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ADELPHA IXIA LEUCAS: IMMATURE STAGES AND POSITION WITHIN *ADELPHA* (NYMPHALIDAE)

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ABSTRACT. The larva and pupa of the nymphalid butterfly *Adelpha ixia leucas* are described, and it is concluded that the species belongs to the same species-group as *A. delphicola, A. isis, A. melanthe, A. mesentina,* and *A. phylaca pseudaethalia. Luehea seemannii* (Tiliaceae) is reported as a larval food plant.

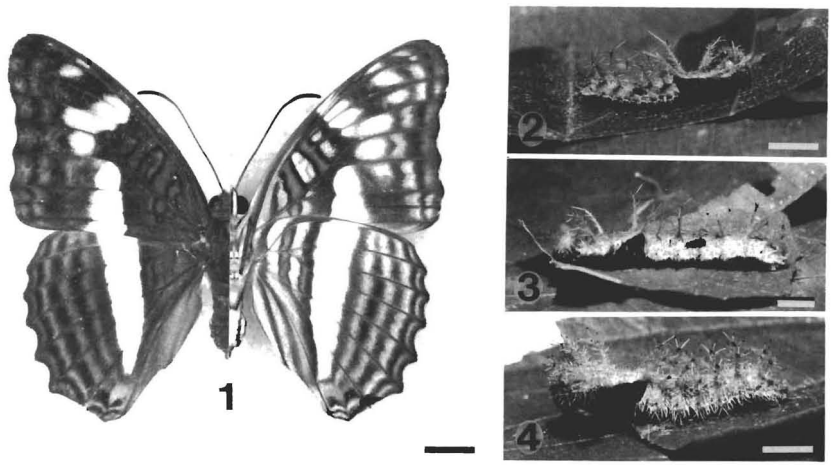
Additional key words: life history, larval food plant, Panama, Tiliaceae.

Although close to 100 species have been assigned to the nymphalid genus *Adelpha* Hübner, 1819, the immature stages are known for only 21 species, including 11 Panamanian ones (Müller 1886, Swainson 1901, Jorgensen 1921, Moss 1933, Comstock & Vázquez 1960, Young 1974, Aiello 1984). This scarcity of life history information is unfortunate because it appears that larval and pupal characters hold the best clues to species relationships within this large and complex genus, whereas wing pattern, traditionally used, may be quite misleading (Aiello 1984). Based on characters of the larvae and pupae, and the larval food plant relationships (Aiello 1984), the 21 species can be sorted into 7 species-groups. Because they are based on limited knowledge of a few *Adelpha* species only, these groups must be treated as provisional.

In this paper I describe the larva and pupa of a twelfth Panamanian species, *Adelpha ixia leucas* Fruhstorfer (Fig. 1), report its larval food plant, and assign the species to an *Adelpha* species-group.

MATERIALS AND METHODS

Two penultimate stadium *Adelpha* larvae were found on leaves of *Luehea seemannii* Triana & Planchon (Tiliaceae), on Pipeline Road near Gamboa, Republic of Panama, on 22 November 1989. The larvae and several leaves of their food plant were placed in small cages made from window screening and petri dish covers. The cages were kept



FIGS. 1–4. Adult: (1) *Adelpha ixia leucas*, dorsal (left), ventral (right) (reared lot 89-22 no. 2). Final instar larvae: (2) *Adelpha ixia leucas* on *Luehea seemannii* (Tiliaceae) (reared lot 89-22 no. 2); (3) *Adelpha phylaca pseudaethalia* on *Cecropia obtusifolia* (Cecropiaceae) (reared lot 83-78); (4) *Adelpha melanthe* on *Trema micrantha* (Ulmaceae) (reared lot 83-8 no. 3). [Scale bars = 0.5 cm.]

inside Ziploc plastic bags together with a piece of folded, dampened paper towel. The two larvae were designated as Rearing Lot 89-22, and were labelled as individuals 1 and 2. A record of molting and other behaviors was kept on a rearing sheet for that lot.

The adult butterfly, pointed larval head capsules, and pupal skin (Lot 89-22 no. 2) are in the author's collection, together with the fungus-killed final instar larva (dried, mounted, and pinned) and its larval head capsule (Lot 89-22 no. 1).

My field identification of the larval food plant was verified by consulting Robyns (1964) and D'Arcy (1987). A voucher specimen (*Aiello 1437*) of the plant is in the collection of the author.

Plant classification follows Dahlgren (1980).

Larva and Food Plant

Except for a paler dorsal area, both larvae were rusty brown, a darker shade of the underside color of their food plant leaves. Each larva ate the apex of its leaf except for the midvein, which it exposed and then extended, using fecula held in place with silk. The resulting slender supports were used by larvae to rest upon when not feeding and also during molting. The larvae attached large pieces of leaf and clumps of fecula to the base of their supports. These assemblages gave the impression of fallen debris caught on the apex of a broken leaf, and the larvae were well camouflaged whether feeding or resting.

On 26 November, larva no. 1 rested on its support, facing away from the leaf. The prothorax became quite swollen as the new head capsule formed inside. By the next morning the larva had molted to the final stadium (Figs. 2 and 5), and was beige except for the sides of the thorax through abdominal segment 2, which were chestnut in color. The scoli were long, slender, and straight, including those of abdominal segment 2, which in many species of *Adelpha* bears scoli different from those of other segments. Such "two-toned" larvae, with slender scoli on abdominal segment 2, are typical of *Adelpha* Group-II (see Aiello 1984).

Larva no. 2 molted to the final stadium, identical in form, pattern, and color to larva no. 1, on 29 November.

On 6 December, larva no. 1 died. Presumably, it succumbed to an entomogenous fungus because several days later, white filaments began to emerge from it, and by 11 December it was clothed in long white fungal fruiting bodies that emitted clouds of white spores with the slightest air current.

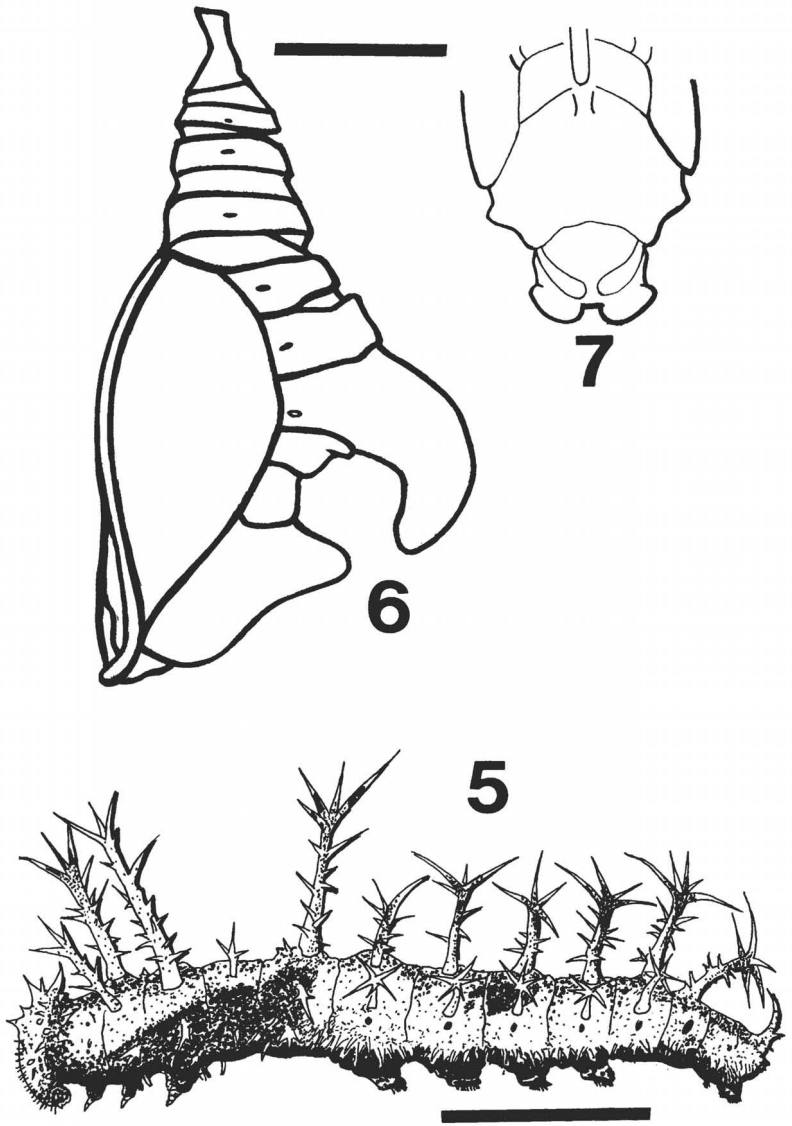
Pupa

Larva no. 2 was found hanging for pupation from the cage cover on 11 December. By the next morning it had molted to the pupa (Fig. 6): straw-colored, with abdominal segment 2 expanded to form a huge dorsal hook. "Huge-hook" pupae also are typical of *Adelpha* Group-II (Aiello 1984). The head horns (Fig. 7) were very small as in *A. melanthe* Bates, but unlike the rounded, asymmetrical horns of *A. melanthe*, these were more symmetrical and somewhat squared off.

Based on pupation times reported for *A. melanthe* and *A. phylaca pseudaethalia* Hall, I estimated that the adult would eclose on or about 22 December, after ten days as a pupa. Eclose it did, but we'll never know just when, because from 20 through 26 December we were confined to our homes due to the U.S. invasion of Panamá. When, on 27 December, we were able to visit our offices briefly, I found the adult dead on the cage floor. Its wings were undamaged, evidence that it had not fluttered against the cage walls.

Position within *Adelpha*

In all cases for which both the larva and pupa are known, *Adelpha* species that have "two-toned" larvae also have "huge-hook" pupae, and vice versa. Six *Adelpha* species, *A. delphicola* Fruhstorfer, *A. isis* Drury, *A. ixia leucas*, *A. melanthe* (Fig. 4), *A. mesentina* Cramer, and *A. phylaca pseudaethalia* (Fig. 3), have such larvae and pupae, and in my opinion are more clearly related to one another than to other *Adelpha* species for which information on the immatures is available.



FIGS. 5–7. Immature stages of *Adelpha ixia leucas*: (5) Final instar larva; (6) Lateral view of entire pupa; (7) Dorsal view of pupa head and thorax. [Scale bars = 0.5 cm.]

Larvae of two of the three Group-II species reared by me, *A. ixia leucas* and *A. phylaca pseudaethalia*, are nearly identical. The only difference between them seemed to be that the ground color of *A. ixia leucas* was beige, whereas that of *A. phylaca pseudaethalia* was bone

white. How consistent those colors are within and between species remains to be seen. The larva of the third species, *A. melanthe*, differs from them in the abundant white speckles and the grayish body spines that obscure its cream to brown ground color, and in the black-tipped scolus spines. These three conditions give the larva a distinctive frosted appearance.

Based on descriptions of immatures of *A. abyla* Hewitson (Swainson 1901) and *A. calliphiclea* Butler (Jorgensen 1921), those two species may belong to Group-II (Aiello 1984), but I have seen neither specimens nor illustrations of the immature stages.

Of the seven *Adelpha* species-groups outlined by Aiello (1984), Groups-I and -II are the most clearly defined. Group-I, with its distinctive genitalia, may prove to be more closely allied to *Limenitis* Fabricius, 1807, than to *Adelpha*. But Group-II, although its characteristic "two-toned" larvae and "huge-hook" pupae seem to set it apart, has genitalia similar to those of the remaining *Adelpha* groups, and with them it appears to form a natural assemblage.

Larval Food Plants of *Adelpha* Group-II

Luehea seemannii, the larval food plant of *A. ixia leucas*, has been recorded for one other species of *Adelpha* (*boetia* (Felder & Felder), from Parque Corcovado, Costa Rica), by J. Mallet (in DeVries 1986). Because I have not seen the larva or pupa of *A. boetia* I can draw no conclusions concerning its relationship to other *Adelpha* species. The only other record of *Adelpha* on the Tiliaceae is for *A.* nr. *celerio* (Bates) (*Adelpha* Group-I) on *Heliocarpus popayanensis* (Aiello 1984).

Although the Cecropiaceae (Urticales) appears to be the dominant larval food plant family for species of *Adelpha* Group-II, a total of seven larval food plant genera (*Bombax, Cecropia, Coussapoa, Luehea, Pourouma, Trema, and Urera*) have been reported for the six species that clearly belong to this *Adelpha* species group (references cited in Aiello 1984). These seven plant genera represent five plant families in two orders, Urticales and Malvales (Table 1). Dahlgen (1980) assigns the two orders to the same superorder (Malviflorae), based on certain chemical similarities as well as morphological characteristics. That close alliance is also supported by the fact that two species of *Adelpha* (*A. delphicola*, Group-II and *A. celerio*, Group-I) have been reported on plants from both orders. The relationship is not without controversy however; Cronquist (1981) maintains the Urticales and Malvales in separate subclasses, Hamamelidae and Dilleniidae, respectively.

The larval food plant (*Ilex paraguariensis*) reported by Jorgensen (1921) for *A. calliphiclea*, a possible member of Group-II, represents a significant departure from the other larval food plants recorded for that

TABLE 1. Larval food plant genera reported for the six *Adelpha* species comprising species-group II. The affiliation of a seventh species, *A. calliphiclea*, is unconfirmed.

Larval food plant genus	*Adelpha* species
Superorder Malviflorae	
Order Urticales	
ULMACEAE	
Trema	*A. melanthe*
CECROPIACEAE	
Cecropia	*A. delphicola, isis, melanthe, phylaca*
Coussapoa	*A. isis*
Pourouma	*A. delphicola, isis, mesentina*
URTICACEAE	
Urera	*A. melanthe*
Order Malvales	
TILIACEAE	
Luehea	*A. ixia*
BOMBACACEAE	
Bombax	*A. delphicola*
Superorder Corniflorae	
Order Cornales	
AQUIFOLIACEAE	
Ilex	*A. calliphiclea*

group and for *Adelpha* as a whole, although it has been reported also for *A. serpa hyas* Boisduval, Group-I, by d'Araújo e Silva et al. (1967–68).

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