Journal of the Lepidopterists' Society
42(1), 1988, 57–58

GENERAL NOTE

DIFFERING OVIPOSITION AND LARVAL FEEDING STRATEGIES IN TWO *COLOTIS* BUTTERFLIES SHARING THE SAME FOOD PLANT

Additional key words: Pieridae, *Colotis amatus, C. vestalis,* eggs, Salvadoraceae.

There is much interest in the habit of certain butterfly species laying eggs in clusters. It is generally agreed that cluster-laying is a derived trait, the ancestral butterfly having laid single eggs. Cluster-laying has evolved independently several times in all butterfly families. Its significance has been subject to a variety of interpretations. The purpose of this paper is to present oviposition data for two closely related species of *Colotis* in New Delhi, India.

The species in question are *Colotis amatus* F., whose geographic distribution covers most of Africa, Arabia, India, and Sri Lanka; and *C. vestalis* Butler, found in NW India, Pakistan, and East Africa, but unaccountably absent from Arabia (Larsen, T. B. 1983, Fauna of Saudi Arabia 5:333–478). Together with *C. phisadia* Godart, *C. amatus* and *C. vestalis* form a small section of the genus that feed on Salvadoraceae rather than on the more usual Capparidaceae.

In New Delhi both butterflies feed on *Salvadora persica* L. and *S. oleoides* Decaisne. Usually both are phenologically synchronous, and occur on the same trees or bushes. In size and behavior they are very similar and were not the ground colours salmon and white, respectively, they would be difficult to tell apart on the wing. M. A. Wynther-Blyth (1957, Butterflies of the Indian Region, Bombay Natural History Society, Bombay, 523 pp.) even suggests they interbreed, interspecific copula having been observed.

Given the overall similarity, the difference in oviposition behavior is startling. *Colotis amatus* lays clusters averaging ca. 30 eggs on upper surfaces of fresh leaves at outer extremities of the host plant (Table 1). Eggs are evenly spaced within each clutch. *Colotis vestalis* lays single eggs deep inside the host plant, usually on a twig or a branch, rarely on an old leaf. I observed eggs being laid as far as 90 cm from the nearest leaf, a considerable distance for a small, freshly hatched larva to travel. Larvae of *C. amatus* feed gregariously on fresh foliage, but group cohesion weakens in final instars. Those of *C. vestalis* feed singly on old leaves, usually deep inside the bush or tree. I never found both species on the same leaf.

The egg of *C. vestalis* is chalk white with 20–22 keels extending from the micropyle to the base. It is covered in fine hairs, best visible when the egg is submerged in fluid. Egg volume appeared 15–20% greater than that of *C. amatus*. The latter's eggs are yellow, have only 14–16 keels, lack hairs, and unlike those of *C. vestalis* are covered with a sticky substance. Midges and mosquitoes were often found trapped on egg clutches.

S. Courtney (1984, Am. Nat. 123:276–281) mentions that *Aporia crataegi* L. in Morocco may adjust egg-clutch size to food plant quality. The data are given in more detail by S. Courtney (1986, Adv. Ecol. Res. 15:51–131). *Colotis amatus* clutch-size on the broad-leaved Salvadora *persica* averaged 28.7 eggs (n = 106), and on the narrow-leaved *S. oleoides,* 22.7 (n = 17) in my Delhi sample; the difference is not statistically significant.

Although these two common butterflies are synchronous and share foodplants, they seem to be noncompetitive. I never saw complete defoliation of food plants. There are a number of potential pathways for two such butterflies to evolve different ovipositing strategies, but data to support any specific hypothesis are not available. Probably no single causal factor underlies all egg clustering. However, available data do not support the hypothesis of R. A. Fisher (1930, The genetical theory of natural selection, Clarendon Press, Oxford, 272 pp.) that egg clustering leads to aposematism; if anything *C. vestalis,* which feeds on old leaves, should be the more aposematic of the two. I masticated a number of specimens without finding the least pungency or emetic response, although I found other aposematic butterflies emetic (Larsen, T. B. 1983, Entomol. Rec. J. Var. 95: 66–67).

The closest parallel I have seen to the two *Colotis* species is that of *Eurema hecabe* L. and *E. blanda* Boisduval in Papua New Guinea and S India. The former lays single eggs,

TABLE 1. Number of eggs in 123 clutches laid in the wild by *Colotis amatus* in New Delhi, India (autumn 1986).

No. eggs in clutch	No. clutches	No. eggs in clutch	No. clutches
1–5	0	41–45	5
6–10	2	46–50	3
11–15	10	51–55	0
16–20	24	56–60	2
21–25	25	61–65	1
26–30	19	66–70	1
31–35	17	71–75	1
36–40	13	76+	0

Average 27.9 eggs per clutch.

the latter clutches. However, in both places the two show more ecological and spatial segregation than *Colotis*; they can feed on the same plants but usually do not do so in the same locality. In Yemen I noticed that Capparidaceae-feeding *Colotis* tend towards local food plant specialisation.

The *Urtica* feeding members of the Vanessini in the Palaearctic fall into two groups. *Vanessa* lay single eggs, *Aglais* lay clutches. Members of both genera are often found on the same batch of nettles, but as in *Colotis* complete defoliation is rare.

This paper was prepared under a general research grant for 1987 kindly provided by the Carlsberg Foundation of Denmark.

TORBEN B. LARSEN, *Snoghoj alle 29C, DK 2770 Kastrup, Denmark.*

Received for publication 23 July 1987; accepted 26 October 1987.