NATURE IN SINGAPORE 2010 **3**: 21–26
Date of Publication: 25 January 2010

FINAL INSTAR CATERPILLAR AND METAMORPHOSIS OF *EUMELEA LUDOVICATA* GUENÉE, 1857, IN SINGAPORE (LEPIDOPTERA: GEOMETRIDAE: DESMOBATHRINAE)

Tzi Ming Leong[1]* and **Celine H. S. Low**[2]
[1]*Central Nature Reserve, National Parks Board,*
601 Island Club Road, Singapore 578775, Republic of Singapore
[2]*Hougang Ave 5, Blk 363, #04–288, Singapore 530363, Republic of Singapore*
(**Corresponding author: leong_tzi_ming@nparks.gov.sg, banjarana@gmail.com*)

INTRODUCTION

The geometrid moth, *Eumelea ludovicata* Guenée, 1857, belongs to the tribe Eumeleini within the subfamily Desmobathrinae, and occurs throughout the Indo-Australian tropics eastward to Solomons and Guam (Holloway, 1996). The few records of this species in Singapore have only been from the central nature reserves thus far. Here, an account of its final instar larva is summarised, with the successful completion of metamorphosis.

Fig. 1. Lateral view of final instar larva of *Eumelea ludovicata* encountered at Bukit Kallang (MacRitchie Reservoir forest) on the evening of 21 Nov.2009 (ca. 1945 hours). Its remarkable resemblance to an inclined twig is convincing camouflage indeed. Its total length was 40 mm.

OBSERVATIONS

On the evening of 21 Nov.2009 (ca. 1945 hours), a final instar larva of *Eumelea ludovicata* was found perched at shoulder level at Bukit Kallang, MacRitchie Reservoir forest (Figs. 1–3). Its total length was 40 mm, and its body was a combination of ashy gray and dark brown, with hints of green. On its venter, there were chalky white patches on its third and fourth abdominal segments (Fig. 2).

From a distance, its resemblance to a twig was most convincing, and is an excellent example of effective larval camouflage. While it was perched on the stem of a wild cinnamon (*Cinnamomum iners*; Lauraceae) shrub, there were no clear signs of recent folivory on the leaves. The more likely candidate for its hostplant was in fact an adjacent shrub, *Macaranga conifera* (Euphorbiaceae). The reasons for such an inference are discussed at the end of this article. The larva was then collected to be reared in captivity to monitor its metamorphosis.

This larva entered into its pre-pupal phase much sooner than we expected, and demonstrated a darkening of its body colours on the very same night it was encountered. The green colours on its flanks had progressively become more intense and vivid. By the morning of 22 Nov.2009, the larva had already enshrouded itself with silk-fastened leaves and proceeded with bodily contractions and fluid release. On the morning of 23 Nov.2009, pupation was recently complete and the larval exuvia was removed and preserved.

The freshly formed pupa remained a translucent jade green at first, but turned to a light maize-yellow in the following days. The pupa was measured to be 22 × 4 mm. The most unusual feature of this pupa was the ventral, sword-like casing which housed the developing antennae, limbs, and proboscis. Its apex almost reached the cremaster, and the distal third was not attached to the ventral surface of the abdomen (Fig. 4). This unique pupa matched the earlier description for that of the species (Holloway, 1996).

In the early hours of 29 Nov.2009 (ca. 0045 hours), the characteristic wing colours and patterns had become visible at the wing cases. Its eye covers had acquired a cloudy-grey appearance. The thoracic region had turned orange dorsally. In the same evening (ca. 2030 hours), a female moth eventually emerged, displaying a brilliant combination of fuchsia bands over a yellowish-orange background (Fig. 5). Its underwing colour patterns were similarly attractive (Fig. 6). Its limbs were particularly lengthy and slender, allowing the moth to adopt a posture that was elevated well above the substrate (Fig. 7).

This female moth was then preserved as a voucher specimen at the Zoological Reference Collection (ZRC) at the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore, with measurements of its body length (BL) and forewing length (FW) obtained: ZRC.LEP.266 (BL: 19 mm, FW: 26 mm). The empty pupal case was also preserved and catalogued. At the geometrid collection of the ZRC, at least two other voucher specimens of *Eumelea ludovicata* were examined: ZRC.LEP.270 (female, BL: 22 mm, FW: 29 mm, coll. H. K. Lua, 26 Feb.1989, Bukit Timah, Hindhede Drive); ZRC.LEP.271 (male, BL: 20 mm, FW: 24 mm, coll. J. W. H. Yong, Mar.1992, Peirce Reservoir).

For various representatives of the genus *Eumelea*, the documented larval hostplants in the genera *Macaranga* and *Mallotus* (both in the family Euphorbiaceae) have been predominant, although the ginger, *Elettaria cardomomum* (Zingiberaceae) has also been reported (Holloway, 1996; Robinson et al., 2009). Hence, our deduction that the neighbouring *Macaranga conifera* was the consumed hostplant. It is hoped that future investigations of our local species of *Macaranga* and *Mallotus* may reveal the larvae of other *Eumelea*, such as *Eumelea rosalia* (Stoll, 1781), which also occurs in Singapore, thus providing us with opportunity for comparisons of their larval morphology.

ACKNOWLEDGEMENTS

We were privileged and delighted to have the moth identity verified by Jeremy D. Holloway (Natural History Museum, London). We thank Gwee Aik Teck (Herbarium, Singapore Botanic Gardens) for kindly identifying the prospective larval hostplant. Sincere appreciation goes to Lua Hui Kheng (Raffles Museum of Biodiversity Research) for granting access to examine the specimens in the geometrid collection.

LITERATURE CITED

Holloway, J. D., 1996. The Moths of Borneo: Family Geometridae, subfamilies Oenochrominae, Desmobathrinae and Geometrinae. *Malayan Nature Journal*, **49**(3 & 4): 147–326.

Robinson, G. S., P. R. Ackery, I. J. Kitching, G. W. Beccaloni & L. M. Hernández, 2009. *HOSTS—A Database of the World's Lepidopteran Hostplants*. The Natural History Museum, London. http://www.nhm.ac.uk/research-curation/research/projects/hostplants/. (Accessed: 27 Dec.2009).

Fig. 2. Ventral view of final instar larva (as in Fig. 1).

Fig. 3. Dorsal view of final instar larva (as in Figs. 1, 2). Although it was perched on the stem of a wild cinnamon (*Cinnamomum iners*; Lauraceae) shrub, this was unlikely to have been its foodplant. Instead, an immediately adjacent *Macaranga conifera* (Euphorbiaceae) shrub was a more plausible candidate.

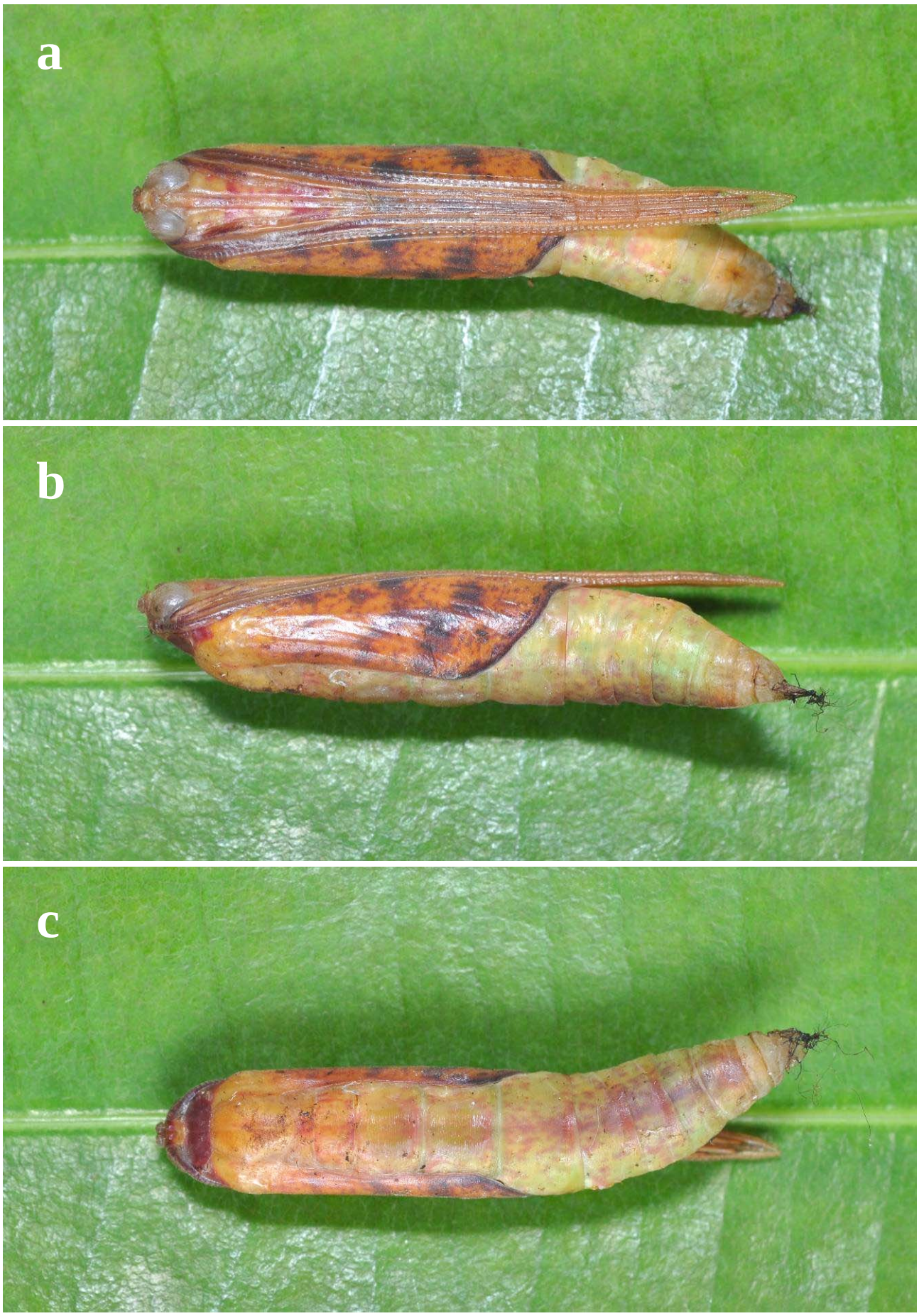

Fig. 4. Ventral (a), lateral (b), and dorsal (c) views of pre-eclosion pupa (22 by 4 mm). Its wing patterns may already be perceived at the wing cases. Photographed on the early morning of 29 Nov.2009 (ca. 0045 hours). The sword-like, protective case for the developing antennae, limbs and proboscis protrudes freely at its distal third, unattached to the abdomen.

Fig. 5. Dorsal view of freshly emerged female moth (ZRC.LEP.266, body length: 19 mm, forewing length: 26 mm), eclosed on the night of 29 Nov.2009 (ca. 2030 hours).

Fig. 6. Ventral view of female moth (ZRC.LEP.266).

Fig. 7. Frontal view of female moth (ZRC.LEP.266). Note its long, slender limbs.