

The biology and life history of *Athyma gutama canlaonensis* Okano & Okano, 1986 (Lepidoptera: Nymphalidae: Limenitidinae) from Negros island, Philippines

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Abstract: The immature stages of the Philippine endemic butterfly *Athyma gutama canlaonensis* Okano & Okano, 1986 are described and illustrated from specimens collected on Mount Talinis, Negros island, Philippines. This is the first detailed documentation of the biology and life history of the species.

Key words: Immature stages, larva, Oriental, ovum, pupa, Rubiaceae, *Uncaria*

INTRODUCTION

The Philippine endemic sergeant butterfly *Athyma gutama* was described by Moore in 1858 from specimens collected in Luzon. There are five subspecies distributed in the country (Treadaway & Schroeder, 2012): ssp. *gutama* Moore, 1858 occurs in Babuyan, Luzon, and Mindoro; ssp. *canlaonensis* Okano & Okano, 1986 occurs in Negros; ssp. *cebuensis* Okano & Okano, 1986 occurs in Cebu; ssp. *sibuyana* Tsukada, 1991 occurs in Sibuyan; and ssp. *teldeniya* Fruhstorfer, 1912 occurs in Balabac, Calamian, and Palawan. This paper describes the biology and life history of *Athyma gutama canlaonensis* from Mount Talinis, Negros island, Philippines. Wu *et al.* (2019) recently synonymized *Tarattia* Moore, 1898, a name used by a number of earlier authors (e.g., Tsukada, 1991; Treadaway & Schroeder, 2012).

There are now 18 species of *Athyma* Westwood, [1850] including *A. gutama* Moore, 1858 and *A. cosmia* Semper, 1878 in the Philippines, of which 13 species are endemic to the country. Some species are highly variable in wing pattern, which has resulted in the synonymy of several subspecies names (Treadaway & Schroeder, 2012), such as with *A. maenas semperi* Moore, 1896 (*A. m. kikuchii* Tsukada & Kaneko, 1985 and *A. m. bohollensis* Okano & Okano, 1990 are synonyms) and *A. cosmia cosmia* Semper, 1878 (*A. c. samarensis* Jumalon, 1975, *A. c. tawitawiensis* Medicielo & Hanafusa, 1994, and *A. c. tenebrosa* Murayama, 1982 are synonyms). Investigating the immature stages of all the species, as well as the subspecies, may shed further light on the taxonomy and systematics of this genus (Kirton *et al.*, 2020).

MATERIALS AND METHODS

Study Site and Specimens

The samples were collected at a private property along the Apolong Trail in the municipality of Valencia in May 2020

(end of dry season). The trail is well-known to hikers as it leads towards the peak of Mount Talinis. The elevation of the site is around 600 m, with primary and secondary forests and some scattered small-scale agricultural areas. The eggs and a pupa were collected from the hostplant, which is common in the area.

Rearing

Rearing was carried out under ambient indoor conditions with as-needed use of an air conditioner. Cut stems bearing leaves of the hostplant collected from the same site were placed in a water bottle and replaced regularly to maintain freshness. The two emerging adults, male and female, are preserved as vouchers in the Biology Department museum at Silliman University, Dumaguete City, Philippines.

RESULTS

Description of Immature Stages

Ovum. Figure 1. Pale green in color when found, turning brownish just before emergence. Egg dome-shaped with concave indentions that have hexagonal ridges and fine seta-like projections arising from each corner. Duration: 3 days.

First instar larva. Body brownish in color and covered with minute pale spots (Figure 2), each centered with a tiny seta. Head capsule a darker shade of brown with a scattering of minute setae. Duration: 3 days.

Second instar larva. Body dark brown (Figure 3), becoming lighter as caterpillar grows, with dorsolateral, lateral, and subspiracular tubercles bearing stubby, branched scoli. Head capsule brown with numerous lighter-colored chalazae and adjacent tiny setae. Duration 3 days.

Third instar larva. Structurally similar to second instar (Figure 4), but with scoli-bearing body tubercles and head-capsule chalazae much larger. Body and head capsule colors similar to that of second instar, with paler dorsal suffusion visible on last six abdominal segments and whitish ends to subspiracular scoli. Duration 3 days.

Fourth instar larva. Colors as in previous instar (Figure 5), with all body scoli and head chalazae distinctly longer, frons white, and dorsal suffusion of abdomen more pronounced, especially on 5th abdominal segment. Duration ±3 days.



Figures 1-13. 1-12. *Athyma gutama canlaonensis* immature stages. 1. Ovum, dorsal view. 2. Dorsolateral view of newly emerged first instar larva eating leaf trichome en route to apex. 3. Second instar larva showing feeding behavior. 4. Lateral view of third instar larva resting on stripped midrib of leaf strengthened with silk. 5. Lateral view of fourth instar larva. 6-7. Late fifth instar larva, dorsal [6] and lateral [7]. 8. Dorsal view of fully mature fifth instar larva. 9. Dorsal view of wandering larva shortly before entering prepupal stage. 10-11. Pupa, dorsal [10] and lateral [11]. 12. Newly emerged adult ♀. 13. Hostplant: *Uncaria* sp. (Rubiaceae).

Fifth instar larva. Freshly molted caterpillar is initially coral-pink in color, covered with paler, well-developed body chazae, branched scoli, and head chazae. A black rectangular patch is present on 5th abdominal segment. Over course of 48 hours, front of head capsule and ends of dorsolateral scoli turn black, body gradually changes to darker shades of green, and black dorsal patch becomes an auburn-colored band (Figures 6-7). At this time, mature caterpillar has reddish dorsolateral scoli, while subspiracular scoli are light orange-yellow, with short abdominal dorsolateral scoli on first segment. Scoli on thoracic segments 2 and 3 are longest, with white underside extending up to spiracular line (Figure 8). Duration 4.5 days.

Prepupa. Body takes on a colorful, variegated appearance, gradually fading to dull peach as fully grown caterpillar searches for a safe place to pupate (Figure 9). Duration 1 day.

Pupa. Newly formed chrysalis is salmon-pink in color, turning after several hours to brown with gold and silver reflective patches as it hardens. Black-tipped cephalic projections are long, tapering, and point sideways. A lateral protuberance and prominent ridge occur along edge of wing cases. A series of mid-dorsal keels are present: a short, rounded one on first thoracic segment; an elongated, thornlike one on first abdominal segment; and three increasingly longer truncated ones posteriorly on abdominal segments 4-6 (Figures 10-11). Abdominal segments 1, 2, and 3 bear single pairs of small conical tubercles. Duration 7 days.

Behavior: In the field, eggs were laid singly on the upper surface of mature hostplant leaves mostly near the tip, with an occasional leaf having two eggs. The newly hatched larva first fully consumed its empty eggshell, leaving only the basal disc, and then moved along the leaf margin eating trichomes (Figure 2) until it reached the apex. At the leaf apex, it began feeding and constructing what is commonly referred to as a "frass chain", a survival strategy practiced by at least 47 other nymphalid genera worldwide (K. Wolfe, unpublished data). When the young caterpillar was transferred to a fresh leaf, it again followed the margin to the tip where it started a new frass chain by methodically incising apical portions of the leaf on alternating sides of the midrib and then consuming the resulting separated lamina. This defensive behavior continued through the fourth instar and included fecal pellets being silked together where the stripped midrib met the leaf lamina (Figure 3). When not feeding or disturbed, the young caterpillar retreated to its protective perch, while the caterpillar in its last instar typically rested on the upperside of leaves, both stages arching the anterior part of their body upwards when disturbed. In captivity, pupation occurred on the margin of a hostplant leaf, while in the wild, the under surface of a midrib or lateral vein was chosen, with the pupa hanging vertically by its cremaster from a silken pad. Total developmental time from collection of egg to eclosion of adult (Figure 12) was about 28 days at ambient room temperature.

Habitat

The species is found in primary and secondary forests at mid-elevation on Mount Talinis, although adults were mostly observed flying in cleared areas or trails where the hostplant is common. In Palawan, *A. speciosa* Staudinger, 1889 occurs in low to high elevation areas, while *A. gutama* is found at >500 m (Igarashi & Fukuda, 2000). *Athyma saskia* Schroeder & Treadaway, 1991 is the most recently described species from the genus in the Philippines.

Hostplant

The hostplant is an unidentified species of *Uncaria* Schreb. (Rubiaceae) (Figure 13). The butterfly is also known to feed on *Wendlandia luzoniensis* DC. (Rubiaceae) in Palawan (Igarashi & Fukuda, 2000).

DISCUSSION

The lack of life history documentation and illustration for other species and subspecies indicates that there is still a need to document the life histories of Philippine butterflies for comparative studies. The morphology of the later larval stages of *Athyma gutama canlaonensis*, which is a common forest butterfly, is similar to the general morphology of other *Athyma* species in Asia as illustrated by Igarashi & Fukuda (2000), such as *A. selenophora* (Kollar, [1844]), *A. speciosa*, *A. cama* Moore, [1858], *A. libnites* (Hewitson, 1859), and *A. nefte* (Cramer, [1780]). Comparison with ssp. *teldeniya* from Palawan, illustrated by Igarashi & Fukuda (2000), suggests that the morphology of the immature stages, such as the dorsal projection of the first abdominal segment of the pupa, may be different even at the subspecies level. There is also a possibility that diet and weather or seasonality, such as wet and dry periods, may affect the appearance of the developmental stages of the butterfly.

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