

**LAST INSTAR CATERPILLAR AND METAMORPHOSIS OF
LEBADEA MARTHA PARKERI ELIOT
(LEPIDOPTERA: NYMPHALIDAE: NYMPHALINAE)**

T. M. Leong* and Aminurashid

Central Nature Reserve, National Parks Board,
601 Island Club Road, Singapore 578775

(*Corresponding author: leong_tzi_ming@nparks.gov.sg, banjarana@gmail.com)

INTRODUCTION

In Singapore, the native knight butterfly, *Lebadea martha parkeri* Eliot (Corbet & Pendlebury, 1978), is largely confined to the remnant forests of the Central Catchment Nature Reserve (Khew & Neo, 1997). Adult butterflies can be seen along forest trails by day, and resting individuals are occasionally spotted at night, perched under leaves (Fig. 1). Adult males can be distinguished from females by their more slender forewing shape and the presence of white markings at the apices of the forewings (Neo, 1996). This species graced the cover of the local guide book, A Guide to Common Butterflies of Singapore by Steven S. H. Neo (Neo, 1996). Unlike the adults, larvae of this species are less frequently encountered. However, when presented with the opportunity to observe its larval morphology at close range, the formidable extent of defensive armour protecting its entire body is easily appreciated.



Fig. 1. Adult male knight butterfly, *Lebadea martha parkeri* resting under the leaf of a shrub at MacRitchie Reservoir forest on the night of 11 Oct.2008 (ca. 2100 hrs). Body length 26 mm.

SPECIMEN DETAILS

While conducting a faunal survey in MacRitchie Reservoir forest on the morning of 9 Oct.2008 (ca. 1130 hrs), both the authors encountered a spiny caterpillar feeding on the leaf of the native shrub *Ixora congesta* (family Rubiaceae). The shrub was approximately 1.8 m tall and growing along the sandy bank of a clear, shallow, slow-flowing forest stream. This plant was in the preliminary stage of flowering, exhibiting the young buds of its light orange inflorescence. The single caterpillar was perched at almost eye-level. It was subsequently reared ex situ and identified as *Lebadea martha parkeri* Eliot. Its diagnostic larval form and features matched those illustrated in Igarashi & Fukuda (2000, Plate 181). In Corbet & Pendlebury (1978), the caterpillar is described as being 'dark brown with two bright green lateral patches'.

When reared in captivity, the caterpillar continued to feed on the leaves of its host plant. Its body was 37 mm long \times 6 mm wide (Figs. 2 & 3). The caterpillar was dark brown towards the anterior, but blackish towards the posterior. On its dorsum, a beige, circular hump was noticeable on the second abdominal segment. On its flanks, the most distinct markings were the apple green lateral patches on its third and fourth abdominal segments. Its fifth abdominal segment displayed a reticulated pattern of white on the sides. Its entire body was adorned with a complex arrangement of spines. Each of the segments was armed with two pairs of spines at the dorsolateral and ventrolateral positions, with the dorsolateral pairs being longer and more elaborate. On the first seven abdominal segments, each spine comprised five smaller, sharp-tipped spines radiating from the top of a short, stout protuberance projecting away from the body. On the eighth abdominal segment, these supporting processes were thicker and point backwards.

The longest pair of spines are jet-black and located on the third thoracic segment. These were entirely covered with short spikes and their apices bore four to five longer spikes that projected towards the anterior (Fig. 4). The first and second thoracic segments had relatively shorter spines. Its head was adorned with at least 30 short, brown spines radiating outwards. The background texture on its head was a network of closely spaced, shallow punctations.



Fig. 2. Dorsal view of the last instar caterpillar. This was found on a shrub, *Ixora congesta* (family Rubiaceae) that was growing beside a sandy stream in MacRitchie Reservoir forest on 9 Oct.2008, at about 1130 hrs. Note the beige, circular dorsal hump at its second abdominal segment. This larva was 37 mm long \times 6 mm wide (excluding spikes).



Fig. 3. Lateral view of the same caterpillar (as in Fig. 2). Note the prominent green, lateral patches on the third and fourth abdominal segments. The first seven abdominal segments bear a dorsolateral pair of spikes borne on top of a short, straight stem. The eighth segment bears a pair of thicker, back-curved stems, also radiating with spikes.

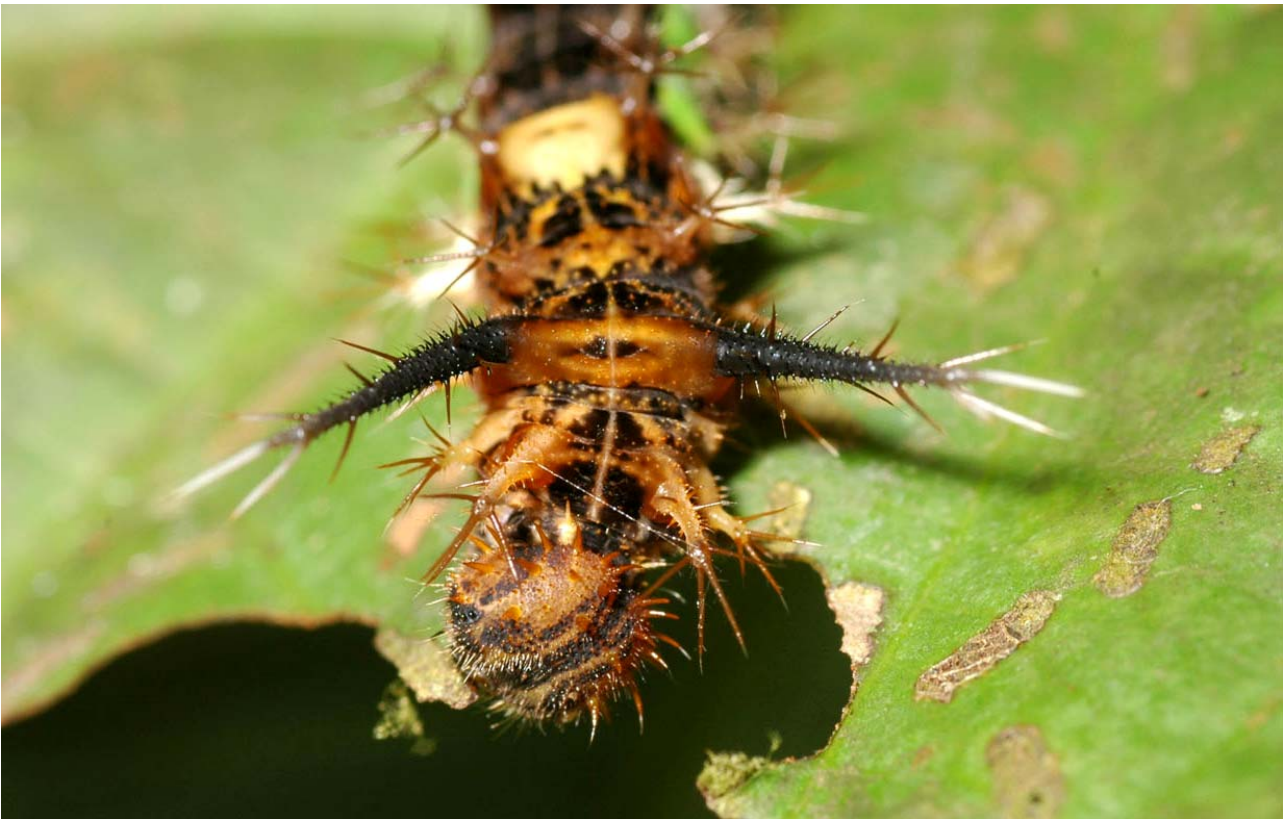


Fig. 4. Head view of the caterpillar, feeding on a leaf of its hostplant. Note the compact arrangement of sharp spikes radiating from its head. Additional protection is offered by the second and third thoracic pair of dorsolateral horns. The distal ends of the longest (black) pair of horns project just beyond the anterior margin of the caterpillar's head.

On 10 Oct.2008, the green lateral patches of the caterpillar progressively faded, eventually changing to a light pink. The next morning, it was perched on the underside of a small branch, remaining very still, and by 0900 hrs, it had suspended itself in a vertical, head-down position with the anal prolegs clasping onto a silken mat previously woven onto the branch (Fig. 5). By nightfall that same day, the exuvia (cast off skin) of its last instar had been sloughed off, revealing a dark, caramel-brown, 22 mm long \times 7 mm wide pupa (Fig. 6). Along the dorsal margin of its abdominal region, there was a distinct, contiguous row of straight-edged ridges, somewhat resembling a vertebral column. At its widest portion, there was a pair of short, downward-pointing horns. The 'face' of the pupa displayed symmetrical, white markings.



Fig. 5. Lateral perspective of the prepupal stage (photographed 11 Oct.2008), dangling from the branch by grasping onto a mat of white, silken threads with its anal prolegs. Note that the previously green lateral markings on its third and fourth abdominal segments have now turned pink.



Fig. 6. Lateral (a), ventral (b) and dorsal (c) perspectives of the pupa. Note dorsal row of sharply raised, trapezoidal ridges along the abdominal segments. The pupa was 22 mm long \times 7 mm wide.

On the morning of 20 Oct.2008, the butterfly eventually emerged from its pupal case. The actual moment of emergence was not witnessed. By about 0950 hrs, it was already perched upon its empty pupal case with its wings fully unfurled. Initially, its antennae were drooping downwards and remained limp, but gradually began to rise upwards (Fig. 7). This male was subsequently preserved as a voucher specimen (ZRC.7.6879, forewing length: 30 mm) in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research (RMBR), National University of Singapore.

DISCUSSION

In the third, revised edition of Corbet & Pendlebury (1978), J. N. Eliot formally described *Lebadea martha parkeri* as a new subspecies from Singapore. This was named after N. Parker, who collected the male holotype from MacRitchie Reservoir on 28 Oct.1971. The paratype, also a male, was collected from Karimun Island (Riau Archipelago, Indonesia) by J. N. Eliot on 24 Dec.1937. He also postulated that the Singapore population of this subspecies most likely originated from the Riau Archipelago. Furthermore, he predicted that the Singapore subspecies might migrate northwards into Johor, thus resulting in hybridisation with the subspecies *malayana* found there.

Conversely, it appears that a southward migration of the *malayana* subspecies has occurred instead. This subspecies has been collected from the island of Pulau Tekong (northeast of Singapore) between the years 2001–2002 (Khew, 2008). In addition, Khew (2008) reported that apparent hybrids between the two subspecies were observed on this and the adjacent island of Pulau Ubin, due west of Pulau Tekong.

Prior to the formal description of the Singapore subspecies, at least three subspecies of *Lebadea martha* were recognised, namely *Lebadea martha martha* Fabricius, *Lebadea martha koenigi* Corbet and *Lebadea martha malayana* Fruhstorfer (Fleming, 1975).



Fig. 7. The adult male butterfly (ZRC.7.6879, forewing length 30 mm), still clinging onto its empty pupal case, emerged on the morning of 20 Oct.2008 at around 0945 hrs. By about 1010 hrs, its wings had been fully expanded and its antennae (previously drooping downwards) were now raised.

In the butterfly collection at the Raffles Museum of Biodiversity Research, there is a modest representation of the Singapore *Lebadea martha parkeri* subspecies (ZRC.7.2762–2764, 2776–2778 & 6879; five males, two females). The earliest specimen (ZRC.7.2764, male) was collected from the Rifle Range Road forest by H. K. Lua in 1976, prior to the official recognition of this subspecies. Except for one specimen (ZRC.7.2763, male) collected from Dalvey Road in 1989, all other specimens of this subspecies were obtained from various localities within the Central Catchment Nature Reserve. In addition to specimens of *Lebadea martha parkeri*, there are also representatives of *Lebadea martha malayana* from Peninsular Malaysia (ZRC.7.2765–2775). These are historic collections (1940–1957) obtained from Pahang, Selangor and Pulau Langkawi, all in Peninsular Malaysia.

Apart from *Ixora* (Rubiaceae), the larvae of *Lebadea martha* have also been recorded feeding on *Mammea siamensis* (Guttiferae) and *Acalypha wilkesiana* (Euphorbiaceae) (Igarashi & Fukuda, 2000). The authors are eager to learn of any subsequent sightings or view photographs of larvae of this butterfly in Singapore, which will enable us to determine if the butterfly prefers a particular species of *Ixora* as its larval host plant and help us monitor the abundance of this local subspecies.

ACKNOWLEDGEMENTS

We are grateful to Chew Ping Ting (National Parks Board) for her confirmation of the caterpillar food plant identity. We would like to thank Zakiah binte Agil (Singapore Botanic Gardens Library) for facilitating the loan of relevant lepidopteran literature. We also thank Kelvin K. P. Lim and Lua Hui Kheng (Raffles Museum of Biodiversity Research) for permission to examine specimens of *Lebadea martha parkeri*, and allied subspecies in the Museum's butterfly collection. We appreciate the meticulous review by an anonymous scientist, who improved the manuscript with valuable comments.

LITERATURE CITED

- Corbet, A. S. & H. M. Pendlebury, 1978. *The Butterflies of the Malay Peninsula. Revised by Lt. Col. J. N. Eliot, third edition*. Malayan Nature Society, Kuala Lumpur. xi + 578 pp., 35 pls.
- Fleming, W. A., 1975. *Butterflies of West Malaysia and Singapore – Volume One*. Longman Malaysia Sdn. Berhad, Kuala Lumpur. x + 64 pp., 54 pls.
- Igarashi, S. & H. Fukuda, 2000. *The Life Histories of Asian Butterflies – Volume 2*. Tokai University Press, Tokyo. Pp. 298–711, Pls. 1–427.
- Khew, S. K., 2008. *Butterflies of Singapore*. <http://www.geocities.com/rainforest/vines/2382/>. (Accessed 11 Oct.2008).
- Khew, S. K. & S. S. H. Neo, 1997. Butterfly biodiversity in Singapore with particular reference to the Central Catchment Nature Reserve. *Gardens' Bulletin Singapore*, **49** (2): 273–296.
- Neo, S. S. H., 1996. *A Guide to Common Butterflies of Singapore*. Singapore Science Centre, Singapore. 169 pp.