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ADVANCED CATERPILLAR AND METAMORPHOSIS OF THE HAWKMOTH *CECHENENA HELOPS HELOPS* (WALKER) (LEPIDOPTERA: SPHINGIDAE: MACROGLOSSINAE)

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INTRODUCTION

The hawkmoth, *Cechenena helops helops* (Walker, 1856) (Family Sphingidae) has a widespread South Asian to Southeast Asian distribution, having been recorded from Northeast India, Nepal, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Borneo, Java and the Philippines (Palawan, Balabac) (Inoue et al., 1997). A brief account of its advanced larva, pupa and emergent adult is reported from the Central Nature Reserve in Singapore.

OBSERVATIONS

During a faunal survey on 29 May 2008 in the MacRitchie forest area, both authors encountered a caterpillar that was in its initial stage of weaving silken threads onto live leaves around itself. It was first spotted by the second author, who noticed slight movement amidst the aggregation of leaves. Upon closer inspection of the larval morphology it was immediately recognised as a hawkmoth (Family Sphingidae), by the presence of a distinct tail horn at its posterior and prominent false eye-spots at its anterior (Fig. 1).

Fig. 1. Advanced larva of *Cechenena helops helops*, exhibiting typical pre-pupal behaviour of attaching silken threads to adjacent leaves. Note distinct, posterior tail horn and presence of ocelli at the thoracic region, characteristics often associated with hawkmoth caterpillars. This caterpillar was 90 mm in length, with its tail horn measured to be 14 mm.

This advanced larva was in the initial stages of forming its leaf shelter, in which to pupate. It had selected the live, green leaves of the local shrub, *Pternandra coerulescens* (Family Melastomataceae) in which to construct this shelter. This particular shrub was growing immediately adjacent to a clear, sandy, forest stream. The larva was situated ca. 1.2 m above the running water of the stream, securely nestled amongst the foliage. Attempts were made to search for other larvae of this kind and fresh signs of possible folivory, but neither were detected. The lack of fresh evidence of folivory on the leaves of this shrub suggested that this particular plant species was unlikely to have been the actual foodplant of the larva. Thus far, the only documented foodplant of this hawkmoth is the tropical vine, *Tetrastigma* (Family Vitaceae) (Inoue et al., 1997). In the Central Nature Reserve of Singapore, two representatives of this genus of climbers have been documented, namely *Tetrastigma lawsoni* and *Tetrastigma leucostaphylum* (Chew et al., 1997). Hence, our encounter of this larval hawkmoth species at this particular site may indicate the presence of the *Tetrastigma* vine in the adjacent vicinity. Subsequent botanical excursions will be made to this site to confirm our hypothesis.

The larva was subsequently reared ex situ to monitor its development and for photographic documentation. When outstretched, the larva was measured to be 90 mm long. Its body was a uniform orange-brown throughout, with a distinct, black line running along its dorsal margin from the top of its head towards its posterior, fading off before reaching the base of its tail horn. The body has an overall smooth texture. At its thoracic region, there is a noticeable lateral expansion of the segments, corresponding to the position of the prominent false eye-spots. This appears to enhance the visual effect of the ocelli, especially when viewed directly from the front (Fig. 2). An irregular, dark brown band traverses between the ocelli. A pair of faint, beige lines runs from below the ocelli over its head.

At its posterior, its tail horn (14 mm long) had a darker shade of orange-brown and was adorned with closely spaced granules (Fig. 3). It was widest at its bulbous base and gradually tapered to a rounded apex, tipped with a smaller knob. Dorsally, a straight, black stripe was present along its entire length.

On the 30 May 2008, the day after the larva was found, it was observed to be in the process of contracting, accompanied by the simultaneous secretion of excessive fluids from within the prepupa. By the 1 Jun.2008, the exuvium of its last larval instar had been completely sloughed off and this piece of contracted exoskeleton was subsequently preserved.

Fig. 2. Frontal perspective of the startling, false eye-spots on the thoracic segment. Note the lateral expansion of the corresponding segment. The caterpillar's head is tucked downwards in defensive mode.

Fig. 3. Lateral view of the tail horn (length: 14 mm) pointing towards the posterior (left of figure). Along its dorsal margin, there is a continuous black stripe running from its base to the apex. A small, rounded knob is present at this distal end. Note also the granular texture of the tail horn, in contrast with the smooth dermis of the larval body.

The pupa was an overall chestnut brown and was 85 mm in length (Fig. 4). At the anterior, its developing proboscis was housed in a bilaterally flattened sheath that projected at least 10 mm in front of its head. At its posterior end, the cremaster (an arrangement of small hooks) was used to cling onto the silken mesh. From the ventral perspective of its visible abdominal segments (just beyond posterior margin of wings), a symmetrical network of fine, longitudinal streaking patterns were apparent (Fig. 4b).

On the 21 Jun.2008, the pupa began to display the initial darkening of its wing region. The colour of this wing portion progressively increased in intensity over the next few days, till it became almost entirely black on the 24 Jun.2008. On the morning of 25 Jun.2008, it was found that the adult sphingid had already emerged, with its wings fully outstretched (Fig. 5). The forewings of the moth were light brown in colour and exhibited a pair of chocolate brown, circular patches near the base. Its body was also chocolate brown, with a cream, polygonal pattern flanked by two orange spots at the junction between its thorax and abdomen (Fig. 5a). On its underside, the ventral colour of its body and wings was a shade of orange, with light, purplish-brown markings (Fig. 5b). Its antennae and limbs were a greyish-white. The emergent moth was a female, with a forewing length of 53 mm and a body length of 52 mm. It was subsequently preserved as a voucher specimen (ZRC.LEP.49), along with its empty pupal case and the moult of its last instar, at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore.

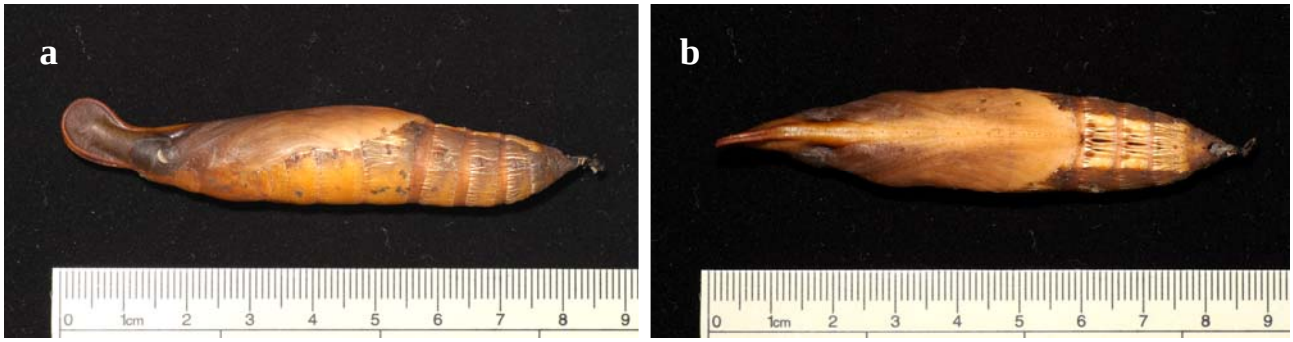

Fig. 4. Lateral (a) and ventral (b) perspectives of the pupa of *Cechenena helops helops*. Note anterior extension of its bilaterally flattened proboscis sheath. The pupa length was 85 mm.

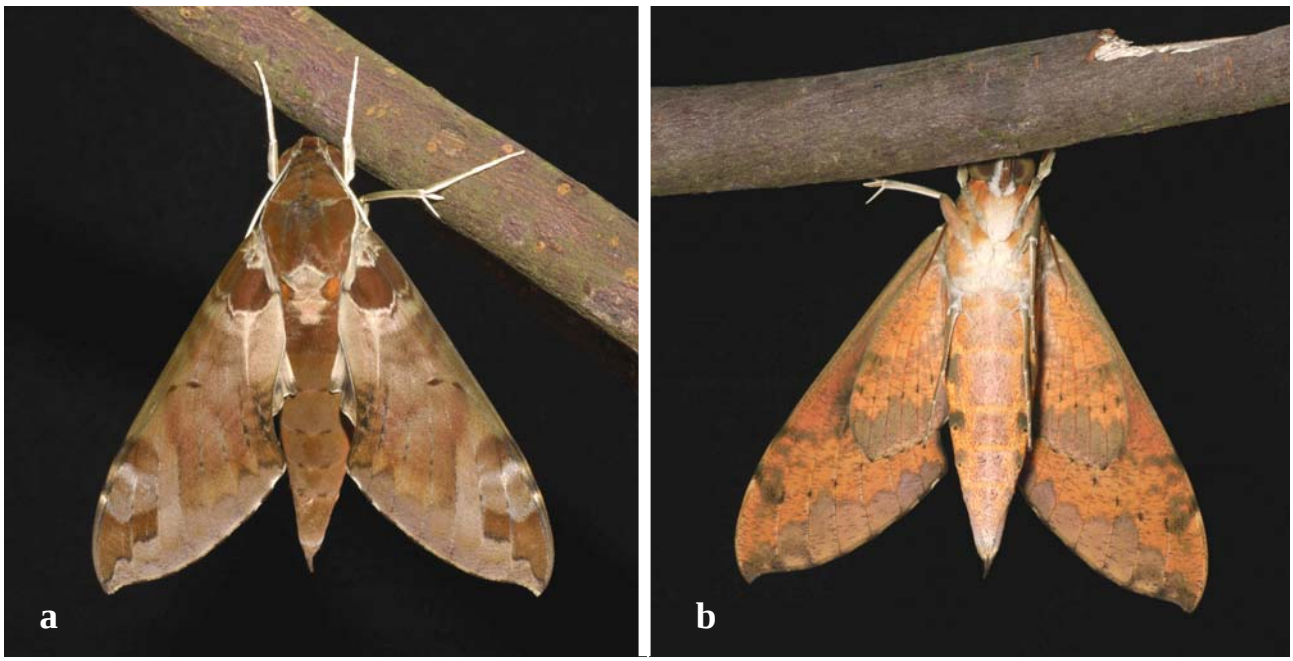

Fig. 5. Dorsal (a) and ventral (b) aspects of the adult female (ZRC.LEP.49, forewing length 53 mm, body length 52 mm) that emerged on the 25 Jun.2008.

Early descriptions of the larva and pupa of this species of hawkmoth were by Dupont & Roepke (1941), based on Javanese material. In addition to the nominate subspecies, *Cechenena helops helops* (Walker, 1856), two other subspecies are recognised, namely *Cechenena helops interposita* Joicey & Talbot, 1921, and *Cechenena helops papuana* Rothschild & Jordan, 1903 (Kitching & Cadiou, 2000). Both of these subspecies occur east of Wallace's Line, with *Cechenena helops interposita* found from the Indonesian islands of Buru and Seram, while *Cechenena helops papuana* occurs throughout New Guinea (Beck & Kitching, 2008).

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LITERATURE CITED

Beck, J. & I. J. Kitching, 2008. The Sphingidae of Southeast-Asia (incl. New Guinea, Bismarck & Solomon Islands). Version 1.5. http://www.sphin-sea.unibas.ch/ (Accessed 5 Nov.2008).

Chew, P. T., S. Suran & A. Ibrahim, 1997. Checklist of vascular plants in the Nature Reserves of Singapore. *Gardens' Bulletin Singapore*, **49**(2): 161–223.

Dupont, F. & W. Roepke, 1941. Heterocera Javanica. Fam. Sphingidae, hawk moths. *Verhandlingen der Koninklijke Nederlandsche Akadedemie van Wetenschappen* (Afdeeling Natuurkunde 2), **40**: 1–104, 23 pls.

Inoue, H., R. D. Kennett & I. J. Kitching, 1997. *Moths of Thailand, Vol. Two — Sphingidae*. Chok Chai Press, Bangkok. 149 pp., 44 col. pls.

Kitching, I. J. & J.-M. Cadiou, 2000. *Hawkmoths of the World. An Annotated and Illustrated Revisionary Checklist (Lepidoptera: Sphingidae)*. The Natural History Musuem, London. vii + 226 pp.