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NOTES ON THE COURTSHIP OF TROIDES OBLONGOMACULATUS PAPUENSIS (PAPILIONIDAE) IN PAPUA NEW GUINEA

Straatman (1976, Trans. Lepid. Soc. Japan 27:156–162), gave an account of the courtship behavior exhibited during hybridization of *Troides oblongomaculatus papuensis* Wallace males with *Ornithoptera priamus poseidon* Doubleday females. However, there has been no detailed description of the courtship behavior of *T. o. papuensis*, particularly the use of the hindwing pouches of the male, although various authors have commented upon their highly specialized morphology and obvious androconial function. Similar pouches are found at the base of the costa of the forewings of *Chaetocneme* (Hesperiidae) males from the same region.

The cultivated Aristolochia tagala Chan. vines in the grounds of the Insect Farming and Trading Agency (I.F.T.A.) at Bulolo in Papua New Guinea have produced a thriving population of *T. o. papuensis* that can be observed readily throughout the year. These notes are a summary of observations of over fifty courtships and of a markrecapture study over a period of one year (March '79–March '80).

Mark-recapture results by the author of ex-pupa specimens have shown that individual males can live up to two and one-half months and probably longer. They regularly patrol the grounds of the I.F.T.A. in search of freshly eclosed females by flying to inspect each vine in turn. Up to six males have been in sight at one time and often one or two females may be observed ovipositing at the same time. Marked females have been recaptured while ovipositing on the vines only up to about a week later, which suggests that they go much further afield in search of suitable vines on which to oviposit; thereby, maximizing the dispersal of the species.

Numbers of individuals in the I.F.T.A. grounds have always been too low to obtain an accurate estimate of population size using standard formulae, but a constantly renewed population of 15–25 individuals would be a fair estimate. The farthest distance from which a marked male has been recovered is 2 km, but they probably range farther and have been observed to revisit areas on a rotational basis to feed and search for females.

There are two distinct patterns of courtship by *Troides* males. In the first case, where a newly eclosed virgin female is encountered, pairing is abrupt with apparently no signal from the female that she is receptive. She merely does not prevent the male from coupling. The display by the male prior to pairing is, therefore, short and consists of a period of no more than 30 seconds, while he flutters with rapid wing beats close to, but not actually touching, the female. The male will settle near her on foliage and then turn to engage his open claspers to each side of her abdomen. The female opens her genital aperture by raising the ovipositor, and the union is effected within a matter of a few seconds. If the female flies off later the male is carried hanging inertly below with legs folded. When the female alights again the male will often remain in this posture. Based on ten observations, pairing lasts for about five hours.

The second category of courtship behavior is a sustained and repeated display initiated by the sighting of a previously paired, flying female. Males seem unable to recognize mated females, and prolonged courtship is only exhibited to such individuals. The author has never witnessed sustained aerial courtship of virgin females, probably because males in the grounds of the I.F.T.A. are always sufficiently numerous to locate most new females before they take to the air. Males may even be able to learn in advance the position of female larvae and pupae, because on many occasions *Troides* males have been observed to fly and investigate these early stages. Often they will hinder ovipositing females or (rarely) pursue other males in a briefly attempted courtship display.

The display to the female is a fluttering flight for the purpose of engaging her antennae with the androconial hair-scales of the scent pouches of the male. Therefore, if



FIG. 1. Left side of head of female *Troides oblongomaculatus papuensis*, showing androconial scales from male adhering to her antenna.

the female is flying along in a straight line, the male will execute loops around her, coming quickly from behind and underneath so that the last wingbeat carries him upwards and backwards. The hindwing pouches are thereby timed to open as the female moves forward, so that her antennae then engage in the open slots of the male's pouches.

Sustained courtship by the male in this way elicits an avoidance reaction by the previously paired female, who then goes to ground with wings spread and abdomen pointing downwards. Often the male will continue this display and hover just above the head of the female, repeatedly backing his scent pouches in irregular sweeps onto the female's antennae by quick, downward strokes of the forewings. The male may fly off and return three or four more times but soon leaves the female at this stage. She may remain inert and prostrate on the ground for some minutes after the male has gone and then suddenly take to the air.

If the androconial pouch of the male is opened it can be seen to be full of vertically arranged, extremely close packed, white, hair-like scales. These are very easily dislodged and are so fine and light that they easily stick to a shiny needle point. Their function in courtship is to adhere to the antennae of the female (Fig. 1). Therefore, it appears that the male's courtship pheromone is not airborne but is physically transferred via the androconial hairs to the chemosensory surface of the female's antennae. The photograph shows the head of a female immediately after the repeated courtship display of a male. The hair-scales even adhere to the proboscis when the female has been subjected to a long courtship display.

Similar courtship has been observed in Ornithoptera, but it appears that the stiff fringe of brush-like hairs on the inner margin of the hindwing of Ornithoptera males

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is a modification of the scent pouch of *Troides*. These long hairs are covered with a pheromone which is brushed by direct contact onto the antennae of the female during the courtship flight, but the hairs are not displaced. If the hindwings of a fresh male of *O. priamus poseidon*, for example, are placed on white card and stuck tightly beneath clear sticky-backed plastic, from the scent hairs only an orange compound, which presumably contains the pheromone, is slowly leached off through the glue reminiscent of a chromatogram.

During copulation a gelatinous substance is produced by the accessory glands of the male. This is soft and clear at first with a slight yellowish tinge and almost fills the genital cavity of the female once the male has parted. Later it dries hard and becomes opaque and dark brown. This is the sphragis, which is thought to act as a barrier to further insemination. However, as some ovipositing females have been found to have lost this, it appears more likely that it is the presence of the large spermatophore (which fills the bursa copulatrix) that produces a stimulus to reject further males. Nevertheless in *Cressida* and *Parnassius* (Papilionidae) and *Miyana* (Nymphalidae) the sphragis is external, very large, and is permanent and surely must physically prevent further pairing. Of the photographs in figure 65 (p. 87) of Haugum & Low (1979, A Monograph of the Birdwing Butterflies. Vol. 1, part 2, Scand. Sci. Press) of supposed sphragis in *O. priamus*, only the central picture shows this. The outer two merely figure the artificially distended genital plates of the female. Specimens killed by injection with ethyl acetate, for example, often die in this latter condition.

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ALBINIC VARIANTS OF *CHLOSYNE NYCTEIS* FROM CONNECTICUT (NYMPHALIDAE)

On 8 July 1979 two albinic males of *Chlosyne nycteis* (Dbldy.) were collected along a woodland trail on water company land near Lake Gaillard, North Branford, New Haven Co., Connecticut. One specimen has the usual orange-red ground color entirely replaced by white (Fig. 1). The other is only partially albinic, with creamy overlay in the hindwing medial and forewing subapical areas, and on wing bases. In both, the melanic border and markings are apparently unaltered. These specimens were taken in the company of typical orange-red *C. nycteis*. Some 10 to 15 adults were seen in the area on that day. A third specimen, also fully albinic, was collected 1 July 1979 at the same locality by William Martha. We are aware of no other wild-captured albinic *C. nycteis*.

The white color may represent the expression of an extremely rare allele akin to "whitish" and "blonde" of *Colias* (see Remington, 1954, Lepid. News 7:139–145). That the specimens were collected from within a small, local population of *C. nycteis* also suggests they may be the progeny of a single female. Oliver (1979, J. Lepid. Soc. 32: 309) and Shapiro (1966, Butterflies of the Delaware Valley, Spec. Publ. Amer. Entomol. Soc. 20) have reported albinos of *Phyciodes tharos* Drury from Pennsylvania. It is of interest to note the occurrence of similar white phenotypes in these two very closely related butterfly genera. Albinics have yet to segregate out of mass cultures of *C. nycteis*, *C. harrisii* (Scudder), and *Phyciodes* spp. (C. G. Oliver, pers. comm.). Our two