

LAST INSTAR CATERPILLAR AND METAMORPHOSIS OF *NEOSTAUROPUS ALTERNUS* (WALKER) (LEPIDOPTERA: NOTODONTIDAE)

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INTRODUCTION

The notodontid moth *Neostauropus alternus* (Walker, 1855) has a fairly widespread geographical distribution and has been recorded from the northeast Himalaya, Sundaland, the Philippines, Sulawesi and the south Moluccas (Holloway, 1983). Prior to this report, knowledge of its occurrence in Singapore was based on only a single, adult male specimen collected 88 years ago. The unique caterpillar of this species is illustrated from various perspectives to better appreciate its unusual posture, morphology and behaviour. This bizarre larva is compared with a remarkably similar larval form of another notodontid that occurs in Europe.

OBSERVATIONS

While conducting a nocturnal faunal survey with Subaraj Rajathurai in the Central Nature Reserve on 10 Apr.2006 (ca. 2000 hrs), we chanced upon an unusual invertebrate clinging onto the stem of the local shrub, *Melastoma malabathricum* (Melastomataceae). This particular shrub was found just before the entrance to the HSBC TreeTop Walk in the MacRitchie Reservoir forest. Upon closer inspection and examination, we realised that it was a kind of caterpillar, but with unusually elongate thoracic limbs. It was subsequently reared and photographed for documentation.

On the night of 13 Apr.2006, the caterpillar had started to pupate and its cocoon was complete by the next day. On 24 Apr.2006, the adult successfully emerged and was identified as *Neostauropus alternus* (Walker, 1855).

When the caterpillar was not feeding, it generally rested upside-down, clinging to a support stem by its four pairs of abdominal prolegs (Fig. 1). Both the anterior and posterior ends thus hung downward, with the top of its head often in close contact with the last abdominal segment. Possibly the most unusual character of this caterpillar lies in the length of its thoracic legs. The second and third pairs are much longer than the first, with the femur and tibia folded inwards when not in use (Fig. 2). On its dorsum, a series of pronounced paired humps occurs from the first to the fourth abdominal segments. The fifth abdominal segment also bears such a pair of dorsal protuberances, but they are less well developed. The seventh and eighth abdominal segments are flattened ventrally and expanded laterally, with the seventh segment bearing a pair of short, black spines directed towards the posterior (Fig. 3). There is also an inner pair of shorter, brown tubercles on the seventh segment. On its posterior-most segment, a pair of highly modified, elongate (stenopodiform) anal prolegs is present, often closed together when the caterpillar is at rest.

When the caterpillar began to feed, it would carefully part its thoracic legs to touch and grip the leaf lamina, before proceeding to chew from the outer margin inwards (Fig. 4). There was a regular tapping motion of the tarsal claws of its thoracic limbs, apparently 'sensing' both sides of the leaf surface as it continued to feed. When the caterpillar was unintentionally startled during my observations, I noticed a possible form of defensive behaviour. It would abruptly fling its long and slender thoracic limbs outwards and vibrate them for a few seconds, before gradually folding them back in. This sudden movement was simultaneously performed with the equally sudden parting of the anal prolegs (Fig. 5). Such a captivating demonstration may serve to be a visual deterrence to potential predators.

As the caterpillar prepared to pupate, it laboriously drew together as many live green leaves within its reach as it could and spun them together with black, silken threads (Fig. 6). Once concealed within this shroud of leaves, it underwent metamorphosis in ten days and finally emerged as an adult female (Fig. 7). In lateral view, prominent tufts of protruding, golden brown hairs were noticeable on its anterior abdominal segments. Hence, it shows the feature that gave rise to the common name of "Prominent Moths" assigned to the moths in this family (Notodontidae) (Barlow, 1982). A male moth reared from larva in Calcutta, India, also spent approximately 10 days in its pupa (Sevastopulo, 1947).



Fig. 1. Cryptic posture of final instar larva of *Neostauropus alternus* perched on its hostplant, *Melastoma malabathricum*. Note its elongated thoracic legs, especially the second and third pairs and the pronounced, paired dorsal humps at its first four abdominal segments. The seventh and eighth abdominal segments have laterally protruding expansions. Its posterior-most segment bears a pair of club-like anal prolegs, curved towards their apices. When subsequently outstretched, the total length of the larva was measured to be 70 mm.

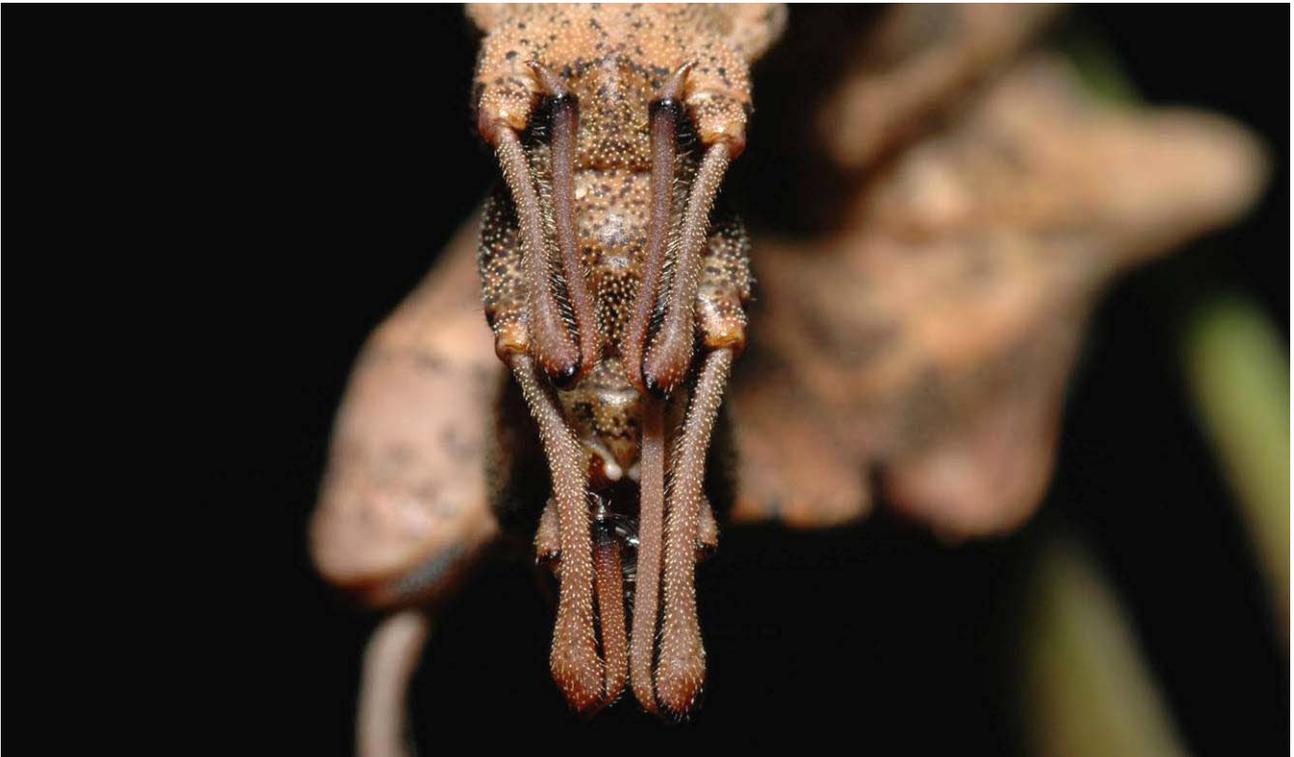


Fig. 2. Ventral aspect of the thoracic region of the larva, illustrating the resting posture of its in-folded limbs (head towards bottom of figure). In the second left thoracic limb, note that its tibial length is half that of the right side. Such asymmetry may be due to a mild limb deformity.



Fig. 3. Ventral aspect of posterior portion of abdominal segments. Note the degree of lateral expansion in the seventh and eighth segments, with a pair of sharp spines on the seventh.



Fig. 4. While feeding, the larva gently taps the leaf blade on both sides with its thoracic limbs.



Fig. 5. When alarmed, the larva was observed to suddenly throw its thoracic limbs wide open and vibrate them for a few seconds. This was also accompanied by the parting of its anal prolegs (seen here above its head). Such a visually startling display may serve to ward off any potential predators.



Fig. 6. Black silken threads were used to spin together adjacent, live leaves to construct its cocoon.



Fig. 7. Recently emerged adult female (ZRC.LEP.46), 30 mm body length, after spending 10 days within its cocoon. (Photograph by: Kelvin K. P. Lim).

The female moth was subsequently preserved as a voucher specimen (ZRC.LEP.46) and deposited in the Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research, National University of Singapore. This female moth was noticeably larger than the local male specimen (ZRC.LEP.42). The female has a forewing length of 27 mm and body length of 30 mm; the male has a forewing length of 18 mm and body length of 19 mm. The male specimen was collected from “Gardens Singapore” on 4 Dec.1920 by “I. H. B.” (most likely, Isaac Henry Burkill, who was the Director of the Singapore Botanic Gardens from 1912 to 1925). An additional female specimen (ZRC.LEP.43) of *Neostauropus alternus* was collected from Kuala Lumpur (Peninsular Malaysia: Selangor) by H. M. Pendlebury in 1928 (day/month not recorded) and was apparently “bred from larva”, according to the specimen label.

DISCUSSION

The larvae of *Neostauropus alternus* are highly polyphagous and have been documented as feeding on a total of 36 genera of hostplants belonging to 18 families, of which the legumes (family Fabaceae) are best represented (12 genera consumed) (Robinson et al., 2008). It has also been regarded as an agricultural pest of certain crops, including tea, coffee, mango and rambutan (Holloway, 1983). This present report adds another genus (*Melastoma*) and family (Melastomataceae) to the list of recorded hostplants for the species.

The earliest description of the diagnostic caterpillar of *Neostauropus alternus* was based on observations in Sri Lanka (Moore, 1882–1883). Subsequent documentation of this larva was based on Indian material (Hampson, 1892; Gardner, 1943; Sevastopulo, 1947). Sevastopulo (1947) reported that the first instar larva was a “very good ant mimic both in appearance and behaviour” and stated that the resting posture of its mid instar looked “like an irregularly curved, dead leaf.” This resemblance to dried or dead leaf debris is certainly applicable to the later instars as well. In his treatment of the Bornean Notodontidae, Holloway (1983) provided a brief, yet succinct written account of the larva, highlighting the characteristic morphological features.

The unmistakable caterpillar of *Neostauropus alternus* bears a remarkable resemblance to a geographically distant relative, *Stauropus fagi* (Linnaeus, 1758), also in the family Notodontidae. This species is known as the “Lobster Moth” in Britain owing to the “crustacean-like appearance” of its caterpillar, and its foodplants include beech (*Fagus*) and oak (*Quercus*), both in the family Fagaceae (Kimber, 2008). The undeniable similarities between the larval and adult (including genitalia) characters of *Neostauropus alternus* and the members of the genus *Stauropus* have caused lepidopterists, such as Holloway (1983), to question whether the species should be retained in *Neostauropus* at all.

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