

**THE BROWN FORM FINAL INSTAR CATERPILLAR OF THE HAWKMOTH,  
*ACHERONTIA LACHESIS* (FABRICIUS, 1798) IN SINGAPORE (LEPIDOPTERA:  
SPHINGIDAE), WITH AN ACCOUNT OF PARASITISM BY THE TACHINID FLY,  
*DRINO* (ZYGOBOTHRIA) *ATROPIVORA* (ROBINEAU-DESVOIDY, 1830)**

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**INTRODUCTION**

The caterpillars of *Acherontia lachesis* (Fabricius, 1798) are known to have three colour forms: green, yellow, and brown (Pittaway & Kitching, 2011). In Singapore, the green and yellow forms have been previously reared and reported (Leong & D’Rozario, 2011). Here, the brown form final instar is described and illustrated from a recent local encounter. However, this caterpillar did not survive to complete metamorphosis, as it succumbed to tachinid parasitoids prior to pupation. The tachinids’ ravenous consumption of their sphingid host, subsequent pupation, and eventual eclosion as adult flies are also documented.

**OBSERVATIONS**

On the night of 15 Jul.2011 (ca. 2250 hours), a full-grown, brown form caterpillar of *Acherontia lachesis* (body length: 95 mm, tail horn: 16 mm) was found on a small tree of Malayan teak (*Vitex pinnata* L.; Lamiaceae), in the landward edge of the mangrove forest patch of Pasir Ris Park (Fig. 1). It was feeding on leaves just above head-height.



Fig. 1. The final instar caterpillar (brown form) of *Acherontia lachesis* on its hostplant, *Vitex pinnata* (Lamiaceae), found in the landward edge of the mangrove forest patch of Pasir Ris Park on the night of 15 Jul.2011 (ca. 2250 hours). Its body length was 95 mm, tail horn length 16 mm.

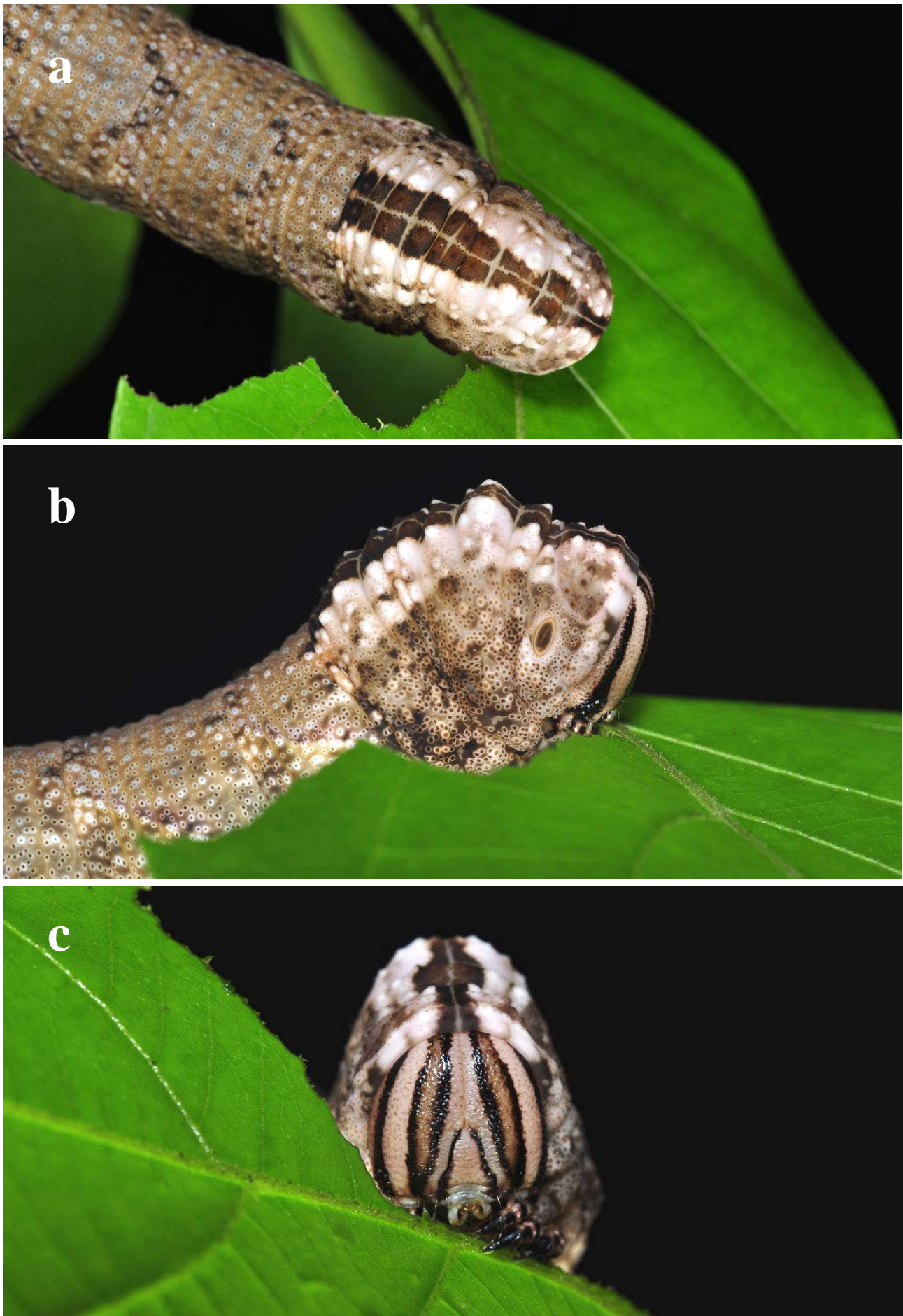


Fig. 2. Dorsal (a), lateral (b), and frontal (c) close-up views of the anterior segments of the caterpillar (as in Fig. 1).



Anteriorly, a distinct dark brown, mid-dorsal band was present on the thoracic segments. This brown band was flanked by white bands on both sides. Its head displayed attractive, symmetrical black stripes, which clearly delineated beige and brown sectors (Fig. 2). Overall, the caterpillar exhibited a stippled appearance, a visual effect created by numerous closely-spaced brown dots, each of which was encircled by a white ring (Fig. 3).

The spiracles were dark brown, with a thin, beige outline. Its abdominal prolegs were banded with brown and black. Upon closer inspection, the arrangement of crochets (used for gripping stems) could be observed (Fig. 4). Its posterior tail horn exhibited the typical sinusoidal curve and spiny tubercles of the species (Fig. 5). The tail horn was mostly dark brown for three quarters of its length, merging into pale buff posteriorly. Its anal prolegs were deep, blackish brown, and well demarcated from the whitish margin of the supra-anal flap.

While being reared in captivity, the caterpillar appeared superficially healthy and fed at a regular rate throughout the day on 16 Jul.2011 (Fig. 6). On the morning of 17 Jul.2011, the caterpillar ceased to feed and started to pace around—apparent prepupal behaviour. But by the same evening, it became weak and sluggish, mostly remaining still, with occasional spasms. Backlighting with a flashlight revealed discernible crawling movements within its body and it was suspected to be harbouring tachinid maggots internally.

This suspicion was confirmed on the morning of 18 Jul.2011, with the preliminary emergence of four maggots from a rupture in the caterpillar's body wall. The same afternoon, the caterpillar's body appeared deflated and lay in a putrid pool of dark fluid that reeked. Even more maggots had emerged as they spilled out from the caterpillar. In the evening, it was evident that the caterpillar's body was entirely infested with numerous maggots, as a writhing mass of them was gravitating towards both ends of the host (Fig. 7). The pale, white maggots were measured to be 12–15 mm long.

A brief video clip of the tachinid maggots in the process of devouring the caterpillar host from within was recorded and subsequently uploaded (<http://www.youtube.com/watch?v=TyFjMjaq0A>). Later that same night (ca. 2345 hours), the thoracic region appeared even more deflated and the head capsule had become almost detached (Fig. 8). Its contents must have been consumed, as it was clearly hollowed out. The intolerable stench from the leaked fluids was unrelenting, if not aggravated.



Fig. 3. Lateral close-up of the mid-section to show the dense arrangement of tiny, dark brown dots, encircled with white, and abdominal spiracles.



Fig. 4. Ventral close-up of the abdominal prolegs to show the arrangement of crochets used for gripping and climbing.



Fig. 5. Posterior close-up to show the shape and ornamentation of the tail horn (16 mm).





Fig. 6. For most of the day on 16 Jul.2011, the caterpillar demonstrated a healthy appetite and maintained a routine of regular feeding bouts and defecation.



Fig. 7. On the afternoon of 18 Jul.2011 (1745 hours), a group of tachinid maggots (12–15 mm) had advanced into the thoracic cavity of the caterpillar host, consuming the soft tissue and fluid at a steady pace.





Fig. 8. By the late night of 18 Jul.2011 (2345 hours), most of the thoracic tissue had already been consumed. The head was not spared as well, and dangled as an empty capsule (arrowed) almost detached from the body.



Fig. 9. The maggots began to pupate on the evening of 19 Jul.2011. A total of 56 puparia (lengths: 5–7 mm, widths: 2–3 mm) were counted.



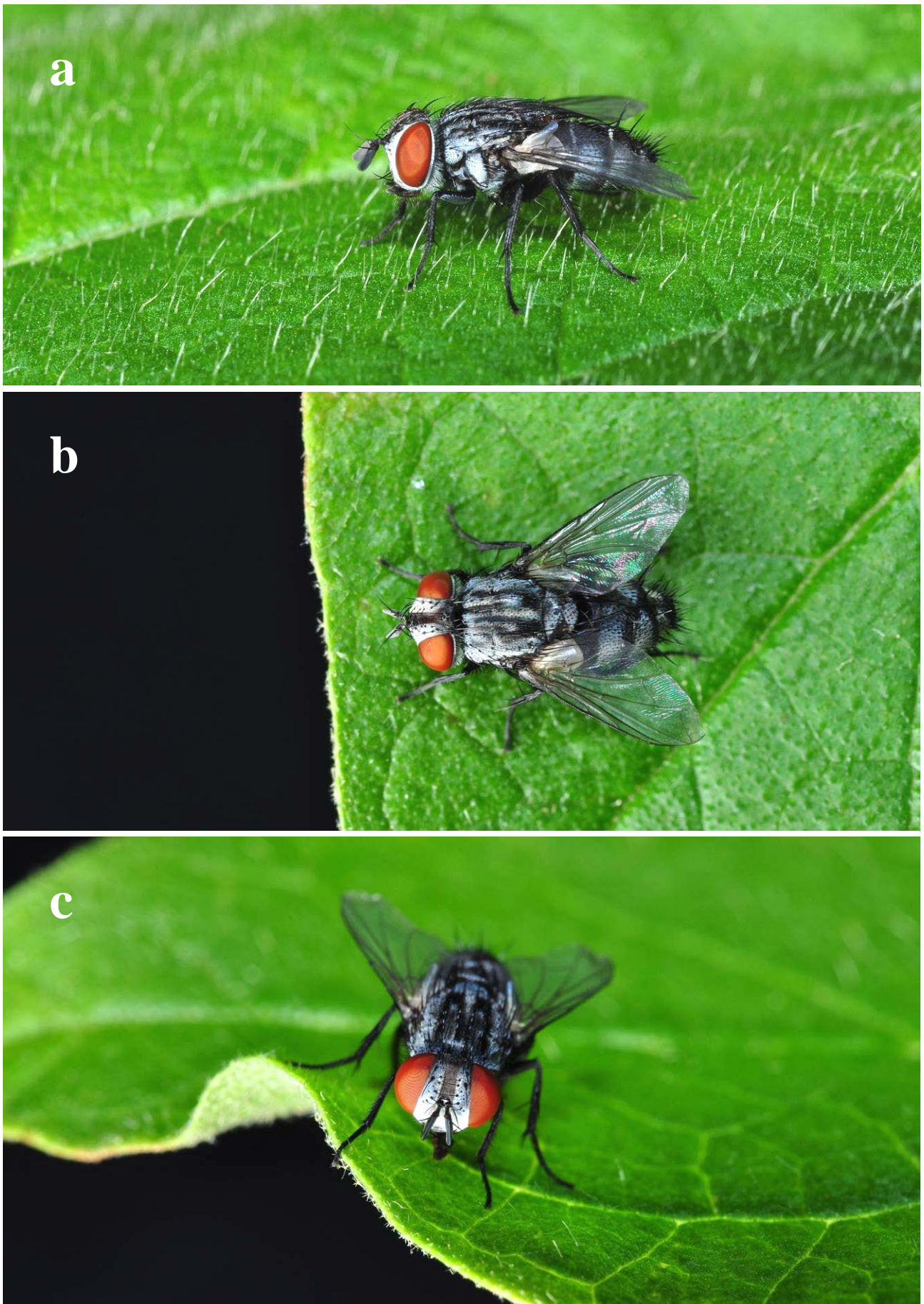


Fig. 10. Lateral (a), dorsal (b), and frontal (c) views of a tachinid fly, *Drino (Zygobothria) atropivora* that emerged from its puparium on 27 Jul.2011. All 56 flies emerged successfully and synchronously (ZRC.6.22177, body lengths: 7–9 mm, forewing lengths: 5–7 mm).

By the morning of 19 Jul.2011, the caterpillar host had been entirely consumed, save for its external cuticle. The maggots were mostly huddled underneath this loose cuticle, lying in the remnant layer of brown fluid. Then in the evening, they began to gradually disperse, in search of a place to pupate. By 20 Jul.2011, pupation was complete and a total of 56 dark brown puparia (lengths: 5–7 mm, widths: 2–3 mm) were counted (Fig. 9). The remnant caterpillar cuticle was then carefully cleaned, preserved (in 70% ethanol), and catalogued at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biological Sciences (RMBR), National University of Singapore (ZRC.LEP.355).

On the afternoon of 27 Jul.2011, the adult tachinid flies eclosed en masse, with 100% emergence (Fig. 10). The flies were preserved as voucher specimens (ZRC.6.22177, body lengths: 7–9 mm, forewing lengths: 5–7 mm) and subsequently identified as *Drino* (*Zygobothria*) *atropivora* (Robineau-Desvoidy, 1830) by Hiroshi Shima (Aug.2011). This widespread species belongs to the tribe Eryciini, in the subfamily Exoristinae, and has a broad geographic range that includes the Palaearctic, Afrotropical, Oriental, and Australasian regions (O'Hara et al., 2009).

There have been previous records of *Acherontia lachesis* as the parasitoid host for *Drino* (*Zygobothria*) *atropivora* in Myanmar, India and Java (Crosskey, 1976: 303 — as *Zygobothria atropivora*). There appears to be some degree of preference for sphingids as hosts by this tachinid, as testified by records of seven other hawkmoth species, including: *Acherontia atropos*, *Acherontia styx styx*, *Psilogramma increta*, *Agrius convolvuli*, *Hippotion celerio*, *Sphinx caligineus*, and *Sphinx maurorum* (Crosskey, 1976; Shima, 2006; Pittaway, 2011; Pittaway & Kitching, 2011). However, other moths are also parasitised by this tachinid, including: *Streblote dorsalis* (Lasiocampidae) in Sri Lanka, and *Mythimna separata* (Noctuidae) in Japan (Crosskey, 1976; Shima, 2006).

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