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Oviposition behaviour in *Lycaena thetis* Klug (Lepidoptera : Lycaenidae)

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Summary

The oviposition behaviour of *Lycaena thetis* was observed in the Aladag mountains, southern Turkey. Females drop their eggs singly into the spiny cushions of the larval foodplant (*Acantholimon* spp., Plumbaginaceae).

Zusammenfassung

Das Eiablageverhalten von *Lycaena thetis* wurde im Aladag-Gebirge (Süd-Türkei) beobachtet. Die Weibchen lassen ihre Eier einzeln in die dornigen Kugelpolster ihrer Wirtspflanze (*Acantholimon* spp., Plumbaginaceae) fallen.

The life histories of European or North American species of the Lycaenini ("Copper butterflies") are, in general, well known. For most Asian *Lycaena* Fabricius, 1807, species, however, even basic biological information on hostplants, voltinism, or diapause stages is lacking (cf. Fiedler, 1991). Recently, Tolman (1993) published a detailed account of the larval biology of *Lycaena thetis* Klug, 1834, from southern Greece. Since Tolman based his description on field-collected young, hibernated larvae, the oviposition behaviour of *L. thetis* remained unknown. Furthermore, Tolman's paper deals with the westernmost populations of *L. thetis*. Because the distribution of *L. thetis* extends throughout Asia Minor to northern Iran (Schurian & Hofmann, 1982), it remained to be tested whether populations in the heart of the species' range utilize the same or similar hostplants.

On 15.viii.1993, between 11.00-15.00 EEST, we had the opportunity to observe the unusual oviposition behaviour of *L. thetis* in a population of southern Turkey. The habitat was a south-facing steep slope in a valley of the Aladag mountains (Prov. Nidge), approximately 1800-

1900 m above sea level. This slope was mostly covered by limestone boulders and scree. The sparse vegetation contained *Juniperus* shrubs and single conifer trees. Spiny, cushion-forming, perennial plants (*Astragalus* and *Acantholimon* spp.) which are relatively immune to overgrazing by the abundant sheep and goats, formed the lower vegetation between the boulders.

Fig. 1. Large contiguous cushions (total diameter > 1 m) of *Acantholimon* sp. (Plumbaginaceae), the hostplant of *Lycaena thetis*.

When we first walked through the habitat late in the morning, only few territorial males and nectaring females of *L. thetis* were on the wing. Males preferably basked on barren ground. Around noon, when the air temperatures had reached about 30°C, females became increasingly active. They often visited the last flowers of *Acantholimon* spp. (Plumbaginaceae). This cushion plant with extremely spiny, needle-like leaves (Fig. 1) is the hostplant of *L. thetis* in Greece (Tolman, 1993), although we were unaware of his paper at the time of our observations. Females examined the *Acantholimon* cushions in the fluttery searching flights that typically precede oviposition in many lycaenid butterflies. After alighting, each female would crawl about on the cushions for several minutes, repeatedly curling its abdomen

and probing the plant surface with the antennae and ovipositor. However, despite intensive close examination of the respective plants after the females had flown off, we failed to find any eggs attached to the twigs or leaves.

Finally, we succeeded in observing the actual oviposition act. When viewed in contre-jour, we could clearly see that after up to 5 minutes of intensive crawling and probing the hostplant, the female eventually inserts its ovipositor between the needle-like leaves and simply drops a single egg into the cushion. In one case, the egg by chance stuck to a twig deep within an *Acantholimon* cushion, but unfortunately it fell to the ground during our attempt to secure it. The hemispherical egg was rather large (ca. 1 mm in diameter) and showed the rough chorionic sculpturing typical for *Lycaena* eggs. In total, we observed 10 successful oviposition acts, all in the same manner. On at least twice as many occasions, a female left the hostplant without laying an egg.

Ovipositions only occurred during the hottest hours around noon. When we left the habitat (15.00), the females tended to bask for long periods on the *Acantholimon* cushions, and flight activity evidently decreased. We followed various individual females for dozens of metres. These females ignored many potential hostplant cushions and alighted to probe quite a number of *Acantholimon* plants before an egg was laid. Hence, they appear to be very choosy, but we do not know the factors that finally elicit oviposition. Egg-laying occurred on small as well as on large plants (Ø = 30-100 cm) and not invariably in full sun, although high temperatures are clearly required. All eggs were dropped into the central part of a cushion, not at the edges.

To obtain oviposition in captivity, we collected a total of 10 females from various habitats in southern Turkey in August 1993. These were caged in a plastic bottle (1.5 l) lined with moist filter paper, twigs of the hostplant *Acantholimon* as oviposition substrate, and sugar solution as food. However, despite exposing the females to various conditions (direct sunlight, shadow, high temperatures, high or low humidity), not a single egg was laid. The last female died after 14 days in captivity. When earlier attempting to obtain eggs from *L. thetis* in captivity (1977 and 1984), females had been confined with an erroneously presumed hostplant (*Rumex* sp., Polygonaceae) without any success. Our failure to induce oviposition in captivity contrasts sharply with successful attempts involving various other Lycaenidae species (*Lycaena candens* (Herrich-Schäffer, 1844), *Agrodiaetus* spp., *Polyommatus* spp.) under similar conditions. Females of *L. thersamon* (Esper, 1784) (like *L. thetis*, often assigned to the "subgenus" *Thersamonia* Verity, 1919), however,

laid only few eggs, suggesting that in both species highly xerothermic conditions (and presumably unknown factors) are essential for egg-laying.

Dropping the eggs instead of attaching them onto the hostplant is a very rare behaviour in Lycaenidae butterflies, but has been recorded from the Nearctic *Lycaena rubidus* (Behr, 1866 ; see Funk, 1975). In *L. thetis*, the females may thereby avoid fatal injuries inflicted by the extremely spiny leaves, and the eggs are probably protected against many enemies within the dense thorny *Acantholimon* cushions. It remains to be proven whether *L. thetis* hibernates in the egg stage or whether the larvae hatch in late summer to diapause. Both strategies occur within the genus *Lycaena*. Since Tolman (1993) found larvae of 4-7 mm length shortly after hibernation in Greece, diapause as a young caterpillar seems more likely.

Our observations confirm that *Acantholimon* is the hostplant not only for Greek, but also for Turkish *L. thetis* populations. The plant family Plumbaginaceae is well represented in eremic steppe habitats. In addition, Plumbaginaceae are not too distantly related to the usual Polygonaceae hostplants of most *Lycaena* species (both plant families belong to the subclass Caryophyllidae). Schurian & Hofmann (1982) explicitly mentioned the presence of *Acantholimon* (in part quoted as "*Acantolimnus*") in habitats of *L. eberti* Forster, 1972, and Lukhtanov & Lukhtanov (1994) recorded the hostplant of *L. solskyi* (Erschoff, 1874) as *Acantholimon*. Therefore, additional species of Asian *Lycaena* might also use *Acantholimon* as hostplant. Fuchs (1989) reported that *L. thetis* (especially females) preferably visited another spiny cushion plant, *Drypis spinosa* (Caryophyllaceae), in central Greece for nectaring and basking. Whether this plant species could serve as alternative larval hostplant, needs to be demonstrated.

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