

the only one sighted to date, was captured while it was visiting cold campfire coals on 14 July 1983, in Stanley Basin, Custer County, Idaho. Mr. Brown conveyed to me that he was unaware of any record of this aberrant form of *lutzi*.

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NATURAL HISTORY NOTES FOR *AELLOPOS CECULUS* (CRAMER) (SPHINGIDAE) IN NORTHEASTERN COSTA RICA

With the exception of one early study (Moss, 1920, Novit. Zool. 27:333-424) and one recent one (Haber & Frankie, 1983, *In* Janzen, D. H. (ed.), *Costa Rican natural history*, The Univ. of Chicago Press, Chicago, 816 pp.), little information has been published regarding the life cycle and associated natural history for Neotropical sphingids of the genus *Aellopos* (formerly *Sesia*). In this note I report additional information on the early stages and life cycle of *A. ceculus* (Cramer) (Fig. 1) at one locality in northeastern Costa Rica, including observations on oviposition, larval food plant, and caterpillar behavior. Previously, a description of the fifth instar larva and a larval food plant record had been reported by Moss (op. cit.) in Brazil.

The locality is "Finca La Tigra," near La Virgen (10°23'N, 84°07'W; 220 m elev.), Heredia Province and Sarapiquí District, Costa Rica. Information on this sphingid was generated by observing caterpillars in captivity and one instance of repeated oviposition attempts by one female in the wild. One fourth instar larva was reared in February 1984 to adulthood, and a second individual was reared from egg to adult in August-September 1984. Rearing was done by confining a caterpillar in a large, tightly closed, clear plastic bag containing fresh cuttings of the food plant.

On 4 August 1984 and 1600 h, a female *A. ceculus* alighted a total of five times on the very long (approx. 1.0 m) meristem of the rubiaceous vine-like shrub *Sabicea billosa* R. & S. Immediately prior to this time, I observed the same moth meander through dense pockets of secondary-growth vines on the opposite side of the roadcut from this individual of *S. billosa*. The moth fluttered and hovered in this vine patch for several minutes before darting across the gravelly dirt road to oviposit on *S. billosa*. Although the moth momentarily alighted at several places on the long meristem, including unfurling leaflets, close examination of the vine following the departure of the moth revealed only a single egg carefully positioned on the dorsal surface of a tiny leaflet near the very tip of the meristematic growth (Fig. 2). Even though freshly opened flowers were present on the older portions of this vine and on adjacent individuals of *S. billosa*, *A. ceculus* did not pause to feed. Careful examination of both meristems and older leaves and flowers on three *S. billosa* vines in the same area revealed no additional eggs or sphingid caterpillars. All three vines possessed very clear evidence of recent "explosive" growth of meristems, easily recognizable by the reddish tinge of these tissues.

The white 1.1 mm dia. spherical egg (Fig. 2) bears no external ridges or other sculpturing and hatches in five days. The first instar larva immediately devours the egg shell; the larva is 6 mm long × 1.2 mm thick, and pale, translucent green with a 1.1 mm long terminal black caudal "horn." About four days later, the caterpillar molts to the second instar; it is about 14 mm long at this time. Although very similar in overall appearance to the first instar, the caterpillar's body cuticle assumes a reflective luster and with faint evidence of a medial, dorsal pink band running the length (Fig. 2). Throughout all instars, the head capsule remains pale green in color but with a stripe pattern becoming evident by the third instar larval stage. The trunk region of both the first and second instars is dark green and covered sparsely with fine setae. The caudal horn in both instars stands



FIG. 1. Adult female *Aellopos ceculus* (Cramer), dorsal view, reared from the egg stage in this study. This specimen is deposited, along with the pupal shell, in the collections of the Milwaukee Public Museum.

almost perpendicular to the main axis of the body. The second instar lasts about five days and grows to 25 mm long.

The third instar larva (Fig. 2) assumes the basic color pattern and overall appearance which is retained until pupation. The third instar attains a maximum body length of 31 mm in about six days. The caudal horn is 5 mm long, deflected posteriorly, and reddish. The spiracles are also ringed in red. The broad dorso-medial band running lengthwise is faintly edged in white. This composite band begins on the second thoracic segment but becomes very pronounced on the abdominal segments. Laterally the trunk region is marked with a series of seven composite, oblique bands, reddish anteriorly and white posteriorly. These bands appear "white" even though they are actually composites of two colors (Fig. 2). Laterally, each of these composite oblique bands crosses three adjacent body segments and fuses into the dorso-medial line on the third segment (i.e., posterior-most) in such a triplet. Adjacent oblique bands overlap considerably in the segments bearing them (Fig. 2). All abdominal segments bear multiple vertical rows of pronounced white studs, readily seen with a 10 \times hand lens; these markings are also present on the thoracic segments, but they are less pronounced. The fourth and fifth instars are virtually identical in color patterns to the third instar. By the time of pupation, the caterpillar is 51 mm long; the overall duration of the caterpillar stage is 28 days.

A greenish prepupal stage lasts about three days, and the dark brown pupa measures 31 mm long \times 9 mm laterally through the wing pad (thoracic) area. In the rearing study, the pupa was formed in the folds of dampened paper towels at the bottom of the plastic



FIG. 2. Larval food plant, oviposition, and early stages for *Aellopos ceculus* at "Finca La Tigra," near La Virgen, Sarapiquí District, Costa Rica. Top two photographs: the larval food plant, *Sabicea billosa* R. & S. (Rubiaceae) showing the long meristem and terminal leaflet used as an oviposition site (left), and position of the egg on the dorsal surface of an unfurling meristematic leaflet (right). Left column below these photographs: close-up view of the egg, and second instar larva (dorsal view) and resting on ventral midrib of meristematic leaf; third instar larva, lateral view, showing pattern of markings and studded rugosity of the cuticle (right); also resting on a midrib of a food plant leaf.

bag containing the food plant. When handled, the pupa quickly responds with violent movements of the abdominal segments. The pupa stage lasted 22 days for my sample of $N = 1$ individual reared from egg to adult. A pupa obtained in February 1984 from a caterpillar discovered in the fourth instar lasted 17 days. The individual *A. ceculus* obtained from the complete rearing (Fig. 1) was a female. This individual has a wingspread of 39 mm and a body length of 25 mm. A detailed description of the adult for this species (under *Sesia*) is given in Seitz (1924, *Macrolepidoptera of the World*, vol. 6, A. Kernan, Stuttgart, 501 pp.).

Following the devouring of the egg shell, the first instar larva positions itself along the midrib of the ventral surface of a reddish meristematic leaf. The caterpillar throughout all five instars perches on the midrib of a leaf and appears very cryptic in this manner. Until the latter half of the third instar, the caterpillar feeds exclusively on reddish, soft meristematic leaf tissues and not on the greener, mature leaves of *S. billosa*. Feeding appears to occur in both day and night.

This sphingid is generously distributed geographically from Mexico to southern Brazil (Seitz, op. cit.). Moss (op. cit.) reported two different Rubiaceae as larval food plants in Brazil, including *Sabicea*. Moss reported that different color morphs of the caterpillar are associated with the two different food plants, and the description for the *Sabicea*-associated form matches that reported here for the Costa Rican population. One interesting difference, however, is that Moss reported *Sabicea*-associated caterpillars to possess chestnut-red lateral stripes, while my individual clearly had more whitish stripes. Haber and Frankie (op. cit.) also note that the caterpillars of *A. titans* Cramer are dimorphic in color. Larval descriptions and food plants for other species of *Aellopos* are summarized in Hodges (1971, *The moths of America north of Mexico*, Fasc. 21, Claxsey, London, 158 pp.). But, Hodges (op. cit.) also reports that descriptions of early stages and associated natural history data are poorly known for some species. In Costa Rica, *A. ceculus* has previously been reported for a different, lower-elevation locality in the Sarapiquí District, "Finca La Selva," about 25 km from "Finca La Tigra," and it is one of five species of the genus known to occur in Costa Rica (Haber, 1983, *In* Janzen, D. H., op. cit.). Interestingly, *A. ceculus* is the only member of the genus reported from the Sarapiquí District (Haber, op. cit.).

Oviposition behavior in the late afternoon hours may be part of a more general diurnal pattern of adult activity in this sphingid in which activities are concentrated near dusk (e.g., Haber and Frankie, op. cit.). Although *Aellopos* adults may feed on the flowers of their larval food plants (Haber and Frankie, op. cit.), this behavior was not observed in my very brief study, even though flowers were present on the *S. billosa* vines examined. And while most sphingids, including *Aellopos*, presumably place their eggs on the undersides of leaves on the larval food plant (e.g., Haber & Frankie, op. cit.), this was not the case for *A. ceculus* in the present study, albeit a very limited sample. *Aellopos ceculus* gravid females in search of egg-placement sites, as well as other sphingids in the Neotropical Region, may opportunistically exploit meristematic tissues of larval food plants proliferating at certain times of the year. These tissues may serve as highly suitable oviposition sites in that newly hatched caterpillars are placed in close spatial proximity to soft, digestible plant tissues under these conditions. Since there is little evidence indicating that Neotropical sphingid adults or their caterpillars are unpalatable as a consequence of larval food plant selectivity (Haber & Frankie, op. cit.), observed oviposition preference by *A. ceculus*, and perhaps other sphingids, for seasonally available meristematic tissues may indicate a facultative form of natural selection permitting these herbivorous organisms to exploit the most energetically cost-efficient food plant tissues.

Susan Borkin and Joan Jass discovered the *A. ceculus* caterpillar in February 1984, and they shared their observations with me. Luis Diego Gomez of the Herbarium, National Museum of Costa Rica, identified the larval food plant based upon the examination of extensive vegetative material as well as flowers. Mel Scherbarth photographed the adult moth illustrated in this note.

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