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TYPE DESIGNATION AND LATE LARVAL STAGES OF *HOLOPHAEA VESTA* (EREBIDAE: ARCTIINAE) IN SURINAME

Additional key words: Arctiini, Euchromiina, *Commelina*, Surinam, Neotropics

Holophaea vesta (Möschler, 1877) (Erebidae: Arctiinae: Arctiini: Euchromiina) is distributed in Guyana, Suriname, French Guiana and Brazil (Hampson 1898, Draudt 1917). In French Guiana, the species is widely distributed and occurs throughout the year (Cerdeña 2008). We designate and illustrate the type specimens and describe the late larval stages from Suriname.

On 22 July 2015 at Zanderij I, Suriname (5°28'1.52" N, 55°12'23.22" W, 15 m asl, about 42 km S of Paramaribo), the second author noted a dark, setose larva with white markings on its back walking rapidly among low vegetation along a track through savanna forest. The larva was collected and reared to an adult in Paramaribo according to standard methods. Larval length was measured from the anterior end of the head capsule to the end of the anal plate. Genitalia of the imago were prepared according to standard methods. The imago and genital preparation were deposited in

the collection of Naturalis Biodiversity Center, Leiden, the Netherlands. Photographs of the early stages were made with a Nikon D300s camera, an AF Micro Nikkor 105 mm 1:2.8 D lens and an SB-800 flash. In September 2015, a search was made for possible types of *H. vesta* in the Museum für Naturkunde, Berlin (MNB), as it houses the Möschler collection. Specimens were photographed with a Nikon D 800 and an AF-S Micro Nikkor 105 mm 1:2.8G lens on a tripod with a standard gray card as background. Photographs were made in NEF-format and without adjustments converted to TIF-files in the same color space.

Type designation. In his description of *Hysia vesta*, Möschler did not designate any type specimens, but stated “.. this species, of which I own two similar specimens, ..” (Möschler 1877, p. 637; translation from German by first author). The accompanying drawing of the species (Möschler 1877, plate VIII, figure 7) is shown in Fig. 1i. Kirby (1892) placed it in the genus

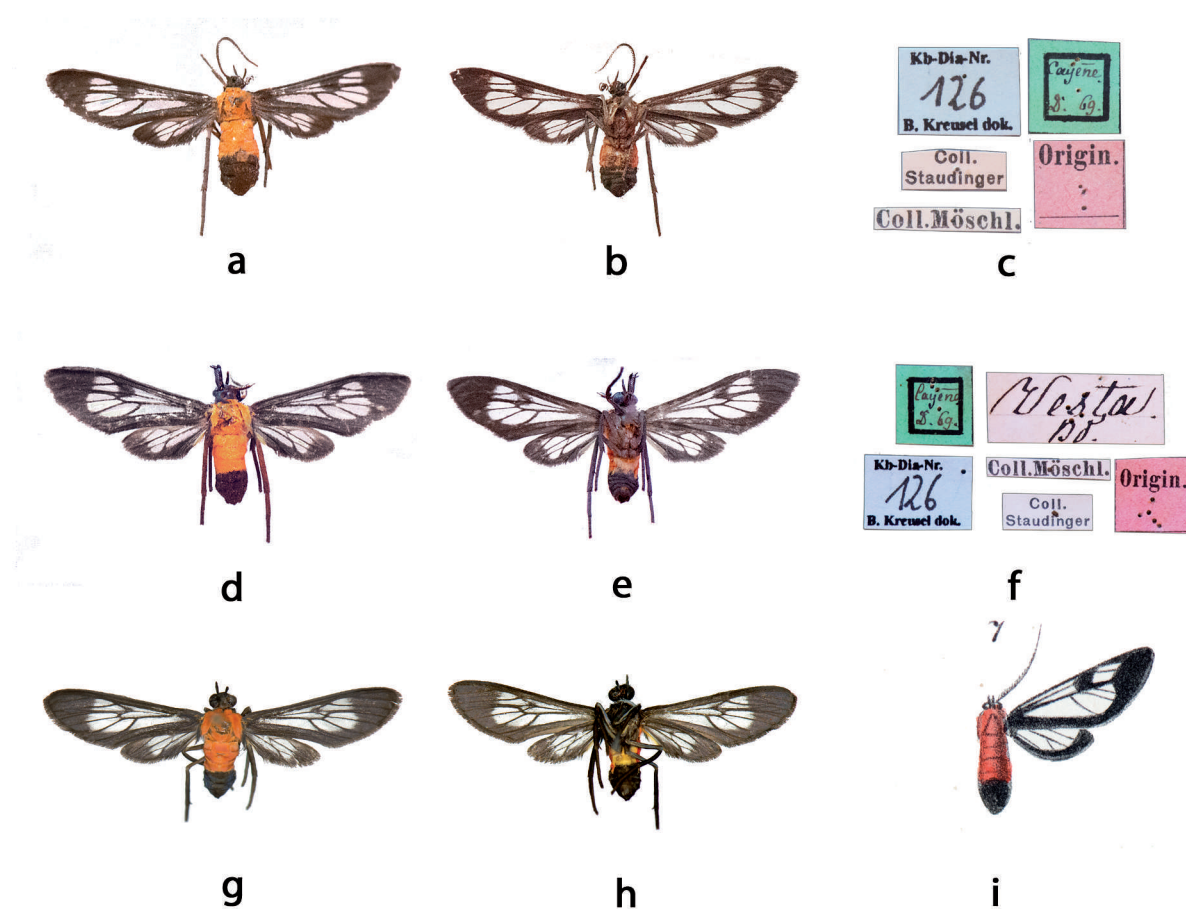


FIG. 1: Specimens and illustration of *Hysia vesta* (now in the genus *Holophaea*) (Erebidae: Arctiinae). **a – c**: designated lectotype (forewing length 12 mm, wingspan 26 mm) in the Museum für Naturkunde, Berlin; **d – f**: designated paralectotype (forewing length 13 mm, wingspan 26 mm) in the Museum für Naturkunde, Berlin; **g – h**: reared specimen (forewing length 11 mm, wingspan 24 mm) from Zanderij I, Suriname; **i**: drawing of *Hysia vesta* (plate VIII, figure 7) in the type description (Möschler 1877). **a, d, g**: dorsal view; **b, e, h**: ventral view; **c, f**: labels on pin of specimen.

Eunomia and Hampson (1898) in the newly erected genus *Holophaea*, which is its current taxonomic status. In the MNB collection, two specimens of *H. vesta* are present that can be attributed to Möschler (Fig. 1a–c and Fig. 1d–f, respectively). Both have a label “coll. Möschl.”, a label “coll. Staudinger”, a pink label “Origin.”, and a rectangular green label “Cayene D. 69” (in all probability Cayenne as French Guiana was called at the time, Datum (date) 1869); one of the specimens has an additional label “Vesta. Bd.” (Vesta Boisduval) (Fig. 1c, f). The small, rectangular labels are Möschler’s: green, quadrangular or rectangular with an inner square drawn with black or (in other specimens) gold-colored ink. After Möschler’s death in 1888, Staudinger bought his collection and incorporated it into his own (Staudinger 1889). The pink labels “Origin.” are the characteristic type labels of Staudinger (Wolfram Mey,

MNB, pers. comm.). The figure in Möschler’s paper (Fig. 1i) has a greater resemblance to the first (Fig. 1a, b) than to the second (Fig. 1d, e) specimen of *Hysia vesta* in the shape of the black patch at the end of the discal cell and the slightly convex orange-black demarcation at the end of the abdomen. In order to stabilize the nomenclature of the taxon and in accordance with recommendation 74B of the ICZN (ICZN 1999), we hereby designate the specimen figured in Fig. 1a–c as the lectotype of *Hysia vesta* (now in the genus *Holophaea*). The specimen illustrated in Fig. 1d–f is the paralectotype. The implication is that the type location is not Suriname, as suggested by the title of Möschler’s paper, but French Guiana.

The host plant (Fig. 2a, b). As the larva was not on a plant when found, several plants were offered to it. It accepted *Commelina* cf. *erecta* L. (Commelinaceae),

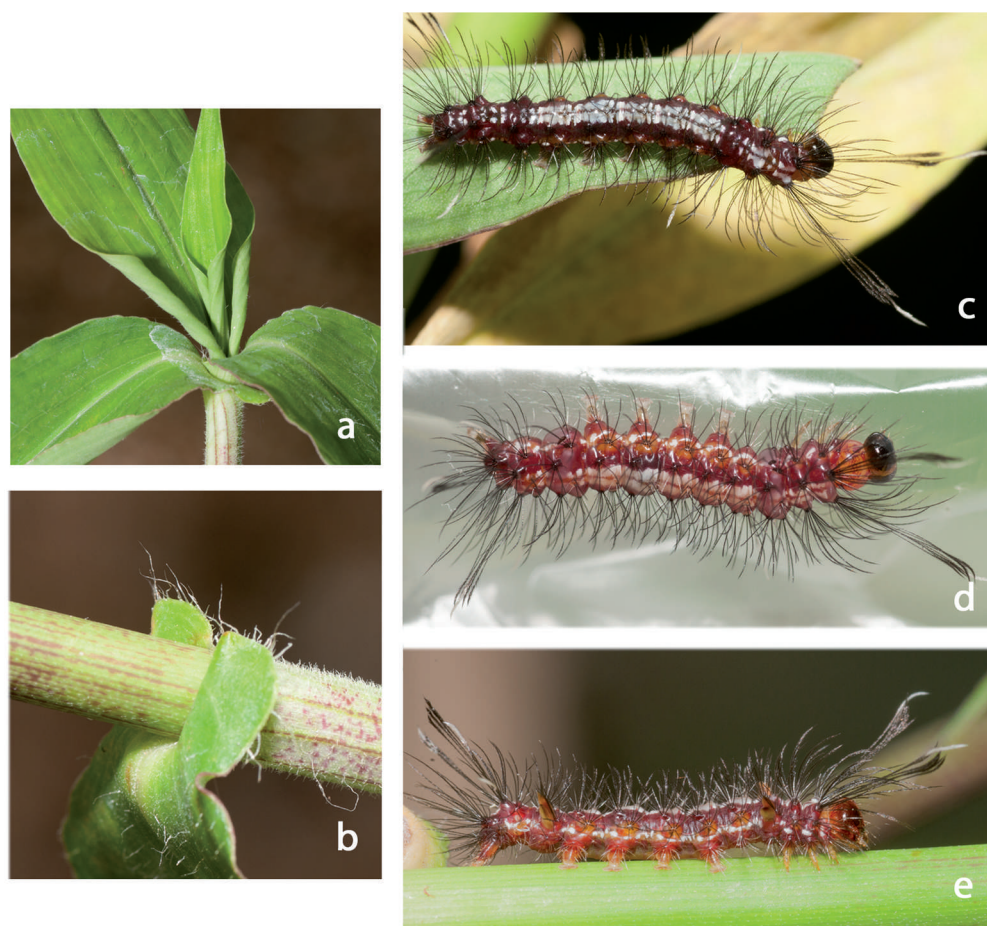


FIG. 2: Host plant and late larval stages of *Holophaea vesta* (Möschler, 1877) in Paramaribo, Suriname. **a:** *Commelina* cf. *erecta* L., upper end of stem with leaves; **b:** *Commelina* cf. *erecta* L., auriculate leaf base with white hairs, clasping the stem; **c:** antepenultimate instar (12 mm), 23 July 2015; **d:** penultimate instar (16 mm), 2 August 2015; **e:** ultimate instar (18 mm), 4 August 2015, note black-tipped brown setal tufts on A1 and A7 (photographs JvdH).

known in Suriname as gado dede, a general name for all Commelinaceae (van Andel & Ruysschaert 2011). Description: Terrestrial, fleshy herb, ca. 40 cm high, stem with red dots, rooting at nodes. Leaf sheaths closed, with short, white hairs. Leaf base auriculate, clasping the stem, long white hairs on margins. Leaves simple, alternate, lanceolate. Flowers or fruits not seen on particular individual.

Antepenultimate instar (Fig. 2c). Overall impression of a dark purple larva with dorsal white markings and multiple verrucae bearing black barbed setae. Head: vertices orange-brown with reticulate black patterning on the dorsal anterior half, and rounded, ill-defined black patches laterally and dorsally nearly bordering intersegmental membrane; medially to stemmata an irregularly defined transverse black patch; epicranial and lateral adfrontal sulci light gray, the color on each side of these gradually changing into orange

brown; frons with irregular black patches apically and basally; clypeus yellow-gray; labrum cleft to about 10 % of its length, with vertical irregular black patches laterally, its lower end white-translucent, latero-inferior parts yellow; stemmata black; basal and middle segment of antennae translucent gray, terminal segment yellow with one long and one short white seta; mandibles light orange-brown, tip dark yellow. Cervical membrane light gray.

Ground color of thorax and abdomen dark red-purple, intersegmental membranes white. From T2 to A9 a longitudinal white dorsal band on either side of the middorsal line, consisting of irregularly formed, confluent patches. Also from T2 to A9 a subventral undulating white band, broken up into irregularly formed white spots, with its lower arches ventral to the lateral verrucae and the dorsal arches in the intersegmental area.

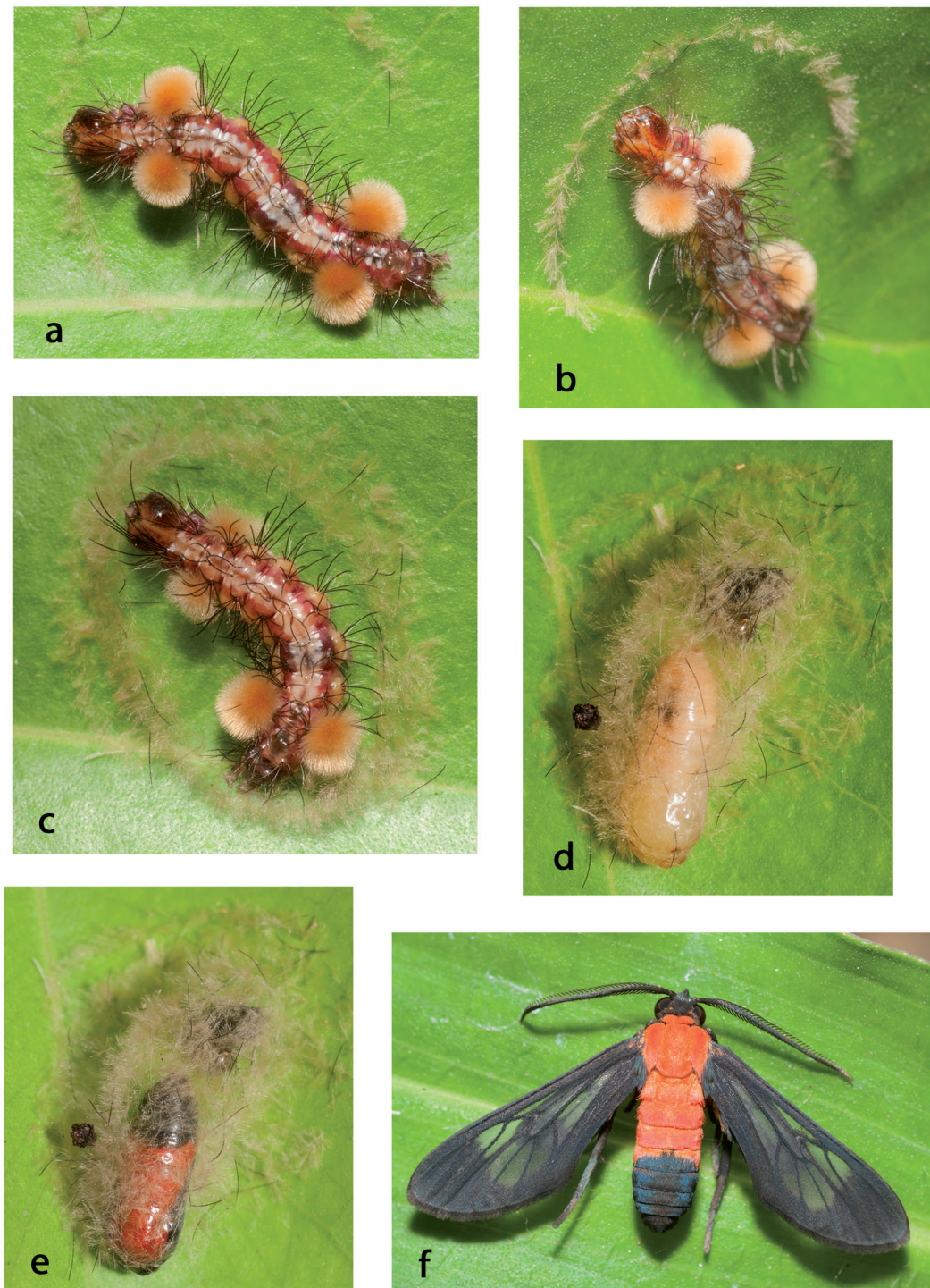


FIG. 3: Pupation of *Holophaea vesta* (Möschler, 1877) in Paramaribo, Suriname. **a**: prepupa constructing cocoon, note expanded A1 and A7 setal tufts (8 August 2015, 17.23 hrs); **b**: same, 17.36 hrs; **c**: same, 19.51 hrs; **d**: cocoon with pupa (11 August); **e**: cocoon with pupa one day before eclosion (16 August); **f**: imago (17 August 2015; forewing length 11 mm, wingspan 24 mm), note fresh orange-red color T1 – A4 (photographs JvdH).

T1 with prothoracic plate light brown to orange-brown with purplish reticulate patterning, length of plate about 80% of the segment. Area behind prothoracic plate with paired dorsal and subventral white spots. T1 also with a lateral small, black verruca and a larger subventral, purple verruca, each with black, non-barbed setae, and caudad to these an oblique white streak with its anterior end about midway between the lateral and subventral verrucae. T2 and T3 with paired white spots in the anterior third and the white dorsal band continuous in the caudal two thirds of the segment; the subventral band is reduced to an oblique white patch in the caudad half of the segments. Middle of T2 with a subdorsal back verruca with barbed black setae adjacent to the dorsal white band; most of these setae have a length of about three body segments, five are about five segments long and one, ending in a white plume, about seven segments. T2 also with a lateral verruca with barbed setae; subventrally and caudad to the lateral verruca, a black verruca with barbed setae. T3 as T2, but with oblique patch of subventral band smaller, the dorsal verruca without the five-to seven-segment-long setae and the lateral verruca with a red base.

Abdomen with prolegs on A3 – A6 and A10. Prolegs with elongate brown base with black or white, nonbarbed setae on pinacula; the planta is gray without setae; crochets heteroideous, arranged in mesoserries. A1 with white dorsal band strongly reduced to five pairs of white dots (one missing on the right-hand side), the caudal ones continuous with the anterior ones of A2; subventral white band reduced to white dots near intersegmental membranes; dorsally, at about 40% of the segment's length adjacent to middorsal purple line, a pair of small, black verrucae with short, unbarbed, black or white setae; subdorsally at about 70% of the length of A1, a larger, black verruca with barbed, black setae; laterally about midway of the segment, a prominent verruca with a purple base and long, black, barbed setae; slightly anterior to this, a subventral black verruca with barbed, black as well as white setae. A2 with prominent dorsal and subventral white bands, position of verrucae as A1, lateral verruca with red base, black barbed setae and one barbed, plumose, white seta. Coloration and verrucae of A3 – A6 as A2, setae on lateral verrucae all black. A7 with dorsal and subventral white bands broken into a series of white spots, position of verrucae as A1 – A6, lateral verruca with purple base and one white seta amidst black ones. A8 as A7, subdorsal verruca with one black, barbed seta ending in a white plume, length about 3.5 body segments, lateral verruca with similar seta about 2.5 segments long. A9 as A7 – A8, dorsal verrucae absent and all setae black. Anal plate purple.

When found on 22 July 2015, the larva measured 12 mm. The next days it fed normally. On 25 July, it was 16 mm. On 26 July, it left the foodplant and became inactive. It molted during the night of 27 – 28 July.

Penultimate instar (Fig. 2d). Similar to previous instar, but with base of T2 lateral verruca red and with oblique, oval black spot ventrocaudad of lateral verrucae of A1 and A7. On 28 July 2015, the newly molted larva was 13 mm, five hours later 15 mm. On 29 July it had resumed feeding, on 30 July it was 18 mm, on 31 July 19 mm. On 1 August, it measured 16 mm and became inactive. It molted in the early morning of 3 August.

Ultimate instar (Fig. 2e). Similar to previous instar, but with modification at the site of the lateral verrucae of A1 and A7: the base has become purple and the previous instar's black, barbed setae and black spots have been replaced by black-tipped tufts of short, orange-brown setae, directed dorsally, laterally and caudad; the distal ends of the tufts are pointed and the setae are adjacent to one another, possibly due to an adhesive secretion. On 3 August, the newly molted larva was 16 mm, ate its exuviae and in the evening resumed feeding. On 4 August, it walked about considerably, measured 18 mm and had returned to the host plant in the evening. During subsequent days, the larva remained on the host plant and fed both during the day and at night. On 5 August, its length was 22 mm.

Pupation and pupa (Fig. 3a-e). On 8 August, the larva was very active and walked about continuously. In the evening, its length was 11 mm, the long, plumose setae had fallen off and the setae of the orange-brown tufts on A1 and A7 had expanded. On the upperside of a leaf, the larva deposited the A1 and A7 setae with the barbs directed preferentially outwards from the cocoon-to-be and loosely secured them with silk during a series of circular movements. The inner layers mainly consisted of white setae arranged parallel to the wall. Thereafter, the roof was spun in a similar fashion. Detached black, barbed setae were loosely interspersed in the walls of the rather flimsy cocoon. Spinning the cocoon took about six hours. The pupa was cream-colored, shiny, rounded anteriorly and measured 8 mm; the exuviae had become detached from its caudad end. On 16 August the pupa had turned red and black.

Imago (Fig. 1g, h and Fig. 3f). In the morning of 17 August, a male *H. vesta* eclosed. Description (after Hampson (1898, p. 265), the types and eclosed specimen): Forewing length 11–13 mm, wingspan 24 – 26 mm. Head black. Antennae bipectinate. Palpi porrect, slightly downcurved, extending well beyond frons, distal two segments covered with short dark gray-brown setae, basal segment with longer dark brown, protruding setae. Proboscis orange-brown, 3 mm.

Thorax dorsally orange-red, laterally black and ventrally light gray covered with short, black setae. Patagia orange-red with laterally long, black setae, forming a laterocaudal plume. Inner side of femora and/or tibiae light gray. Tibial spurs short, tibial spur formula 0-2-2. The rostral four abdominal segments orange-red, the caudal ones black. Wings hyaline with wide black margins and black veins, apex of both wings broadly black. Forewing with vaguely delimited black (post)discoidal spot; there is considerable variation in the extent of black scaling, even between the forewings of the same specimen. The male genitalia of the reared specimen are identical to the ones figured in Cerda (2008) from French Guiana.

Duration of stages.

Antepenultimate instar at least six days, penultimate instar six days, ultimate instar six days, prepupa six hours, pupa eight days.

The larva showed a behavior associated with individual polyphagy: when it was found, it was not on any host plant and in the breeding cage it was regularly on the move and on other plants. In the Arctiinae, individual polyphagy is related to a specialized feeding pattern, called specialized generalism, in which host plant acceptance or rejection is determined by the presence or absence of secondary plant metabolites, notably pyrrolizidine alkaloids (Singer & Bernays 2009). Reluctancy of the larva to feed on other plants as well as the potential presence of antimicrobial secondary metabolites, found in several *Commelina* species that are commonly used as herbal medicine (Ibrahim et al. 2010; Kim et al. 1999), may be indicative of specialist generalist feeding and thus of pharmacophagy. The ultimate instar's barbed setae on the A1 tufts and, to a lesser extent, on the A7 tufts, were deposited in the cocoon wall and likely provided mechanical protection for the pupa. In view of the pupation's long duration, the vulnerable position on top of a leaf and the loss of protective setae in the prepupal stage, the A1 and A7 tufts may also have a role in chemical defence. Additional studies are required to understand more about the early instars, possible larval variation and larval behavior in relation to diet and defense.

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