

## Why is homopterophagous butterfly, *Spalgis epius* (Westwood) (Lepidoptera: Lycaenidae) myrmecophilous?

The recent article on apefly, *Spalgis epius* concluded that the reason for its myrmecophilous (non-association with ants) nature is not clearly understood<sup>1</sup>. Based on observations on *S. epius* and its relationships with different species of ants, the author is hypothesizing some of the possible reasons for evolution of this lycaenid butterfly as myrmecophilous species.

The members of Lycaenidae represent about 40% of all known butterfly species, yet the ecology of their amazing relationships is not obviously understood<sup>2</sup>. Lycaenids feed on diverse unrelated foods such as plants, fungi, lichens, cycads, ferns, conifers, homopterans (mealybugs, scale insects, aphids, etc.) and larvae of ants<sup>2</sup>. Among them, less than 5% is purely entomophagous (feed on insects) species<sup>3</sup>.

Homopterans are known to bribe ants with their sugary secretion (honeydew) and in return ants protect them against their natural enemies (predators and parasitoids)<sup>4</sup>. Homopterans show mutualism with ants by secreting honeydew both to appease predatory ants and to sequester them for defence. Like homopterans, several species of lycaenid larvae have symbiosis with ants by providing secretion of honeydew in exchange for protection against natural enemies<sup>2,3,5,6</sup>.

Some of the primitive plant-feeding lycaenid members changed over to homopterophagous habit due to close association with ants<sup>7,8</sup>, which subsist in the environs of honeydew-secreting homopterans. Most of the species of homopterophagous lycaenid larvae are myrmecophilous (associated with ants) by secreting honeydew<sup>3</sup>. As ants get nectar from both homopterans and lycaenid caterpillars, they are not hostile to the caterpillars, which are predators of homopterans. Thus, the caterpillars deceive the ants by preying on homopterans.

Most of the homopterophagous lycaenids are myrmecophilous to thwart attack of natural enemies with the help of ants as well as to feed on homopterans<sup>3</sup>, a homopterophagous *S. epius* has evolved as myrmecophilous type and ants derive no benefit from the predatory larvae<sup>3,4,9</sup>. Unlike other lycaenids, *S. epius* larvae do not yield an ant confection, and ants that visit honey-secreting homopterans are hostile to the caterpillars<sup>1,3,9</sup>. Myrmecophily is judged as a primitive trait among living

lycaenids, whereas its absence in some species is considered as a secondary loss in evolution<sup>4</sup>.

Myrmecophilous *S. epius* is a potential predator of mealybugs<sup>10-12</sup>; two species of ants, *Oecophylla smaragdina* (F.) and *Crematogaster* sp. attending mealybugs are hostile to *S. epius* larvae<sup>1</sup>. However, it has been noticed that a species of ant, *Anoplolepis gracilipes* Smith (Hymenoptera: Formicidae) feeding on honeydew of mealybugs *Planococcus citri* (Risso) (Ho-

moptera: Pseudococcidae) on hibiscus, was non-hostile to larvae of *S. epius* which were preying on *P. citri*. Generally, *A. gracilipes* is associated with homopterans for honeydew<sup>13</sup>.

Many homopterophagous lycaenids are myrmecophilous, but evolution of *S. epius* as myrmecophilous type is presumed to be due to one of the two reasons, viz. (i) *S. epius* as a homopteran predator might have been mostly associated with non-hostile ants like *A. gracilipes* in the begin-

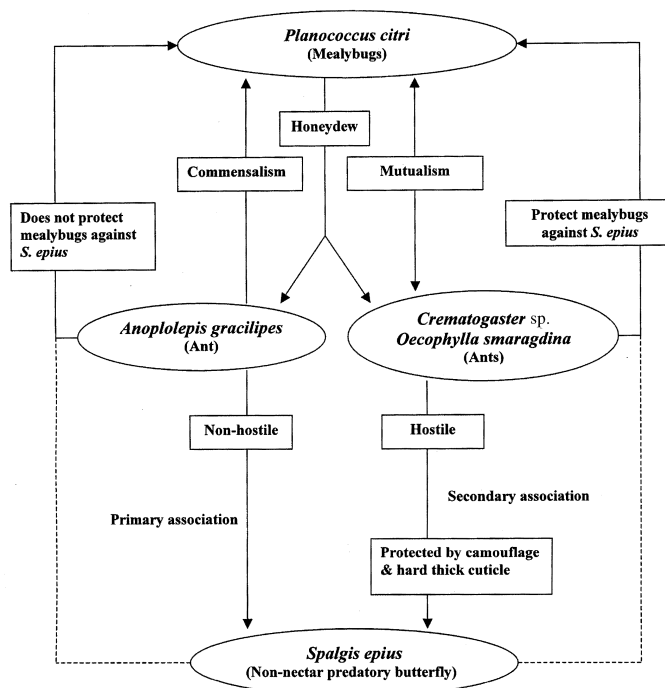


Figure 1. Interaction between predator of mealybugs, *S. epius* and ants.



Figure 2. Two fully grown larger larvae of *S. epius* feeding on mealybugs.

## CORRESPONDENCE

ning or (ii) larvae of *S. epius* simulate mealybugs in their early instars and subsequent mature larvae withstand ant attack by hard, thick dorsal cuticle.

The primary association of *S. epius* with non-hostile ants like *A. gracilipes* at the feeding site of mealybugs probably had made them discontinue secretion of honeydew and their relation with hostile ants later might be secondary association (Figure 1). Or else, as *S. epius* larvae of early instars simulate mealybugs, it is difficult for the hostile ants to recognize these camouflaged predacious guests amidst host population and later instars (Figure 2), which are larger than mealybugs and withstand the attack of hostile ants by their thick dorsal cuticle, as reported in different species of *Spalgis*<sup>1,14,15</sup>. Because of any one of the above developments in *S. epius*, it perhaps opted to save valuable energy (honeydew), which is no longer required to appease ants as predators of mealybugs and sequester them for defence. Moreover, no larval parasitoids/predators of *S. epius* have been reported so far. Hence, it may not be necessary for

*S. epius* to sequester ants for defence. Even if early larval enemies of *S. epius* exist, ants tackle them at the cost of homopterans' nectar.

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## Sethusamudram shipping canal project and the eternal silence of the Indian earth scientists

The controversial Sethusamudram project – excavating the 56-km-long shallow sea between the Palk Bay and Gulf of Mannar and creating a narrow shipping passage linking the east and west coasts of India – received a formal go-ahead signal from the Union Cabinet recently, according to press reports. This project (estimated to cost currently Rs 2233 crores) has been under fire for being unmindful of possible environmental impact. A note, critical of this project, by Ramesh (incidentally a medical practitioner, not a geologist or oceanographer) was published in *Current Science*<sup>1</sup>. The major scientific objections raised by him regarding this project are: (a) The National Environmental Engineering Research Institute, Nagpur, which had been entrusted with the environmental impact assessment (EIA), has not taken recent studies on the sedimentation dynamics of the project area into consideration; therefore their conclusions are questionable. (b) The impact assessment studies have neglected the role of cyclones (not to speak of the rare incidences of tsunamis) in dispersing

the dredged material, a major risk factor of the region. (c) The EIA has only looked at the sedimentation dynamics of a small area, but ignored the adjacent portions, including the Palk Bay strait – an area noted for unusually high sedimentation rate. (d) The nature of the substratum of the region is not known: is it soft or hard? This information is important to decide on whether to dredge or blast the sea bottom and to plan for safe disposal of the dredged material. (e) The EIA study is ambivalent in identifying sites for safe disposal of dredged material, without creating an environmental mess for the organisms living in the sea (Sri Lanka has a major stake here). (f) The impact of changed bottom topography as a result of dredging or blasting on the movement of currents is not known. Ironically, the medical practitioner who is affiliated to an NGO has registered all the aforementioned objections (see his full report in <http://www.geocities.com/sethuship canal>), and I am yet to see any geologist or oceanographer raising any concern on this project.

Personally, I believe all the objections raised remain valid unless and until these issues are resolved by an independent group of experts. Have we considered other dangers, for example, the prospect of grounding or straying, from the canal alignment, of a rogue ship containing coal or oil or even a collision of such ships, and the ensuing ecological disaster? On the other hand, if ships are going to be guided by tugs, there will certainly be a huge toll that would work out to be more expensive than sailing around Sri Lanka (see Ramakrishnan, K. S., *The Hindu*, 21 December 2004). Finally, only the Indian Navy will essentially use this route! Another issue is whether we have worked out a realistic cost-benefit analysis of this project? In a recent statement, the Union Minister for Shipping, Ports and Highways mentions that this canal will have a 'dissipating effect' on tsunamis, if they strike the east coast (*The Hindu*, 6 June 2005). He further states that the Ministry is now ready with scientific data to answer any questions on this project (including a tsunami model of deep sea-