, *Dermatopelte* is closely related to *Rhicnopelte* Förster, 1878, the two genera sharing the apparent apomorphies of a small mouth opening, small and blunt mandibles, concave genae and prominent eyes (in facial view of the head, Fig. 1), and

propodeum with a median carina divided anteriorly by a longitudinal groove which is raised in front as a transverse crest marking off a small cup (Fig. 3). *Dermatopelte* is distinguished from *Rhincopelte* by having a quadrate or elongated gastral petiole with reticulate sculpture dorsally (very transverse and smooth in *Rhincopelte*), and the thoracic dorsum, especially the scutellum, is more shiny with the reticulate sculpture only very weakly raised. The median area of the propodeum has raised sculpture; in *Rhincopelte* it is almost smooth. The body of *D. budensis* is mainly yellowish, but the head and mesosoma of *Rhincopelte* are black.

The single valid species of *Rhincopelte*, *R. crassicornis* (Nees, 1834), is a gregarious ectoparasitoid of noctuid (Lepidoptera) larvae (Čapek, 1963), and *Dermatopelte* was thought to probably have similar host relations (Bouček & Askew, 1968). However, no host was known for *D. budensis* until Vidal (1993) reported the rearing by Prinz of 5 ♂, 15 ♀ (presumably a brood from a single host cocoon) collected from *Zygaena corsica* Boisduval, [1828], on *Santolina* at Nugedu, Sardinia. More recently we have seen specimens of *D. budensis* reared from other species of *Zygaena* Fabricius, 1775 (Lepidoptera: Zygaenidae), as described below, and it is probable that *D. budensis* is confined to attacking burnet moth larvae. It would be very interesting to learn the hosts of the two North American species, *D. sinaloensis* Burks, 2004, and *D. yanegai* Burks, 2004, because the genus *Zygaena* does not occur in the Nearctic (although the Zygaenidae are represented by species of the subfamily Procridinae).

Material

REARED SPECIMENS OF *DERMATOPELTE BUDENSIS*

Morocco: Boumin, ex cocoon of *Zygaena favonia* from larva on *Eryngium campestre* L. (Apiaceae) collected 2.vi.1991 (*A. Hofmann*), 3 ♀ (RRA). **Gibraltar:** Alameda Gardens, ex 2nd instar larvae of *Zygaena fausta* feeding on *Coronilla valentina* L. (Fabaceae), collected 23.x.2007, emerged 14.xi.2007 (*W. G. Tremewan*), 2 ♀, 4 ♂ (BMNH), 1 ♀, 1 ♂ (RRA). **Spain:** Granada, Pto de la Mora, ex cocoon of *Zygaena sarpedon* from larva feeding on *Eryngium campestre* L. collected 13.vi.1991 (*A. Hofmann*), 4 ♀, 1 ♂ (NMS).

In addition to the above, the following sample is referred with a query to *D. budensis* – **Uzbekistan:** Hissar, ex cocoon of *Zygaena cocandica* collected vi.1995 (*A. Hofmann*), 10 ♀, 2 ♂ (RRA).

FIELD CAPTURES

Spain: Madrid, El Ventorillo (1400 m), Malaise trap, 14–21.ix.1989 (*Nieves & Rey*), 1 ♀ (RRA) [this specimen agrees with the holotype of *Dermatopelte budensis* in Budapest]. **France:** Dordogne, Monestier, 23–26.viii.1979 (*Askew*), 3 ♂ (RRA). **Russia:** Primorsky Krai, vii., 1 ♀; Novitskoe, 18.viii.1985 (*Storozheva*), 1 ♀; Kaluzhskaya prov., village of Sivkovo, 29.vii.1979 (*Trjapitzin*) (ZISP), 1 ♀.

Abbreviations for depositories are BMNH (Natural History Museum), NMS (National Museums of Scotland), ZISP (Zoological Institute, Russian Academy of Sciences, St Petersburg), RRA (R. R. Askew collection).

NEW RECORDS

New host records for *Dermatopelte budensis*, in the material listed above, are *Zygaena fausta* (Linnaeus, 1767), *Z. favonia* Freyer, 1844, and *Z. sarpedon*

(Hübner, 1790). *Zygaena cocandica* Erschoff, 1874, is also a host of *Dermatopelte*, possibly of *D. budensis*.

New distributional records are Morocco, Gibraltar, Spain, Russia and possibly Uzbekistan.

Biology of *Dermatopelte budensis*

Dermatopelte budensis is a primary parasitoid of the larvae of species of *Zygaena*. It is probably ectophagous. Most of our material emerged gregariously in June from the recently formed hosts' cocoons. *Zygaena favonia*, *Z. sarpedon* and also *Z. cocandica* were collected as fully grown (or almost so) larvae, some of which spun cocoons from which *Dermatopelte* emerged gregariously a short time later (A. Hofmann, pers. comm.). As there is some host developmental activity after parasitisation, *D. budensis* is clearly a koinobiont. Species of *Cotesia* Cameron, 1891 (Braconidae) had attacked some of the caterpillars in the samples, but there is no evidence that *D. budensis* ever behaves as a secondary parasitoid.

A different developmental history was involved in the parasitism of *Z. fausta*. During a one-hour visit to the Alameda Gardens, Gibraltar, on 23 October 2007, Dr W. G. Tremewan collected 57 prediapause larvae of *Zygaena fausta gibraltaria* Tremewan, 1961, which were feeding on *Coronilla valentina* L. (Fabaceae). Some time after returning to Great Britain, it was noted that eight of the small larvae were dead and from these eight individuals of *Dermatopelte budensis* emerged in November under indoor conditions. According to Dr Tremewan, the parasitized larvae were in the second instar (only primary and subprimary setae appear to be present on the skins of the larval hosts).

Examination of the parasitized host larval remains (Fig. 6) shows that the pupal exuviae of *D. budensis* are situated singly and externally on the venter of each small *Z. fausta* larva. The posterior end of the parasitoid pupa is inside the host remains, but this probably occurred just prior to parasitoid pupation as a means of anchoring the *Dermatopelte* pupa to a substrate, and does not necessarily indicate that the parasitoid had developed internally. *Platyplectrus chlorocephalus* (Nees) (Eulophidae), an ectoparasitoid of *Rhagades pruni* ([Denis & Schiffermüller], 1775) (Zygaenidae), sometimes behaves in a similar way, some fully grown larvae pushing their posterior ends into the host remains for attachment. We believe *D. budensis* to be an ectoparasitoid whose larvae are positioned beneath the host and it was obviously behaving as a solitary parasitoid on the second instar larvae of *Z. fausta*.

We have not been able to examine any of the host remains of cocooned *Zygaena* from which *D. budensis* was reared gregariously, but it might be expected that they would have been prepupal rather than pupal. Further, it seems probable that, as the parasitoid eggs or larvae were not noticed by the collector of the hosts at the time, they would have been positioned in a cryptic site, perhaps ventrally, on the active host larva.

The available data indicate that *D. budensis* is a plurivoltine parasitoid, able to develop solitarily on very small host larvae or gregariously on final instar (ultimately cocooned) ones. All of the material we have seen has evidently

pupated and emerged rather quickly following collection, and it is unclear how this interesting parasitoid passes the winter. Our still rather meagre knowledge of its developmental biology seems consistent with the host being able to continue through the instar in which it is attacked before being consumed. This raises the possibility that the parasitoid causes a developmental arrest in its host in a way similar to that achieved by another eulophid genus, *Eulophus* Müller, 1764, also koinobiont ectoparasitoids of caterpillars, by the use of delayed-action venom injected just before oviposition (Shaw, 1981).

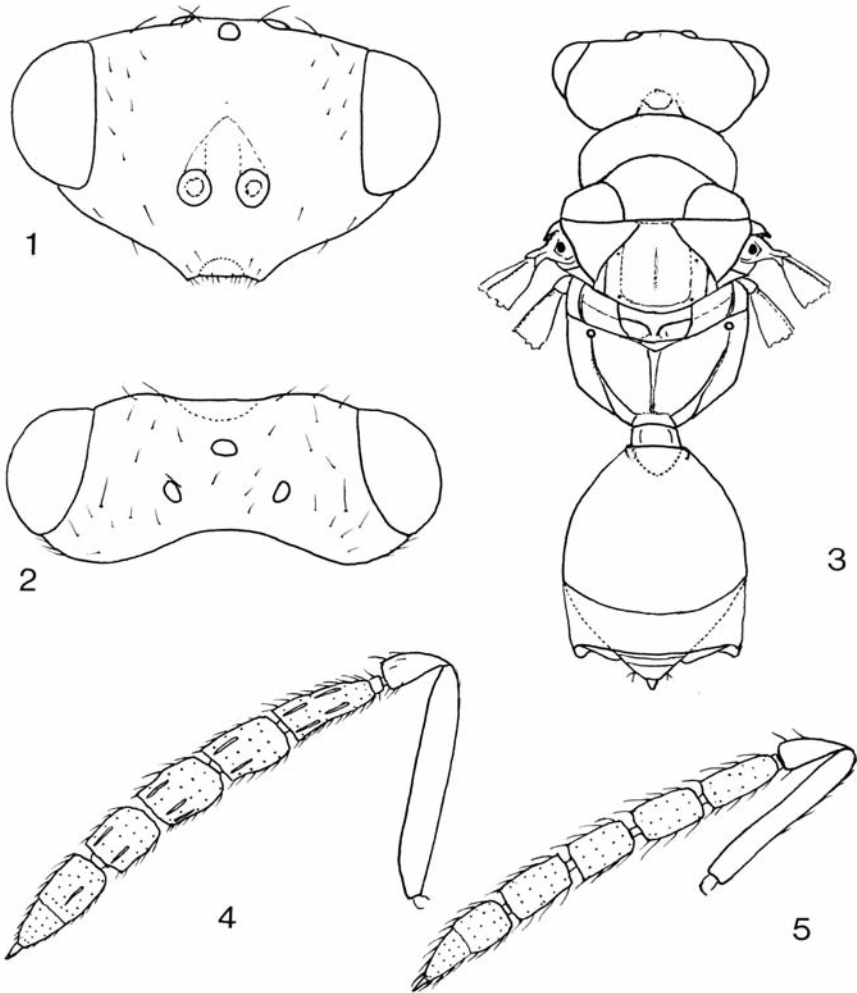
A form of *D. budensis*?

(Figs 1–5)

The identity of the specimens of *Dermatopelte* reared from a cocoon of *Z. cocandica* from Uzbekistan is uncertain. It was thought initially that they might be specifically distinct from the *Dermatopelte* reared from other hosts. *D. budensis*, however, is very variable (Erdös, 1951; Peck, Bouček & Hoffer, 1964) and as the extent of this variation was appreciated, it was considered unwise at this point to describe the *Dermatopelte* from *Z. cocandica* as a new species.

The form associated with *Z. cocandica* differs from the other material at our disposal in the following respects. The scutellum and mid-lobe of the mesoscutum are very weakly sculptured, the reticulation formed by hardly raised lines that on the scutellum are almost obsolete; the sculpture is also very fine, there being 18–20 areoles between the bases of the posterior pair of mesoscutal setae (only 12–16 in *D. budensis*). The head in dorsal view (Fig. 2) is very transverse, 2.6–2.7 times as broad as long (2.1–2.4 times in *D. budensis*), and in front view (Fig. 1) the height of an eye is only very slightly greater than the malar space (1.3–1.6 times greater in *D. budensis*). The clava (Figs 4, 5), including the apical spine, is 2.5–2.8 times as long as broad (2.1–2.3 times in *D. budensis*, the spine about 0.4 times as long as the last (second) claval segment (hardly 0.3 times as long in *D. budensis*). The gaster (Fig. 3) of all females appears to have been distorted in drying, the posterior segments having telescoped into the basal segments. Measurements are difficult to make with accuracy, but it is estimated that the basal gastral tergite is about 0.9 times as long as it is broad, whereas in *D. budensis* it is much shorter than its breadth. The gastral petiole is subconical, about 1.1 times as long as broad, much as in *D. budensis*. The body is yellowish with only the last tarsal segments and pretarsi, the propodeum laterally and the ovipositor sheath more or less brown. In *D. budensis* the coloration is variable and there are nearly always additional dark brown markings on the occiput behind the eyes and in the ocellar triangle, sometimes extending ventrally to the middle of the face. A very dark form is described by Erdös (1951) as subspecies *provincialis*.

Dermatopelte budensis, and the form associated with *Z. cocandica*, differ from both North American species in coloration, in lacking a transverse carina behind the ocelli, and in the gastral petiole being only 1.1–1.2 times as long as broad. In *D. smaloensis*, the petiole is 1.5 (♀) to 1.7 (♂) times as long as broad; in the female of *D. yanegai*, it is almost 2.5 times longer than broad.



Figs 1-5. *Dermatopelte* sp., a parasitoid of *Zygaena cocandica*. 1, ♀ head in front view; 2, ♀ head in dorsal view; 3, ♀ body; 4, ♀ antenna; 5, ♂ antenna.



Fig. 6. Pupal exuviae of *Dermatopelte budensis* on venter of the host remains, a second instar *Zygaena fausta* larva. The dark pellets inside the posterior segments of the host are probably host faecal pellets.

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