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FINAL INSTAR CATERPILLAR AND METAMORPHOSIS OF *AMBLYCHIA HYMENARIA* (GUENÉE) IN SINGAPORE (LEPIDOPTERA: GEOMETRIDAE: ENNOMINAE)

T. M. Leong* and **Aminurashid**
Central Nature Reserve, National Parks Board,
601 Island Club Road, Singapore 578775, Republic of Singapore
(**Corresponding author*: leong_tzi_ming@nparks.gov.sg, banjarana@gmail.com)

INTRODUCTION

The geometrid moth, *Amblychia hymenaria* (Guenée, 1857), belongs to tribe Boarmiini of the subfamily Ennominae, and occurs from India to Sundaland, as well as Sulawesi (Holloway, 1993). The species was previously referred to as *Elphos brabanti* Thierry-Mieg, 1893 (e.g., in Barlow, 1982), but this name has since been relegated to being a junior synonym. In Borneo, at least six representatives of the genus *Amblychia* Guenée have been documented (Holloway, 1993), but only two species have been reported from Singapore thus far, namely *Amblychia angeronaria* Guenée, 1857, and *Amblychia hymenaria*. With particular reference to the latter species, a brief account of its mature larva, pupa and emergent adult is presented here from the Central Catchment Nature Reserve in Singapore. This is possibly the first time that this species' diagnostic caterpillar has been described and illustrated.

Fig. 1. Final instar caterpillar of *Amblychia hymenaria* on its hostplant, kayu manis hutan (*Cinnamomum iners*), encountered on the night of 13 May 2009 (ca. 2000 hours). Its body length was 60 mm, and width, 7 mm.

OBSERVATIONS

A final instar geometrid larva was encountered on the evening of 13 May 2009 (ca. 2000hrs) along a forest edge in the MacRitchie Reservoir forest, perched on the younger leaves of its hostplant, kayu manis hutan (*Cinnamomum iners*; family Lauraceae), at about 1.8 m above ground. It was collected for rearing to determine its identity. The caterpillar had a dark brown ground colour, with scattered, irregular patches of light green along its flanks (Figs. 1, 2). Its spiracles were peach-coloured and clearly outlined with black. Its body length was 60 mm, and width, 7 mm. There were sparsely distributed tubercles over its body, each tipped with short setae. These tubercles were more pronounced towards the anterior of the caterpillar. Its head had a fine, granular appearance and also bore short setae (Fig. 2). The thoracic legs were pale grey, with dark brown bands and dots.

On the 19 May 2009, the caterpillar exhibited its first prepupal behavior, with the cessation of feeding, accompanied by the darkening and constriction of its body. On the 20 May 2009, further contraction of the larva was observed. By the morning of 21 May 2009, pupation was eventually completed and the exuvia of the final instar was subsequently preserved. The pupa had a reddish brown colour and was 27 mm long and 9 mm wide (Fig. 3). Its wing cases had a rather inflated appearance, especially when viewed from the side (Fig. 3b). On its dorsum, a symmetrical arrangement of low, short spines were visible upon close inspection (Fig. 3c). At its posterior end, the cremaster consisted of a thick, swollen base that tapered abruptly to a thin, straight stem tipped with two sharp spines.

On the 30 May 2009, symmetrical patterns began to be discernible beneath the wing cases. By the 31 May 2009, these wing patterns had intensified and the pupa was photographed (Fig. 4). On the very same night (ca. 2200 hours), the moth successfully emerged and was found to be a female (Figs. 5–7). Its size, form and patterns agreed most closely with the illustration of a female *Amblychia hymenaria* in Holloway (1993: Pl. 12: moth no. 4). Its upperside pattern was a composite of black, ashy grey, light khaki and white markings (Fig. 5). Its body was mostly ashy grey, with symmetrical black markings. Its underside differed significantly from its upperside patterns, exhibiting instead a contrasting combination of bold and beautiful, black and white markings (Fig. 6). Just posterior to its proboscis, a pale, beige ‘collar’ colouration was noticeable. Its antennae were straight and non-pectinate, indicative of a female (Fig. 7).

Fig. 2. Lateral close-up of head and thoracic region of the larva.

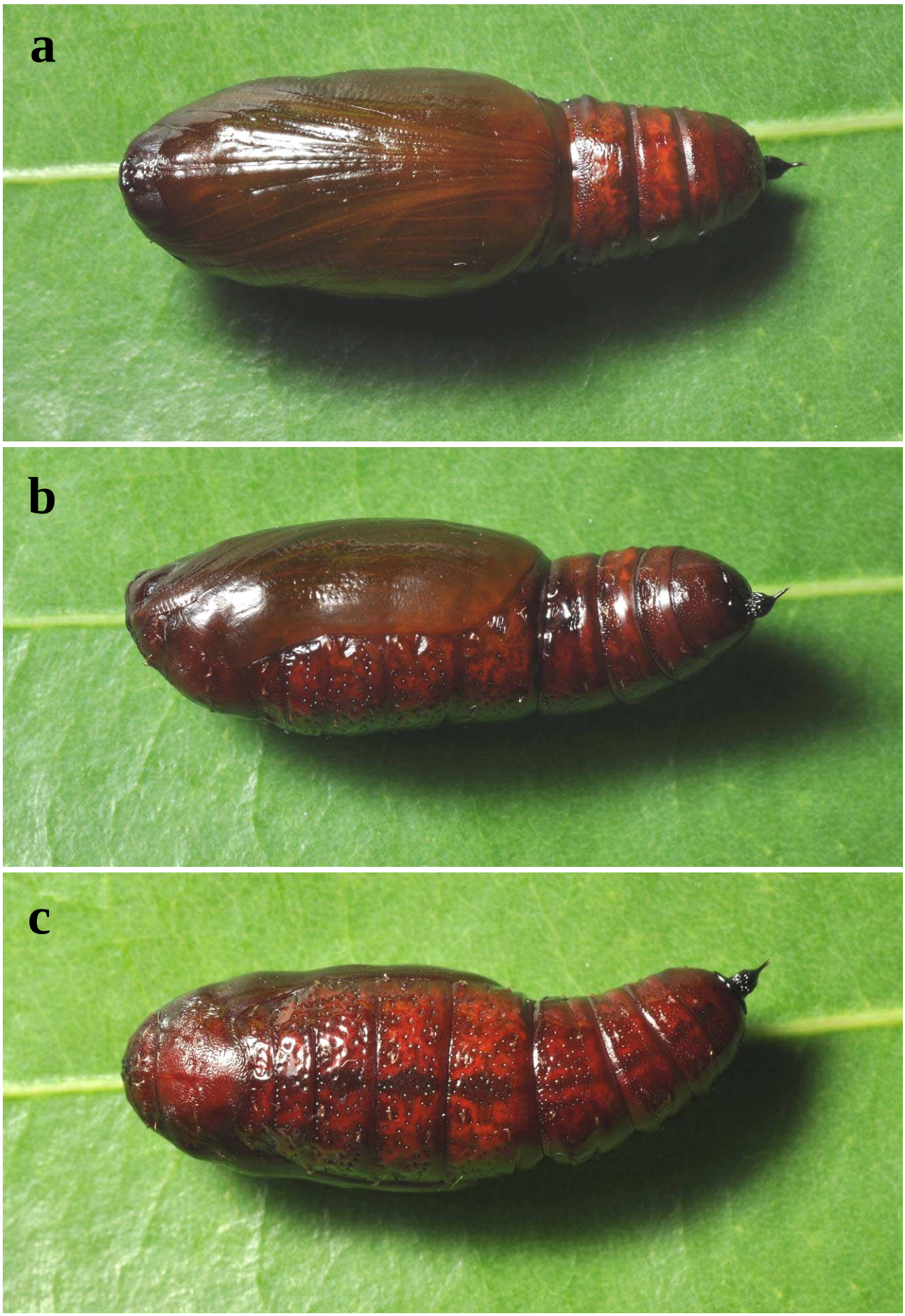

Fig. 3. Ventral (a), lateral (b), and dorsal (c) perspectives of the pupa (27 mm × 9 mm). The process of pupation had been completed by the morning of 21 May 2009.

Fig. 4. Pre-emergent pupa, photographed on the morning of 31 May 2009 (ca. 1130 hours). Note symmetrical markings on its forewings, clearly visible at the wing cases. Compare with Fig. 3a.

Fig. 5. Dorsal view of freshly emerged female individual (ZRC.LEP.159, body length: 27 mm, forewing length: 42 mm), eclosed from its pupa on the night of 31 May 2009 (ca. 2200 hours).

Fig. 6. Ventral view of freshly emerged female (ZRC.LEP.159).

Fig. 7. Ventro-lateral view of freshly emerged female *Amblychia hymenaria* (ZRC.LEP.159).

When placed onto the bark of a tree, the effective camouflage capabilities of its upperside patterns could be better appreciated (Fig. 8). The female moth and its pupal case were subsequently preserved as a voucher specimen in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore (ZRC.LEP.159, body length: 27 mm, forewing length: 42 mm). This specimen possibly represents the first local voucher of *Amblychia hymenaria* in the ZRC. TML previously encountered a male example of this species along Sime Track, MacRitchie Reservoir forest, on 21 Feb.2009 (ca. 2355 hours), resting on a leaf above head level (Fig. 9). This moth was photographed, but not collected. In the ZRC, there is a historical specimen of *Amblychia hymenaria* (ZRC.LEP.158, female, body length: 25 mm, forewing: 47 mm) collected by H. M. Pendlebury on 29 Dec.1927, in Kuala Lumpur, Selangor, Peninsular Malaysia. For Singapore, the other congener, *Amblychia angeronaria*, is thus far represented by only a single specimen (ZRC.LEP.161, male, collector unstated, 3 Jun.1993, Rifle Range Road).

Fig. 8. Dorsal view of emergent female *Amblychia hymenaria* (ZRC.LEP.159), perched upon the bark of a tree, to demonstrate the camouflage potential of its upperwing patterns.

Fig. 9. A male *Amblychia hymenaria* (with bipectinate antennae) encountered on the night of 21 Feb.2009 (ca. 2355 hours) beside Sime Track, MacRitchie Reservoir forest. It was resting under a leaf, about 1.8 m above ground.

Thus far, larvae of the genus *Amblychia* Guenée have been recorded feeding on at least three genera of plants, including *Illicium* (Illiciaceae), *Lindera* (Lauraceae) and *Styrax* (Styracaceae) (Robinson et al., 2009: exact species not indicated for neither moth nor hostplant). Within our nature reserves, two of these genera are known to occur, represented by a single species each, namely *Lindera lucida* and *Styrax benzoin* (Chew et al., 1997). However, both forest species are regarded as uncommon, with rather localised distributions (Chew Ping Ting, pers. comm.). Our present documentation of the larva feeding on *Cinnamomum* (Lauraceae) contributes an additional hostplant genus for *Amblychia*.

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