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NOTES ON THE LIFE HISTORY OF *EANTIS THRASO* (HESPERIIDAE: PYRGINAE) IN ECUADOR

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ABSTRACT. The early stages and larval behavior of *Eantis thraso* (Hübner) in eastern Ecuador are described. All larval instars were found to build leaf shelters on the host plant, which are described and illustrated. A summary of larval host plants for species in the genus *Eantis* Boisduval is provided. Cultivated *Citrus* L. species are reported as the local larval host plants for *E. thraso* in eastern Ecuador.

Additional key words: larvae, larval food plants, larval shelters, life cycles, pupae.

Warren (1996) resurrected the generic name *Eantis* Boisduval from synonymy with *Achlyodes* Hübner for taxa including species and subspecies of Evans' (1953, 1955) *Achlyodes mithridates* Fab. group, after a phylogenetic analysis of morphological characters observed in *Achlyodes*. The genus *Eantis* is entirely Neotropical in its distribution and includes 9 superficially similar species. Material studied by Warren (1996) indicated a geographical range for *E. thraso* from extreme southern Chiapas, Mexico, east to southern Belize, and south throughout tropical Central and South America; recent color illustrations of adult males appear in Lewis (1987:80), Brown (1992:176) and Warren (1996). *Eantis thraso* is replaced in most of Mexico and Texas by the similar *E. tamenund* W. H. Edwards.

Food plant records for *Eantis* are mostly from the family Rutaceae, including cultivated *Citrus* L. plants (Panton 1898, Smyth 1919). Native hosts in most areas also appear to be Rutaceae, especially *Zanthoxylum* L. (Bruner et al. 1945, Poey 1832, Janzen & Hallwachs 2003). Wolcott (1923, 1951) described the larva and pupa of *Eantis minor* (Comstock) from Puerto Rico on cultivated *Citrus* and native *Zanthoxylum* species. *Eantis tamenund* has been reared in Texas on native *Zanthoxylum* species (Kendall 1965). Hayward (1941, 1948) reported *E. thraso* from various *Zanthoxylum* species and Moss (1949) found it on one *Zanthoxylum* species. Biezanko et al. (1974) found *E. thraso* on four species of *Citrus* and two species of *Zanthoxylum*. Most recently, Janzen and Hallwachs (2003) found *E. thraso* on six species of *Zanthoxylum* in northwestern Costa Rica. Despite the fact that larvae of *E. thraso* have been observed and reared several times, the most detailed description of its larva available is that provided by Moss (1949), who described the mature larvae of *E. thraso* as being "'plain green with a rotund brown head." Here, we provide a more detailed description of the early stages of *E. thraso* in Ecuador, as well as notes on its larval shelter-building behavior.

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MATERIALS AND METHODS

The majority of observations were made between September and November of 1997 in north-eastern Ecuador at the La Selva Lodge Research Station, 75 kilometers E.S.E. of Coca, Garzacocha, Sucumbios Province, at 250 meters elevation. For a detailed description of this site, see DeVries et al. (1999). Subsequently, several larvae were found and reared under similar conditions at the Sacha Lodge Research Station located 10 kilometers up river from La Selva. All larvae and pupae were collected from cultivated *Citrus* trees located along the edge of seasonally inundated forest. Over 30 individual larvae of various instars were encountered on the host plants and transferred to the lab for rearing. Head capsule width measurements were taken from shed head capsules using an ocular micrometer. Voucher material including preserved larvae of all instars together with their associated shelters is deposited in the collection of the senior author.

RESULTS

Early stages. No eggs were encountered. First instar (n = 7). Head capsule black to dark brown, moderately heart-shaped; body parallel sided, slightly flattened, roughly dome shaped in cross section, entirely pale olive-green to clear green with some variation due to gut contents, dorsum bare but with a ventro-lateral fringe of minute, pale setae and four long, stiff, pale setae along the margin of the anal plate. Second instar (n = 6) as described for first instar. Third instar (n = 13) head capsule caramel-brown, fading gradually to

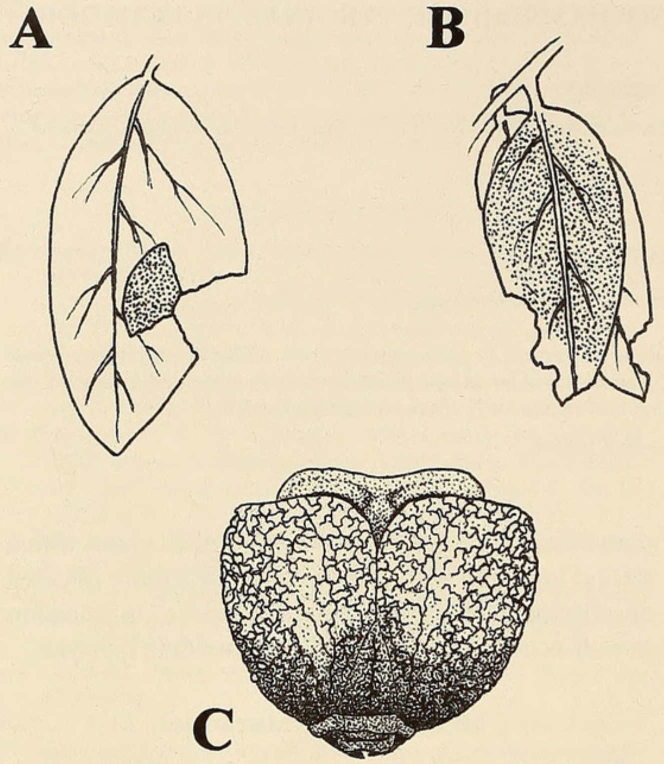

FIG. 1. Shelters and head capsule of *Eantis thraso* from eastern Ecuador: **A,** Larval shelter type built by first through third (or rarely through fifth) instar larvae; **B,** Larval shelter type built by many fourth and fifth instar larvae; **C,** Head capsule of fifth instar larva.

dark brown basally around ommatidia and mouthparts, heart shape more pronounced, average width 1.41 mm (n = 2); body as described for first instar but some individuals with a faint supraspiracular line of yellow hatch marks from T2 to A8. Fourth instar (n = 14) average head capsule width 2.62 mm (n = 3), body as described for third instar, but yellow hatch marks more pronounced, and anal plate still with four stiff, pale setae, which are approximately the same size as in the third instar, so now appear proportionately smaller. Fifth instar (n = 9) head capsule (Fig. 1C) now with distinct black area basally giving a bearded appearance, average width 4.37 mm (n = 4); body as described for fourth instar (also see photos by Janzen & Hallwachs 2003). Immediately upon molting, the fresh head capsules of last instar larvae are pale lime green and slowly change to an ivory color and finally to caramel over the course of an hour. Pupa (n = 8) stout with a short blunt horn arising between eyes and projecting foreword and slightly upward, ground color entirely lime-green; four tiny black dots behind the head form a small crescent on the dorsum of the prothorax, four additional small brown spots located on dorsal abdomen just anterior to cremaster. Cremaster dark brown, entire pupa covered with a light dusting of white waxy flocculence except for two small bare patches in the shape of crescents along the costal edge of wing pads. Approximately 24 hours before eclosion, the pupa turns generally more yellowish, with the wing pads gaining an orange-brown cast and the eyes becoming dark brown.

Larval shelters. Larvae of all instars formed a shelter made by modifying the leaves of their host plant. Terminology for discussion of shelters follows Greeney and Jones (in press). First instar shelters (n = 7) were roughly triangular or trapezoidal shaped sections of leaves cut from the leaf margin and flipped onto the dorsal surface of the leaf (Fig. 1A). Two major cuts in the leaf were made that ended towards the central portion of the leaf and angled to a narrow shelter bridge. This is termed a two-cut, stemmed fold, Group III, type 10 shelter (Greeney & Jones in press). Second instar larvae (n = 6) were found in shelters as described for the first instar. No abandoned first-instar shelters were found at the study sites, suggesting that larvae remained in the shelter built during the first instar. Third instar shelters (n = 13) were similar to those described for the first instar, but were larger. Three of 14 fourth instar larvae had built a third shelter formed by silking together two leaves so that the dorsal surface of one leaf contacted the ventral surface of another leaf and formed a pocket (Fig. 1B). This is termed a two-leaf pocket, Group I, type 2 shelter (Greeney & Jones in press). The remaining eleven fourth instar larvae were encountered in the second larval shelter as described for the third instar. Fifth instar (n = 9) larvae remained in shelters built during the fourth (or third) instar. Two pupae were found in the field, and both were inside the last feeding shelter built. The pupae were attached, face down, to the ventral surface of the shelter by heavy silking at the cremaster, and were supported by a band of silk across the mid-thorax.

DISCUSSION

Despite the relative abundance of larvae at the study site, adult *E. thraso* were not common. Those encountered were exclusively associated with disturbed areas. Other species of Rutaceae, such as *Zanthoxylum americanum* Mill and *Ptelea trifoliata* L., have been suggested as larval host plants for *Eantis* from other regions (Kendall 1965, Kendall & McGuire 1975). It is unknown if these genera are utilized in our area, but the occurrence of adults associated with disturbed areas, where *Citus* is often abundant, suggests that *Citus* is an important larval host in eastern Ecuador. On the other hand, Janzen and Hallwachs (2003) reported on 201 rearings of Costa Rican *E. thraso*, all from *Zanthoxylum* species.

The construction of larval shelters by hesperiid larvae has been known for many years (e.g., Scudder 1889) and has since been reported for a wide variety of species (e.g., Moss 1949, Miller 1990, Atkins et al.

1991). Within the Lepidoptera, species of many taxanomic groups build shelters of some type (e.g., Miller 1983, DeVries 1987, Jones 1999), and there are at least 10 distinct types built by the Hesperiidae alone (Greeney & Jones in press). All of those recorded for the Hesperiidae involve modifying the host plant with cuts and/or silk. Ontogenetic changes in the form of these shelters are also well documented (Graham 1988, Miller 1990). *Eantis thraso* larvae form shelters of two basic types. The first, involving cutting of the leaf (Fig. 1A), is a common type seen in many other species (Young 1991, 1993, HFG pers. obs.). The second, involving the silking together of two separate leaves (Fig. 1B), is likely utilized in this case due to size constraints imposed by the growing larvae and the relatively small leaves of the *Citrus* host.

While no oviposition events were observed and no eggs were found in the field, it is likely that *E. thraso* oviposit on the meristem leaves of their host. All early instars were found on pale, fresh leaves, and later instars were typically on or near new growth. This preference for meristem tissue is known for other rutaceous feeders (Vaidya 1969, Young 1993, HFG pers. obs.), as well as many species of butterflies feeding on a variety of host plants (DeVries 1987).

The value of detailed natural history studies in creating and testing phylogenetic hypotheses has been noted by other authors (Hennig 1966, DeVries 1987). In general, the morphological and ecological attributes of hesperiid larvae are very poorly known, and the taxonomy of most tropical skipper groups remains confused; much additional work is needed in these areas. In the face of ever increasing rates of habitat destruction, we hope this study may encourage others to continue publishing observations on the life history of this and other poorly known (but frequently encountered) taxa.

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