

ERBLICHIA ODORATA SEEM. (TURNERACEAE) IS A
LARVAL HOST PLANT OF *EUEIDES PROCULA VULGIFORMIS*
(NYMPHALIDAE: HELICONIINI) IN SANTA ROSA
NATIONAL PARK, COSTA RICA

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ABSTRACT. The larva of *Eueides procula vulgiformis* Butler & Druce feeds on the leaves of *Erblichia odorata*, a large turneraceous evergreen tree that occurs in relatively pristine evergreen forest patches among the deciduous forest patches of Santa Rosa National Park (300-350 m elevation) in the northwestern coastal plain of the Pacific side of Costa Rica. This is the only known case of a heliconiine caterpillar feeding on the foliage of a tree and the only known case of a heliconiine caterpillar feeding on a plant outside of the Passifloraceae. The larval and pupal stages are described and figured and are unexceptional for the genus *Eueides*.

Eueides procula vulgiformis Butler & Druce is a common butterfly (Fig. 1) in the small patch of evergreen forest ("Bosque Húmedo," "Bosque Siempre Verde") along the main entrance road in the northeast end of Santa Rosa National Park, northeastern Guanacaste Province, Costa Rica (350 m elevation). Its larval host and larval stages were unknown until now (K. Brown, 1981; P. J. DeVries, pers. comm.) and are described here.

Adults are present in the Bosque Húmedo throughout the year, but fluctuate strongly in density within and between years. From December 1979 through January 1982, they have been abundant in a forest where they were not encountered during intensive collecting in 1978 and early 1979 by P. J. DeVries, L. E. Gilbert and J. J. Smiley. In December 1979 and later, an adult could be located with a few minutes search. The most common and omnipresent heliconiine in this habitat is *Heliconius hecale zuleika* Hewitson, with which *E. p. vulgiformis* is a very good Müllerian co-mimic. Adult *E. p. vulgiformis* are encountered throughout the daylight hours, flying and soaring from ground level to the tops of the tallest trees (20 m); when 10-20 m tall *Licania arborea* (Chrysobalanaceae) are in flower in late December and early January, members of both sexes are common visiting the flowers, and males chasing other males are a commonplace.

The larval host of *E. p. vulgiformis* in the Bosque Húmedo is a large turneraceous tree, *Erblichia odorata* Seem. The tree is common in this habitat, attains a height of 15-20 m (DBH up to 50 cm), and is evergreen. *E. odorata* does not occur in the deciduous forests surrounding the Bosque Húmedo and *E. p. vulgiformis* is not encountered in these forests either. *E. odorata* has simple and glabrous lan-

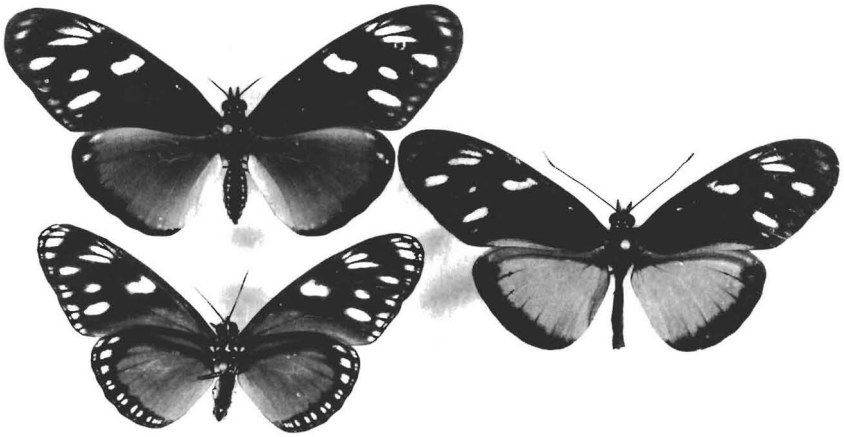


FIG. 1. *Eueides procula vulgiformis* adults reared from larvae found on *Erblichia odorata* in Santa Rosa National Park, Guanacaste Province, Costa Rica: **Upper left**, female; **Lower left**, female underside; **Right**, male.

ceolate leaves 8–14 cm long and 1–3 cm wide (Fig. 2a), with a gently undulating and slightly toothed margin. The leaves are less stiff and leathery than those of most of the evergreen tree species in the Bosque Húmedo but somewhat more stiff and leathery than those of most of the deciduous trees in the area. While most of the individuals of *E. odorata* are adult or subadult trees, the forest is sprinkled with a small number of saplings and seedlings.

When the density of *E. p. vulgiformis* is high, females are often seen fluttering about the margins of the crowns of large *E. odorata*, both in sunlit margins of tree-falls and in moderately shady portions of a well-closed canopy. Males chase them at this time, and sometimes the advances of a male stops an ovipositing female from laying an egg and causes her to move on. If a female is ovipositing on leaves in a small *E. odorata* sapling intermingled with foliage of other trees, she often lands many times on leaves of other species before landing again on an *E. odorata* leaf. For example, during an hour of fluttering about in the foliage and avoiding advances by males, one female *E. p. vulgiformis* contacted eight *E. odorata* leaves and laid a single egg on each of four of them. She landed on 37 leaves of other species during this period (1000–1100 h, 2 July 1980; weather was sunny and breezy). She always landed on the upper surface of the *E. odorata* leaves, and the weight of her body caused the leaf to bend sharply downward. She then reached under the leaf with her abdomen and glued a single egg to the central portion of the blade, 1–2 mm to one side of the

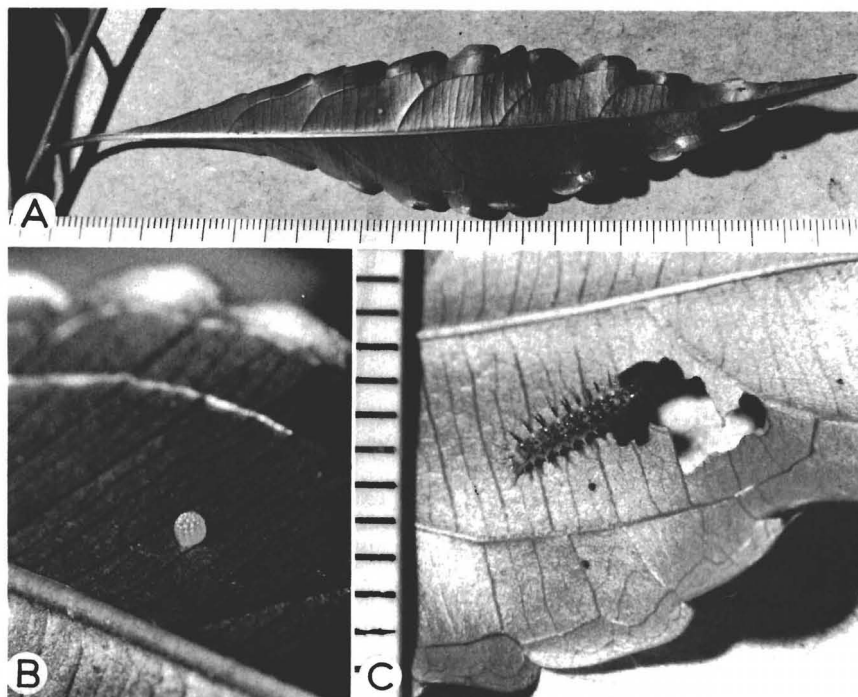


FIG. 2. **a**, normal-sized mature leaf of *Erblichia odorata* with a single egg of *Eueides procula vulgiformis* laid on its underside slightly to the left of center; **b**, egg of *E. p. vulgiformis*; **c**, second instar larva of *E. p. vulgiformis* feeding at the margin of the characteristic holes they cut in the leaf in the first and second instar. All scales in mm in this and later figures (all photos in this and later figures, Santa Rosa National Park, Guanacaste Province, Costa Rica, 350 m elevation).

midrib (Fig. 2a). Immediately after laying the egg she launched into a fluttering flight among the foliage; even if there was another *E. odorata* leaf nearby, she showed no directed flight toward it. After flying 1–3 m, she again alighted. If the landing site was not an *E. odorata* leaf, she launched into flight in a few seconds, and flew another few cm to a m or a bit more before landing again. Her general flight trajectory was neither straight nor strictly horizontal but rather wandering in both a vertical and horizontal plane. When chased by a male, she sometimes flew as much as 10 m before landing again. When the sun was obscured by a cloud for a few minutes, she landed on the upper surface of a leaf and sat motionless.

The eggs are pale greenish-yellow and have the appearance of domed squat cylinders (Fig. 2b). There are numerous ridges running from the base to top (portion away from the leaf), with horizontal

troughs breaking the ridges into a series of bumps. They look very similar to the eggs of *Eueides tales* figured by Brown (1981), except that where the *E. tales* egg has depressions on the surface, the *E. p. vulgiformis* egg has domes or bumps.

Eggs were laid on leaves of all ages, but in searching for eggs, I found more per leaf on vertical shoots off main trunks than on leaves on branches well out into the margins of the crown. For example, I watched one female lay three eggs in 12 minutes on a 30 cm long sucker shoot with 12 leaves at 4 m off the ground. Eggs were found on the leaves of plants as small as 1 m tall in heavily shaded understorey and on leaves in the margins of the crowns of trees 15 m tall (obtained by climbing trees and cutting down branches). I saw females ovipositing in the foliage of the crowns of the tallest trees.

Of a set of four eggs laid by one female on 2 July, one hatched on 5 July and the other three on 6 July. The larvae were maintained at room temperature (not very different from that in the Bosque Húmedo 3 km away) in large plastic bags and pupated on 24–26 July. Throughout the 20 day larval period, the caterpillars were given freshly cut *E. odorata* leafy branches every other day. Still maintained at room temperature, each pupa produced a normal-sized adult (3 males, 1 female) eight days after pupation.

The first instar larva begins feeding in a very distinctive manner, and the second instar continues in the same manner. It eats a ragged-edged hole from 0.1 to 0.3 cm² in area (Fig. 2c), through the leaf blade within about 5 mm of where the egg was laid, and then moves on and eats other similar holes in the same or nearby leaves. After molting to the third instar, the larva begins eating at the margin of the leaf tip. It consumes the blade down to the midrib on one side and may continue until a quarter or more of the leaf blade is missing. Even when many caterpillars were confined in the same rearing container on a small amount of foliage, there was no sign of gregarious or side-by-side feeding.

The second instar larva (Fig. 2c) is semi-translucent light green with two rows of massive spines dorsally and along each side. The spines are as long as the body is thick and have spinelets projecting out of them. The spines are nearly black and their contact point with the body wall is in the center of a whitish-blue ring (dorsal rows of spines only). This gives the impression that the caterpillar has a light gray stripe down its back. The head capsule bears dorsally a pair of wide-spread massive spines like those of the body, but they are curved slightly backwards. The spines on the last two segments are paler in color than are those on the remainder of the body. The head capsule is grayish-brown in color.

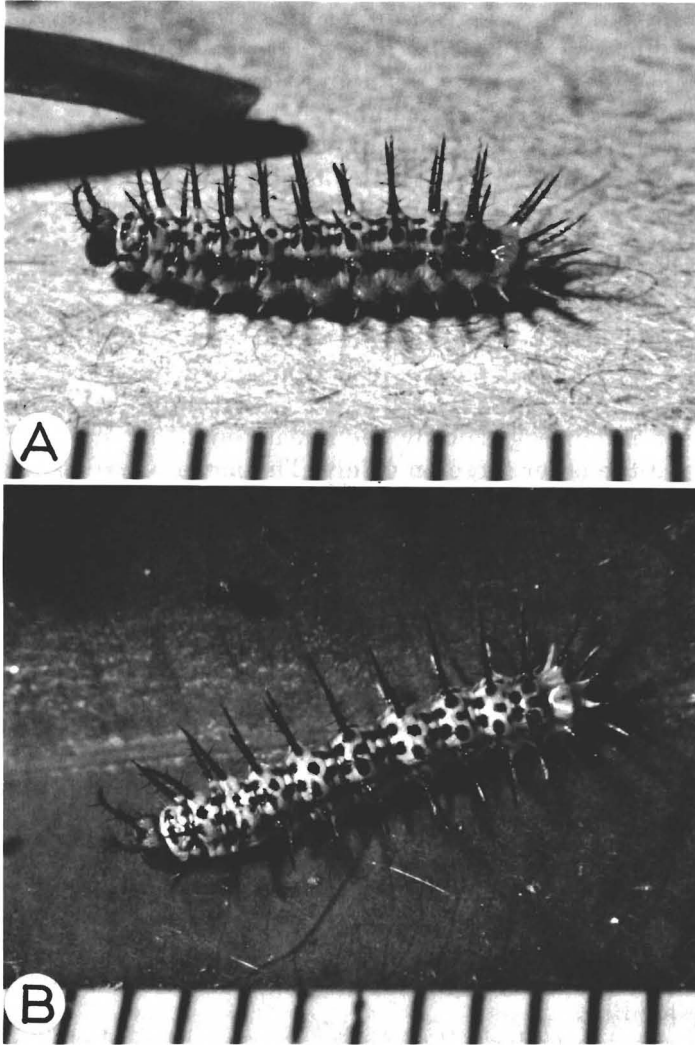


FIG. 3. **a**, third instar larva of *E. p. vulgiformis*, lateral view; **b**, third instar larva of *E. p. vulgiformis*, dorsal view.

The third instar larva gives the overall impression of being white with black spots and a yellow posterior (Fig. 3). The main body spines are black, as long as the body is wide, and bear conspicuous lateral spinelets. The spines do not urticate in this or any other instar. The head capsule spines are white, black-tipped, and curve backwards. The lateral spines on the posterior two segments are gray-white, and

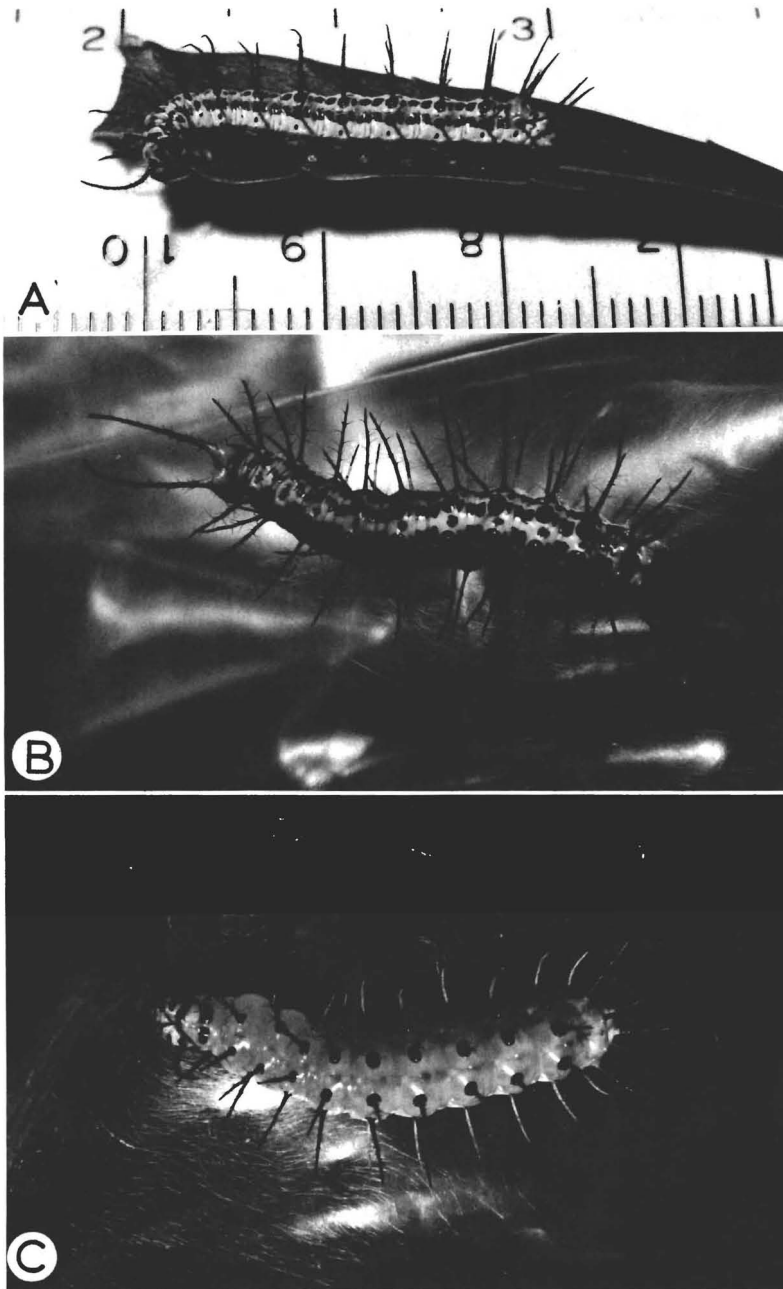


FIG. 4. **a**, fifth instar larva of *E. p. vulgiformis* shortly after molting from the fourth instar; **b**, fifth instar larva of *E. p. vulgiformis* after it has stopped feeding and begun spinning the pad on which it will pupate; **c**, pre-pupa of *E. p. vulgiformis*.



FIG. 5. Pupa of *E. p. vulgiformis*.

the ventral lateral spines along the entire body are more gray than black. The head capsule is black in color. Dorsally, each body segment is white with seven black dots, except that the penultimate segment is bright yellow dorsally. Laterally the caterpillar has a brownish-white stripe bordered by a white stripe ventrally.

The last (fifth) instar larva, while still feeding, is gray-white with a lateral pale yellow stripe (each spiracle covered by a black dot) and with a dorsal band of black dots (Figs. 4a, b). All spines are pure black, have lateral projections, and are as long as the body is thick.

The head capsule is black with white markings. The penultimate body segment is dorsally orange-yellow. Shortly before it becomes a non-feeding pre-pupa, the caterpillar is 22–25 mm in length.

The color change to the pre-pupa is dramatic. The pre-pupa has a bright yellow body with a white head capsule and black spines, except that the most lateral (ventral) set of body spines is white, and the base of each body spine is heavily ringed in black (Fig. 4c). The pre-pupa wanders for a few hours on the walls of the rearing container and then spins a silk pad as a pupation site, or it may change color after spinning the silk pad.

The pupa is white and sparsely flecked with small black specks, bears a pair of white but black-tipped spines ventrally on each of three abdominal segments, and bears a pair of long slightly hooked white spines with gray and yellow tips at the head end (Fig. 5).

In the forest I have found pupae on leaves of *E. odorata* and on leaves up to a few m from foliage of *E. odorata*.

In short, the immature stages of *E. p. vulgiformis* are in no morphological way exceptional in comparison with those of other heliconiines (Brown, 1981) but are distinguishable from those of other *Eueides* (K. Brown, pers. comm.). However, the larvae of *E. p. vulgiformis* are quite exceptional in their choice of food plants. This is the first unambiguous record of a heliconiine feeding on a plant outside of the Passifloraceae (K. Brown, pers. comm.). However, the species has not strayed far, since Turneraceae is closely related to Passifloraceae and Turneraceae is a well known host family for other Nymphalidae that are closely related to Heliconiinae (K. Brown, pers. comm.).

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LITERATURE CITED

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