

## FINAL INSTAR CATERPILLARS AND METAMORPHOSIS OF *CYCLOSLIA SORDIDUS* (WALKER) IN SINGAPORE (LEPIDOPTERA: ZYGAENIDAE: CHALCOSIINAE)

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**ABSTRACT.** — The final instar caterpillar and characteristic cocoon of the chalcosiine moth, *Cyclosia sordidus* (Walker), are described and illustrated. Notes on sexual dimorphism in this species are provided.

**KEY WORDS.** — caterpillar, cocoon, Chalcosiinae, *Cyclosia sordidus*

### INTRODUCTION

The moth *Cyclosia sordidus* was first described by F. Walker (1862) based on specimens collected by A. R. Wallace from Sarawak, Borneo. Two subspecies have been recognised, with the nominate subspecies occurring in Sundaland (including Sumatra, Java, Malay Peninsula, Borneo), while the subspecies *bungauensis* Schultze occurs in Tawitawi, Philippines (Piepers & Snellen, 1902; Endo & Kishida, 1999; Holloway, 2011). Early illustrations of adult moths of this species were featured in the works of Swinhoe (1892: pl. II, Fig. 14 [female]) and Piepers & Snellen (1902: pl. 14, Fig. 4 [female], Fig. 8 [male]). More recent illustrations appeared in Endo & Kishida (1999: 29, Fig. 7 [male], Fig. 8 [female]) and Holloway (2011: pl. 3, moth 10 [male] from Singapore, moth 11 [female]). Although brief descriptions (in French) of its caterpillar and cocoon were included by Piepers & Snellen (1902), illustrations were not provided.

### OBSERVATIONS

On 12 Nov.2011, the skeletonised leaves of a rambai treelet (*Baccaurea motleyana*, family Phyllanthaceae) along the Lower Peirce Reservoir forest betrayed the presence of a small group of caterpillars feeding at waist-level. Four caterpillars were then obtained to be reared in captivity. The body lengths of the final instar caterpillars were between 15–19 mm. Their cylindrical bodies were a translucent, pale greenish yellow, with broad, cherry red bands at the anterior and posterior segments (Figs. 1, 2). At the anterior, this continuous red band spans the dorsum of T2, T3, and A1. At the rear, the band originates at the posterior half of A7 and extends to A9.



Fig. 1. Dorsolateral view of the final instar caterpillar of *Cyclosia sordidus* (body length: 18 mm), feeding on the leaf of a rambai treelet (*Baccaurea motleyana*, Phyllanthaceae) at the Lower Peirce Reservoir forest on 12 Nov.2011.



Fig. 2. Dorsal view of final instar caterpillar (head towards right, as in Fig. 1). Note even rows of protuberances per segment, as well as pale fine setae radiating outwards.

Throughout its body, evenly spaced protuberances were prominently arranged from segments T2 to A9 (Figs. 2, 3). Segments T2 and T3 exhibited six tubercles each, while segments A1 to A9 had four tubercles each. The tubercles from A2 to A7 were particularly attractive, as each was encircled by a cherry red ring at its base. A sparse arrangement of fine, silvery setae radiated from its body, many originating from these tubercles. Along its flanks, the tiny, black spiracles were visible at T1 and from A1 to A8. The abdominal prolegs between A3 and A6 were well developed.

Its head is concealed by a membranous hood that extends forwards from T1. This hood is mostly black in the front and whitish on the sides (Figs. 4, 5). Originating from the ventrolateral corners of T1 is a pair of translucent tentacles that are usually retracted when the caterpillar is on the move, but often extended when the caterpillar is feeding. These structures are motile and probably have sensory functions. At its posterior, the anal segment is adorned with a gently curved, black band (Fig. 6). In captivity, the caterpillars demonstrated a voracious appetite, despite their diminutive size. Apart from the leaves, the petioles were also readily consumed (Figs. 3, 5). A video clip of their feeding activity on a leaf was recorded and uploaded (<http://www.youtube.com/watch?v=yZRKC7kVI2I>).

On the 15 Nov.2011, the caterpillars had begun to display pre-pupal signs, including the darkening of body colours, cessation of feeding, and restless pacing about. That same night, one of the caterpillars was observed to position itself upon the upper side of a leaf and began laying down a thin mat of silk. By the evening of 16 Nov.2011, a fully formed, elliptical cocoon had been completed (Fig. 7). It was carefully aligned over the mid vein of the leaf, was dorsoventrally flattened, and measured 21 × 11 mm. There was a dark, round, protruding knob at the centre. Overall, the cocoon had a light, pinkish brown colour.

On the evening of 3 Dec.2011 (ca. 1900 hours), the first moth had eclosed. Upon eclosion, its translucent gold pupal case had become partially extruded from within the cocoon (Fig. 8). The adult moth was then determined to be a female *Cyclosia sordidus*, after comparisons with published illustrations for this species. The moth was an overall black, with light hints of metallic blue, and powdery white band on its forewings, variously interrupted by the wing venation (Fig. 9). Its body length was 15 mm; forewing length, 23 mm. Its antennae (length: 10 mm) were metallic blue and bipectinate (Fig. 10). From the ventral perspective, the pattern of the hindwings (white with broad, black margins)





Fig. 3. Three caterpillars converged on the petiole (diameter: 4 mm) of the hostplant and systematically consumed this segment for hours without a pause.



Fig. 4. Frontal view of caterpillars feeding along leaf margin. Their heads were constantly shrouded in a membranous hood. A pair of translucent tentacles originating from T1 may be seen.



Fig. 5. Lateral close-ups of anterior segments to view the motile, translucent tentacles at T1. These tentacles were both extensible and retractable, probably serving as sensory organs.



Fig. 6. Posterior close-up of caterpillar. Note curved, black band on anal segment.





Fig. 7. The earliest cocoon to be formed was completed by the evening of 16 Nov.2011. It was positioned along the mid vein of a leaf of its hostplant and measured  $21 \times 11$  mm.

could be seen (Fig. 11). Between 4–5 Dec.2011, the three remaining moths eclosed and were also females. The specimens were preserved and catalogued at the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore as ZRC.LEP.360 (body lengths: 13–16 mm, forewing lengths: 9–11 mm, antenna lengths: 9–10 mm).

There is significant sexual dimorphism in *Cyclosia sordidus*, with males being noticeably smaller than females, having less extensive white on the forewings, and displaying metallic blue on the hindwings (instead of white) (Fig. 12). An extensive series of male moths from Singapore was examined for comparative purposes (ZRC.LEP.363–371, 36 males, body lengths: 9–14 mm, forewing lengths: 15–18 mm, antenna lengths: 7–9 mm). These were mostly collected by L. L. Koh between 2006–2007 from the Bukit Timah Nature Reserve and the Central Catchment Nature Reserve.

The genus *Baccaurea* (Phyllanthaceae) appears to be a preferred larval hostplant among *Cyclosia* moths, with prior records for at least four other species. These include: (i) *Cyclosia macularia* (Guerin) on *Baccaurea motleyana* and *Baccaurea racemosa*, (ii) *Cyclosia nivipetens* Walker on *Baccaurea motleyana*, (iii) *Cyclosia panthona* (Stoll) on *Baccaurea ramiflora*, and (iv) *Cyclosia papilionaris* (Drury) on *Baccaurea ramiflora* (Robinson et al., 2011).

In Singapore, at least two additional species of *Cyclosia* have been recorded, based on field observations and museum specimens. These include *Cyclosia macularia macularia* (Guerin) and *Cyclosia pieridoides virgo* Jordan. Hopefully, future field studies will allow encounters with their respective caterpillars to enable comparisons of larval morphology and hostplant preference.





Fig. 8. The vacated pupal case (arrowed) was partially extruded from the cocoon (as in Fig. 7) upon eclosion of a female moth on the evening of 3 Dec.2011.



Fig. 9. Dorsal view of freshly eclosed female moth (ZRC.LEP.360, body length: 15 mm, forewing: 23 mm).





Fig. 10. Anterior close-up to view details of bipectinate antennae (length: 10 mm) of female moth (as in Fig. 9).



Fig. 11. Ventral view of female moth (as in Figs. 9, 10) to view hindwing patterns.



Fig. 12. Dorsal view of a male (ZRC.LEP.371, body length: 12 mm, forewing: 15 mm, antenna length: 8 mm) collected from MacRitchie forest in Feb.2007.

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