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# FINAL INSTAR CATERPILLARS AND METAMORPHOSIS OF *SPILARCTIA HYPOGOPA* (HAMPSON, 1907) IN SINGAPORE (LEPIDOPTERA: EREBIDAE: ARCTIINAE)

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## INTRODUCTION

The moth *Spilarctia hypogopa* (Hampson, 1907) has a typical Sundaic distribution and is known from Peninsular Malaysia, Sumatra and Borneo (Holloway, 1988—as *Spilosoma hypogopa*). Its occurrence in Singapore is verified with the present account of its caterpillars reared to metamorphoses. Southeast Asian members of *Spilosoma* have been assigned to the genus *Spilarctia* Butler, 1875 instead (Inoue, 1988). A second species, *Spilarctia strigatula* (Walker, 1855) has been recorded for Singapore, based on museum specimens (see: **Comparative Material Examined**). This species ranges from Sundaland into Thailand, and its larva, cocoon, as well as hostplant diversity have been reasonably well documented (Holloway, 1988). For Borneo, ten species of *Spilarctia* have been listed, with a majority not recorded outside of Borneo as yet (Holloway, 1988—as *Spilosoma*). For Indonesia, three new species of *Spilarctia* were recently described from Sumatra, Siberut and Bali respectively (Dubatolov, 2006).

Fig. 1. An aggregation of final instar caterpillars of *Spilarctia hypogopa* feeding on the thick fronds of a bird's nest fern (*Asplenium nidus*, Aspleniaceae) at Bukit Kallang, Central Catchment Nature Reserve, on the night of 8 May 2010 at 2315 hours. There were a total of 70–80 caterpillars counted within this individual fern. (Photograph by: Tzi Ming Leong).

## OBSERVATIONS

While conducting a faunal survey at Bukit Kallang, Central Catchment Nature Reserve, on the night of 8 May 2010 (2315 hours), an infestation of hairy and spiky caterpillars was encountered on a mature clump of bird's nest fern (*Asplenium nidus*, family Aspleniaceae) growing on a wooden stump at chest-level. Many were feeding on the fronds as a group, while others fed individually (Figs. 1–3). In total, between 70 and 80 caterpillars were counted all around this fern. All were of relatively uniform dimensions (body length ca. 55 mm), and may have originated from the same maternal clutch. Each caterpillar was armed with a dense network of plumose setae originating from low verrucae. The body was coloured black at the anterior and posterior, with an orange-brown mid-section. Its head was sooty black (Fig. 3). No caterpillars were collected that night, but upon return on the morning of 12 May 2010, most of the leaves had already been devoured and only two caterpillars were to be seen, both of which were then immediately collected. The other caterpillars had presumably dispersed, in search of suitable pupation sites.

Fig. 2. Dorsal view of an individual caterpillar (head towards left) actively feeding while clinging to the underside of the frond. Note uniform arrangement of dense setae throughout its body. Its body length was ca. 55 mm. (Photograph by: Tzi Ming Leong).

Fig. 3. Anterior close-up of feeding caterpillar. (Photograph by: Tzi Ming Leong).

Shortly after the caterpillars were collected, each began to pupate and construct their cocoons on the 13 and 14 May 2010, respectively. The cocoon framework consisted of closely spaced setae weaved together, forming an egg-shaped structure, measuring ca. 35 × 20 mm (Fig. 4). Owing to the dense arrangement of setae, the underlying pupa was not readily discernible. After a developmental period of approximately 10 days, the moths emerged on the 23 and 25 May 2010, respectively. Both were determined to be males of *Spilarctia hypogopa* (see Holloway, 1988: Pl. 3—moth 16). The thorax and wings had a uniform beige background, with a bold, black mid-dorsal stripe on its thorax and extensive black markings on its forewing dorsum (Fig. 5). Its abdomen was yellow dorsally, with a series of medial black dots per segment. The pectinations of the cream-coloured antennae were visible and decreased in length towards the apex (Fig. 6). The palps and tibio-tarsal segments of its forelimbs were charcoal black. The underside of its abdomen was also beige and patterned with a series of small black spots.

Fig. 4. The elliptical cocoon was constructed with re-constituted setae from the final instar caterpillar. It was ca. 35 × 20 mm. (Photograph by: Tzi Ming Leong).

Fig. 5. Dorsal view of male moth (ZRC.LEP.303, body length: 18 mm, forewing: 18 mm), freshly eclosed on 23 May 2010. Note bold, black mid-dorsal stripe on its thorax and black markings on its forewing dorsum. (Photograph by: Tzi Ming Leong).

Fig. 6. Ventro-lateral view of male moth (as in Fig. 5). Note degree of pectination in its antennae and pattern of black dots on its abdomen. (Photograph by: Tzi Ming Leong).

The emergent moths were preserved as voucher specimens at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore, with measurements of its body length (BL) and forewing length (FW) taken. They were catalogued as ZRC.LEP.303 (eclosed 23 May 2010), 304 (eclosed 25 May 2010) respectively, both specimens with BL: 18 mm, FW: 18 mm. Their corresponding cocoons/pupal cases were also preserved accordingly.

On the afternoon of 24 May 2010 (ca. 1500 hours), a mating pair of moths (Fig. 7) was seen adjacent to the site where the caterpillars were first found. Their abdomens were already joined at the apices and both remained motionless for many hours thereafter. Mild sexual dimorphism was detectable upon closer inspection of the pair. In the female, (a) the pectinations of its antennae appeared marginally shorter, (b) the mid-dorsal, black thoracic stripe was more subtle, and (c) the black markings on the forewing dorsum were less extensive, in comparison with the male. Both specimens were not collected.

For *Spilarctia hypogopa*, the present record of *Asplenium nidus* appears to be the first documented larval hostplant for this moth species. For the individual fern clump that was severely defoliated by the caterpillars, only the stiff, central main veins remained thereafter, and the chances of recovery for this fern were appreciably slim (Fig. 8). Nevertheless, we were surprised to find that at least five young fronds had emerged from the heart of the bird's nest fern during a casual inspection on 29 Jul.2010 (Fig. 9). Upon closer examination, we encountered two caterpillars (probably penultimate instars) of *Spilarctia hypogopa* hiding beneath one of the fronds. They were photographed in situ but not collected. By the next day, all the young fronds had been devoured down to the base, including their mid-veins! Both caterpillars were nowhere in sight and must have moved on to adjacent bird's nest ferns to source for additional food supply.

Only a handful of other moth species have been known to consume the fern *Asplenium nidus*, and these include four genera from two microlepidopteran families—Cosmopterigidae and Oecophoridae (Robinson et al., 2010). For *Spilarctia strigatula*, at least 12 hostplant genera (in 11 families) have been reported (Holloway, 1988; Robinson et al., 2010). For *Spilarctia vandepolli* (Rothschild, 1910), a Sundaic species, its documented larval hostplant is the elephant fern *Angiopteris evecta* (Marattiaceae), based on records from Peninsular Malaysia (Robinson et al., 2010). Throughout its distribution, the cumulative larval hostplant records for the genus *Spilarctia* clearly demonstrate a highly polyphagous appetite (Holloway, 1988; Robinson et al., 2010—as *Spilosoma*). It remains to be seen what additional larval hostplants may be selectively consumed by *Spilarctia hypogopa* in Singapore and the region. However, there may be a particular specialisation/preference for various ferns as larval hostplants by certain species/species groups of *Spilarctia* moths.

Fig. 7. A pair of mating moths (male—left, female—right) was encountered on the afternoon of 24 May 2010 (ca. 1500 hours) at the base of the bird's nest fern clump. (Photograph by: Vanessa S. L. Chang).


Fig. 8. As a result of the caterpillars' insatiable appetites, more than 90% of the live green fronds had been devoured, presumably leaving little chance for this bird's nest fern to recover. (Photograph by: Vanessa S. L. Chang).

Fig. 9. By the 29 Jul.2010, at least five young fronds were observed to have sprouted from within the clump of bird's nest fern. However, two caterpillars of *Spilarctia hypogopa* were detected on the underside of one frond (arrowed). By the following day, all these fronds had been consumed down to the base. (Photograph by: Vanessa S. L. Chang).

## COMPARATIVE MATERIAL EXAMINED

*Spilarctia strigatula* (Walker, 1855)
ZRC.LEP. 319 (male, BL: 18 mm, FW: 19 mm), coll. G. K. Tay, 25 Nov.1981, Lim Chu Kang; ZRC.LEP. 320 (male, BL: 16 mm, FW: 17 mm), coll. Nature Reserves Survey, 28–29 May 1992, Nee Soon Swamp Forest; ZRC.LEP. 321 (male, BL: 19 mm, FW: 20 mm), coll. L. L. Koh, 11–12 Dec.2006, Nee Soon Swamp Forest.

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