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LARVA OF *CYANA* SPECIES MOTH PARASITISED BY TACHINID FLIES, *CARCELIA CAUDATA* BARANOV, 1931 (DIPTERA: TACHINIDAE: EXORISTINAE: ERYCIINI)

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INTRODUCTION

Around the world, there are approximately 10,000 described species of tachinid flies, yet this figure is still an under-representation of the actual global diversity (O'Hara, 2008). In the Oriental region, at least 725 species (in 261 genera) are known (O'Hara, 2008). Recent entomological efforts focusing on the tachinid fauna of mainland China and Taiwan have revealed a checklist of 1,109 valid species, of which 36% are regarded as regional endemics (O'Hara et al., 2009). Tachinid flies are principally parasitoids and predominantly target the caterpillars of Lepidoptera (butterflies and moths) as hosts, in order to complete their own metamorphosis, at the expense of the caterpillars' survival. In Singapore, attempts at rearing native species of caterpillars have occasionally resulted in the unexpected emergence of tachinid larvae, accompanied by the demise of the caterpillar host. Here, we present an account of a hairy moth larva that eventually succumbed to attack by tachinid flies, despite having completed construction of its cocoon.

Fig. 1. Lateral view of cocoon of the moth, *Cyana* species (Arctiidae: Lithosiinae), attached to the upper leaf surface of simpoh air (*Dillenia suffruticosa*). The cocoon meshwork measured 30 × 20 mm.

OBSERVATIONS

On 30 Aug.2010, a cocoon of a *Cyana* species moth (Lepidoptera: Arctiidae: Lithosiinae) was found at Bukit Kallang, MacRitchie Reservoir forest. The mesh-like cocoon (30 × 20 mm) was attached to the upper leaf surface of a simpoh air shrub (*Dillenia suffruticosa*). The cocoon construction and design was consistent with that of the genus, e.g. *Cyana perornata* (Walker, 1854) (see: Leong, 2010). However, instead of a moth pupa suspended therein, we noticed two dipteran puparia (singular, puparium) within (Fig. 1). The dimensions of the elliptical puparia were 6 × 3 mm (Fig. 2). One of the puparia was securely suspended via a network of silken threads, as would the moth pupa (Fig. 3).

There were neither remnants of the larval exuvia nor the moth pupa, indicating a possibility that the moth larva was entirely consumed by the two dipteran larvae prior to their puparial stage. The puparia were a golden brown, but darkened to a shade of black on 1 Sep.2010. By 2 Sep.2010, the first tachinid fly had emerged. On 3 Sep.2010, the second fly emerged (Fig. 4). Both flies were preserved, measured, and catalogued at the Zoological Reference Collection (ZRC), Raffles Museum of Biodiversity Research (RMBR), National University of Singapore (ZRC.6.21809a & 21809b, body lengths: 7 mm, forewing lengths: 6 mm), together with the *Cyana* species moth cocoon (ZRC.LEP.330).

The flies were subsequently identified as *Carcelia caudata* Baranov, 1931 by Hiroshi Shima (Kyushu University). The geographic distribution for this species includes Taiwan (type locality), China, Japan (Honshu), Sri Lanka, and India (Uttar Pradesh) (Crosskey, 1976: 229; O'Hara et al., 2009: 61). Interestingly, a documented lepidopteran host for this fly species listed *Cyana peregrina* (Walker, 1854) based on an Indian record (Crosskey, 1976: 296 ― as *Chionaema peregrina*).

In Singapore and the Southeast Asian region, our understanding of the tachinid diversity and ecology remains far from adequate. Their relationships with the respective insect hosts still require extensive investigation. An excellent example of a comprehensive study of such parasitoid-host interactions was a recent compilation by Stireman et al. (2009), based on field studies conducted in the cloud forests of the northeast Ecuadorian Andes. A total of 157 morpho-species of tachinid flies were reared from 160 species (representing 16 families) of Lepidopteran hosts.

In Japan, at least 200 species of tachinid flies have been recorded, with 370 species of Lepidoptera being targeted as their hosts (Shima, 2006). In order to determine if our tachinid diversity in the Sundaic region has such comparable species richness would certainly demand comparable commitment and effort towards such an enquiry.

Fig. 2. Dorsal view of *Cyana* species cocoon. The dipteran puparia within measured 6 × 3 mm.

Fig. 3. Dorsal close-up of eclosed tachinid fly puparium, suspended by silken threads within the moth cocoon.

Fig. 4. The second tachinid fly, *Carcelia caudata* (ZRC.6.21809b) emerged on 3 Sep.2010. Its body length was 7 mm, forewing length: 6 mm.

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