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FINAL INSTAR CATERPILLAR AND METAMORPHOSIS OF *CALLITEARA HORSFIELDII* (SAUNDERS) IN SINGAPORE (LEPIDOPTERA: LYMANTRIIDAE: ORGYIINI)

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INTRODUCTION

The tussock moth, *Calliteara horsfieldii* (Saunders, 1851) belongs to the tribe Orgyiini and has a broad Australasian distribution, having been recorded in Myanmar, Thailand, Sundaland, Sulawesi, Maluku Islands, New Guinea, and Queensland (Barlow, 1982; Holloway, 1999). The diagnostic final instar larva of this moth is briefly described and illustrated from encounters in Singapore. Attempts to rear the larvae through metamorphosis are summarised.

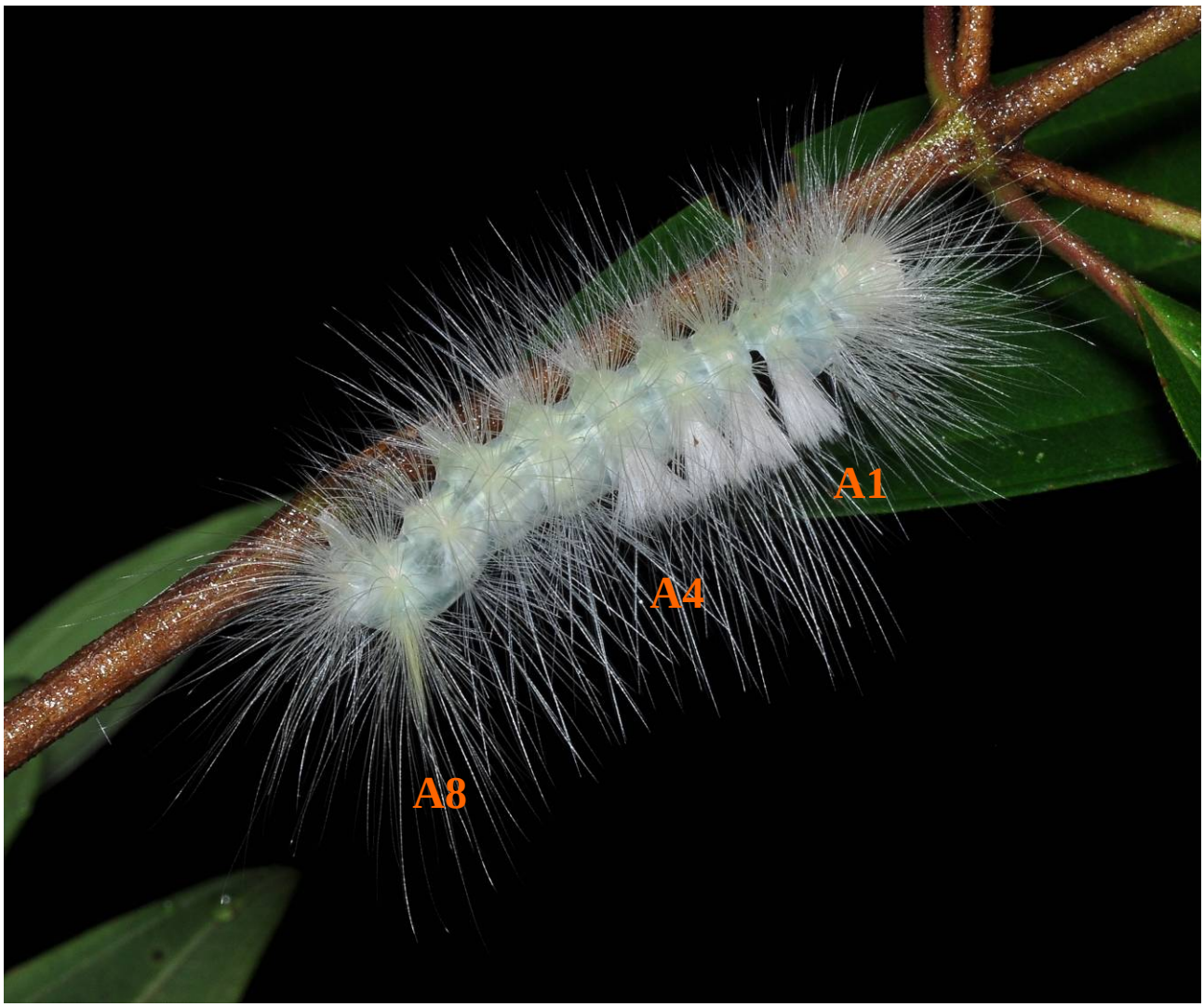

Fig. 1. Lateral view of final instar larva (head towards right) of *Calliteara horsfieldii* on its hostplant, sendudok (*Melastoma malabathricum*), encountered at Bukit Kallang on 19 Sep.2009 at 0005 hours. Its total length was 55 mm. Note prominent row of dorsal brushes between abdominal segments one to four (A1–A4), with a longer, slender brush at A8.

OBSERVATIONS

While conducting a faunal survey at Bukit Kallang, MacRitchie Reservoir forest, a final instar caterpillar of *Calliteara horsfieldii* was encountered at eye-level on the local shrub, sendudok (*Melastoma malabathricum*, family Melastomataceae) on 19 Sep.2009 at 0005 hours (Figs. 1, 2). Its body length was 55 mm. The body was a uniform, pearly white and well-protected with a dense aggregation of long, silvery setae radiating from every segment. From its first to fourth abdominal segment (A1–A4), there was a mid-dorsal arrangement of densely packed brushes, with a longer, slender brush at A8. Defensive behaviour was observed at the mildest provocation, with the caterpillar exposing the velvety black inter-segmental membrane (Fig. 3), otherwise concealed between A1 and A2 when at rest. This larva was comparable to earlier published records of this species (Barlow, 1982: Plate 50—caterpillar 2; Chua, 1993: 93—right figure, also feeding on sendudok).

By 22 Sep.2009, the larva continued to feed and its body had gradually taken on a translucent greenish sheen, possibly owing to the rich chlorophyll content in its diet. On 23 Sep.2009, it ceased all feeding and commenced the establishment of a fine layer of silken mat, upon which to construct its cocoon. Pupation was complete by the late afternoon of 25 Sep.2009, when the exuvia was entirely expelled at the posterior of the newly formed pupa (Fig. 4). The elliptical cocoon comprised two layers—the outer lattice (60 mm long) and an inner lattice (40 mm long), both of which were delicately constructed from the fine setae of the final instar. This double wall of defence provided adequate protection for the developing pupa within, as it was securely enveloped by the inner lattice. The dimensions of the pupa were 35 mm by 10 mm.

On the night of 3 Oct.2009, an adult female moth eventually made its exit from this cocoon and was found to be already gravid, with its abdomen heavy with unfertilised ova. Its body and wings were an overall grayish white, with faint brownish speckles and streaks over its forewings (Fig. 5). At close range, the bipectinate antennae of this female moth were noticeable (Fig. 6), although males of this species would have distinctly longer pectinations. The emergent moth was subsequently retained as a voucher specimen at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), with measurements of its body length (BL) and forewing length (FW) recorded accordingly (ZRC.LEP.230, BL: 31 mm, FW: 36 mm). The remnant, intact cocoon (containing the vacated pupal case and exuvia of final instar) was carefully peeled off its substrate, dried, preserved, and catalogued (ZRC.LEP.230).

Fig. 2. Dorsal view of final instar larva (head towards right) (as in Fig. 1).

Fig. 3. Dorsal view of final instar (as in Figs. 1, 2) in defensive mode, revealing the prominent, jet black inter-segmental membrane between A1 and A2.

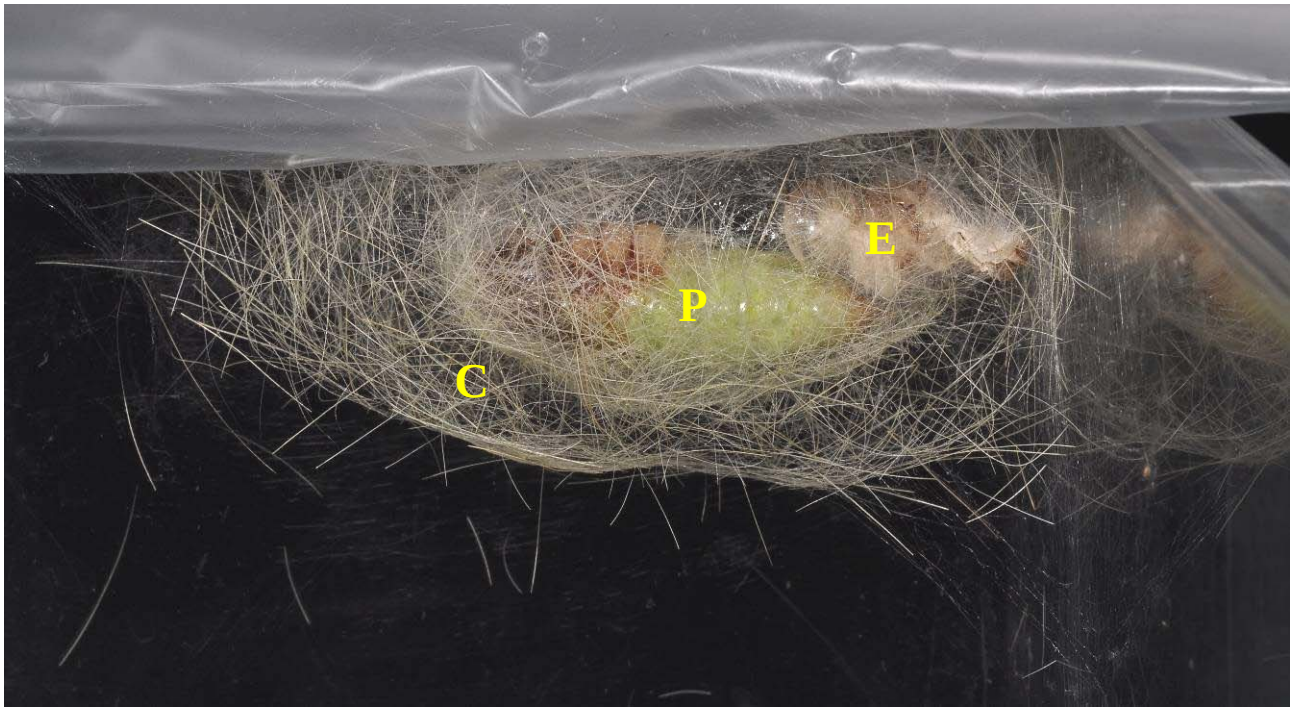

Fig. 4. The cocoon (C), pupa (P, head towards left) and exuvia (E), attached to the upper corner of its rearing tank by carefully woven silk threads. Pupation was complete by 25 Sep.2009. The outer lattice of the cocoon was 60 mm long and the inner lattice, 40 mm long. The pupa was 35 mm by 10 mm.

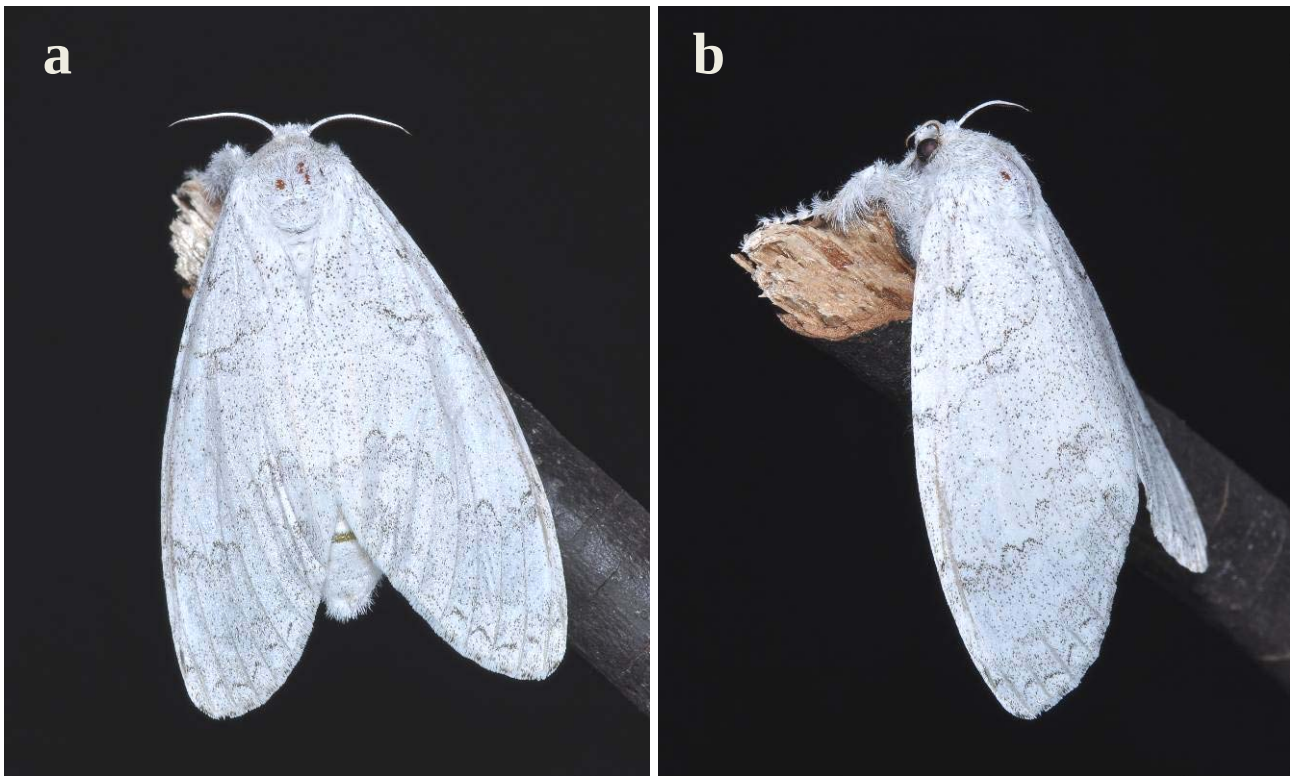

Fig. 5. Dorsal (a) and lateral (b) views of the gravid female (ZRC.LEP.230, body length: 31 mm, forewing length: 36 mm), freshly emerged on the night of 3 Oct.2009.

Fig. 6. Frontal close-up of emergent female (ZRC.LEP.230). Note bipectinate antennae. Males of this species have significantly longer pectinations.

Prior to this rearing attempt, an aggregation of ca. 10 caterpillars were presented to TML by Jana Leong-Škornicková (Singapore Botanic Gardens Herbarium) in May 2008. They were all in their final instars and had been detected and removed from the leaves of a ginger, *Etlingera elatior* (family Zingiberaceae) growing within the herbarium garden yard. In late May 2008, the characteristic cocoons were constructed *en masse* and by June 2008, all the moths had successfully eclosed. Three voucher specimens (two males, one female) were retained, while the rest were released. The specimens were catalogued and measured as follows: ZRC.LEP.227 (male, BL: 21 mm, FW: 18 mm); ZRC.LEP.228 (male, BL: 20 mm, FW: 19 mm); ZRC.LEP.229 (female, BL: 24 mm, FW: 31 mm).

At the ZRC, additional adult specimens of *Calliteara horsfieldii* from Singapore were also examined. These include: ZRC.LEP.238 (male, BL: 15 mm, FW: 18 mm, Raffles College, coll. unknown, 21 Sep.1947); ZRC.LEP.239 (male, BL: 16 mm, FW: 18 mm, Raffles College, 'to virgin female in breeding cage', coll. unknown, 15 Feb.1948); ZRC.LEP.240 (male, BL: 18 mm, FW: 20 mm, Raffles College, 'to virgin female in breeding cage', coll. unknown, 18 Feb.1948,); ZRC.LEP.241 (male, BL: 18 mm, FW: 20 mm, 'Singapore', coll. R. Morrell, Nov.1953); ZRC.LEP.242 (female, BL: 32 mm, FW: 35 mm, 'Singapore', coll. R. Morrell, Mar.1953); ZRC.LEP.248 (female, BL: 22 mm, FW: 28 mm, University campus, coll. D. H. Murphy, Dec.1970).

The larvae of *Calliteara horsfieldii* are notoriously polyphagous and have been documented to consume a total of 47 different hostplant genera in 27 families (Holloway, 1999; Robinson et al., 2009). Our present hostplant records from Singapore would contribute two additional genera (as well as families) to the already lengthy list, namely *Melastoma* (Melastomataceae) and *Etlingera* (Zingiberaceae). The moth's ability to accept and assimilate such a broad spectrum of foodplants may be a key to its wide geographic distribution. The presumed correlation between hostplant range and distributional patterns of Lepidoptera is an interesting hypothesis that is deserving of detailed testing. Investigative research on this topic has focused on certain butterflies (e.g., Hughes, 2000; Dennis et al., 2005), as well as moths (e.g., Leps et al., 1998; Tikkanen et al., 1999).

The caterpillar of an allied species, *Calliteara cerigoides* (Walker, 1862), has been observed to feed preferentially on dipterocarps at a research site in Bogor, West Java, Indonesia (Messer et al., 1992). At the same time, it was also found that their moth eggs had a relatively high rate of parasitism (78%) by chalcid wasps in the subfamilies Eupelmidae and Encyrtidae (Messer et al., 1992).

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LITERATURE CITED

Barlow, H. S., 1982. *An Introduction to the Moths of South East Asia*. The Malayan Nature Society, Kuala Lumpur. vii + 305 pp., 50 col. pls.

Chua, E. K., 1993. *Nature in Singapore—Ours to Protect*. The Nature Society (Singapore). 132 pp.

Dennis, R. L. H., T. G. Shreeve, H. R. Arnold & D. B. Roy, 2005. Does diet breadth control herbivorous insect distribution size? Life history and resource outlets for specialist butterflies. *Journal of Insect Conservation*, **9**(3): 187–200.

Holloway, J. D., 1999. The Moths of Borneo, Part 5: Family Lymantriidae. *Malayan Nature Journal*, **53**(1 & 2): 1–188.

Hughes, J. B., 2000. The scale of resource specialization and the distribution and abundance of lycaenid butterflies. *Oecologia*, **123**(3): 375–383.

Leps, J., K. Spitzer & J. Jaros, 1998. Food plants, species composition and variability of the moth community in undisturbed forest. *Oikos*, **81**(3): 538–548.

Messer, A. C., N. N. Wanta & Sunjaya, 1992. Biological and ecological studies of *Calliteara cerigoides* (Lepidoptera, Lymantriidae), a polyphagous defoliator of Southeast Asian Dipterocarpaceae. *Japanese Journal of Entomology*, **60**(1): 191–202.

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: 5 Oct.2009).

Tikkanen, O.-P., T. G. Carr & H. Roininen, 1999. Factors influencing the distribution of a generalist spring-feeding moth, *Operophtera brumata* (Lepidoptera: Geometridae), on host plants. *Environmental Entomology*, **28**(3): 461–469.