

Biodiversity Record: Parasitism of blue nawab, common rose and common birdwing caterpillars by tachinid flies

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Subjects: Blue nawab, *Polyura schreiber* (Insecta: Lepidoptera: Nymphalidae);
Common birdwing, *Troides helena* (Insecta: Lepidoptera: Papilionidae);
Common rose, *Pachliopta aristolochiae* (Insecta: Lepidoptera: Papilionidae);
Tachinid fly, unidentified genus and species (Insecta: Diptera: Tachinidae).

Subjects identified by: Anuj Jain.

Location, date and time: Singapore Island, Private home garden at Jalan Tempua off Kheam Hock Road; July 2022.

Habitat: Urban parkland. Garden of a private house with caterpillar host plants including the rambutan (*Nephelium lappaceum*) and Dutchman's pipe (*Aristolochia acuminata*) planted on trellis.

Observers: Riza Burgos and Amy Tsang.

Observations: Two final instar caterpillars of the blue nawab were observed feeding on the leaves of the rambutan tree. Upon pupation in early July 2022, the pupa was kept in a soft net container by the observer so it could be safe from predators during pupation. Close to the expected time of eclosure, both pupas showed some infestation on their outer covering (Fig. 1A). Later they were observed to be 'hollowing' out from within when the pupas were seen against the light. Eventually the pupae became very soft, watery and appeared to have died (Fig. 1B). Soon after, seven dark brown puparia (each about 1 cm long) were found on the floor of the soft net container where the pupae had been placed (Fig. 1C). The puparia were identified to be tachinid flies.



Fig. 1. (A) An early stage of infestation on the blue nawab pupa; (B) a fully parasitized blue nawab pupa with an empty case; (C) Seven tachinid fly puparia found at the bottom of the soft net container that held the blue nawab pupae. (Photographs by: Riza Burgos).

Similar infestation and death also occurred for one common rose (Fig. 2A) and two common birdwing caterpillars (Fig. 2B & C) during the latter half of July 2022. The parasitism became apparent when the caterpillars were in their final instar. The caterpillars were kept in a small container with a stick provided for them to 'hang' onto and pupate. However, the caterpillars were unsuccessful in pupating. Instead their body fluids appeared to be excreted out. Similar fly puparia were also found at the bottom of the container. Unfortunately, we were unable to photograph the fly puparia in container with the rose and birdwing caterpillars. Neither could we photograph the adult flies that emerged from the puparia.

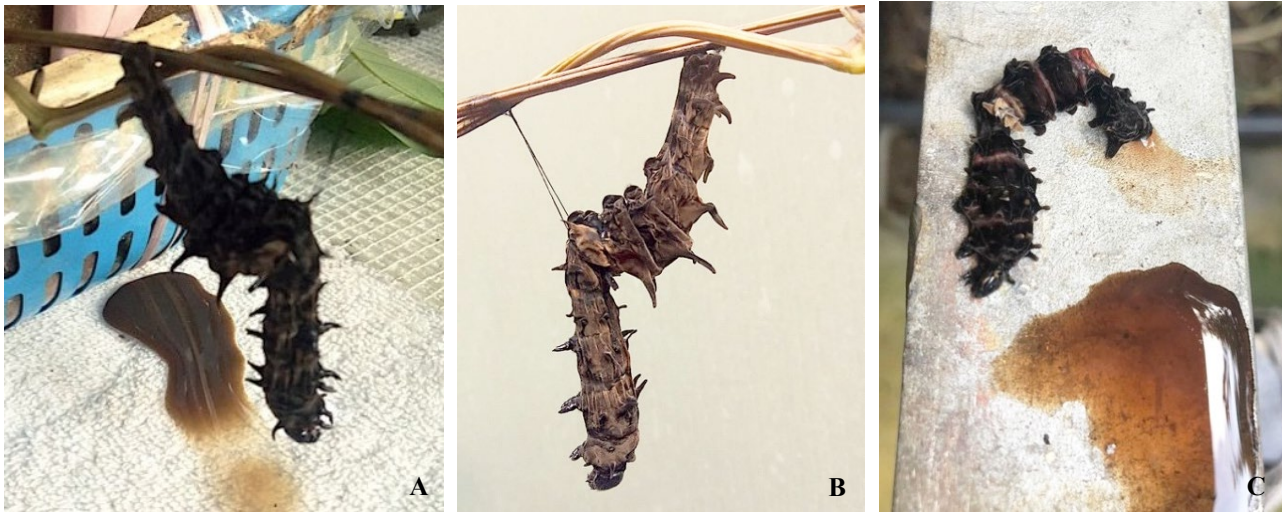


Fig. 2. (A) Fly-infested common rose caterpillar with body fluids excreted, (B) fly-infested common birdwing caterpillar hanging from its silk girdle, (C) a fallen common birdwing caterpillar with body fluids excreted. (Photographs by: Riza Burgos)

Remarks: Tachinid flies are parasitoids that mainly target the caterpillars of butterflies and moths as hosts, in order to complete their life cycle and at the expense of the caterpillars' survival (Leong & Woon, 2010). They lay eggs on young caterpillars. The eggs hatch and the fly larvae (maggots) drink the blood (hemolymph) of the caterpillar. The maggots then eat their way out of the caterpillar or pupa and eventually pupate. A few days later a tachinid fly emerges from each pupa.

Singapore is home to at least 88 native tachinid fly species (The Biodiversity of Singapore, 2022). However, there are surprisingly few published records of lepidopteran interactions with tachinid flies. In comparison, at least 200 species of tachinid flies are known from Japan with 370 species of Lepidoptera being targeted as their hosts (Shima, 2006). The majority of Singapore records of such interactions come from parasitism of moth larvae. The tachinid *Exorista* sp. is known to parasitise the Atlas moth (*Attacus atlas*) (Ow, 2017). Another tachinid, *Carcelia caudata*, is known to parasitise the footman moth (*Cyana* sp.) (Leong & Woon, 2010; Bird Ecology Study Group, 2015). A Google Scholar and internet search with the key words 'tachinid fly', 'parasitism', 'butterfly caterpillar', 'Singapore' revealed no new results except those listed above.

The ecology of tachinid fly and butterfly larvae interactions appears to be very poorly studied in Singapore. To this effect, the population level impacts of such parasitism on butterflies remain unknown. Our limited observations from the Jalan Tempua home garden from January to July 2022 show that at least 10 out of 66 (or about 15%) common rose caterpillars that reached the pupa stage were observed to be parasitized. In comparison, only 2 out of the 16 (or 13%) common birdwing caterpillars that reached the pupa stage were parasitized. A concerted effort is needed to document the population level impacts of tachinid flies on butterfly larvae and particularly on threatened butterfly species such as the common birdwing and common rose that already have small populations (Jain et al., 2021). Studies are also needed to document the differing rates of parasitism between forest, parkland and urban habitats in Singapore.

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