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LIFE HISTORY OF THE PAINTED JEZEBEL, *DELIAS HYPARETE* LINNAEUS, 1758 (ORDER LEPIDOPTERA)

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INTRODUCTION

The painted jezebel (*Delias hyparete metarete*) is an attractive common garden butterfly in the family Pieridae. The underside of the hind-wing is a mix of bright yellow, red and white with black veins (Fig. 1). The wings above are white with black veins. The sexes are generally similar with the female more dusted with black (Yong, 1983). These butterflies can be seen throughout the day, even at dusk. The life history has been studied (Neo, 1996) but details are lacking.

The food plant of the larvae of this butterfly is the semi-parasitic mistletoe *Dendrophthoe pentandra* (Corbet & Pendlebury, 1978), which is also the food plant of the larvae of the peacock royal (*Tajuria cippus maxentius*). A number of other species of this mistletoe family as well as fruit trees like bilimbing (*Averrhoe bilimbi*), coconut (*Cocos nucifera*), mango (*Mangifera indica*), rambutan (*Nephelium lappaceum*) and sweet sop (*Annona squamosa*) also serve as food plants to the larvae of the painted jezebel (Robinson et al., 2001).

The mistletoe attaches to the stem of the host plant by a knobby haustorium, a specialised organ that penetrates the tissues of the host and invades its vascular system to obtain water and nutrients. A horizontal main stem grows from the haustorium, from which secondary branches develop upwards.

After noticing small larvae hatching from egg clusters on the undersurface of the mistletoe leaves, we observed the life history of these organisms daily.

Fig. 1. Adult painted jezebel (*Delias hyparete metarete*).

Fig. 2. Flask-shaped eggs of the painted jezebel.

OBSERVATIONS

Eggs. – The eggs were laid on the under side of recently matured *Dendrophthoe pentandra* leaves that parasitised an Arabian jasmine (*Jasminum sambac*) plant (Fig. 2). There were 21 eggs in the cluster, and of approximately similar number to many other clusters observed earlier.

The eggs were flask-shaped with longitudinal ridges. One end was attached to the leaf surface with the other end being a small corona. These eggs hatched 2–3 days later into tiny, light orange larvae, each with a conspicuous black head and a body covered with sparse, long hairs.

Patterns of Feeding. – Immediately after hatching, the larvae may eat some of the shell but mostly grazed on the leaf tissues, starting with the star-shaped trichomes (Figs. 3–4) until only the upper epidermis remained. The larvae then lined themselves along the chewed-up margin with only their black heads appearing conspicuously when viewed from above (Fig. 5). The row of black heads stopped chomping when disturbed, to retract temporarily from the edge. After each binge of eating, they similarly retracted from the edge to rest before going on another eating binge.

It took eight days to consume the leaf on which the eggs were originally laid. As the leaf surface decreased in size and the 21 larvae got crowded together on the remaining area, one or two invariably got displaced, to hang down a silk thread before slowly climbing back. A few that wandered off to the nearest leaf invariably returned, to end up feeding from the upper surface (Fig. 5). When the leaf blade was completely eaten, the larvae moved to the next leaf (Fig. 6). Again, they all fed close together, starting from the leaf tip.

We observed larvae feeding during the day and even during the few times we checked at 2100 hours, suggesting that feeding was continuous throughout the day and night.

Size Increase, Colour and Moulting. – At the end of the first day, the light orange larvae were about 2 mm long. By the second day the front half of their bodies turned green, no doubt a result of ingesting the chlorophyll-containing leaf tissues. With further feeding, this end became darker green while the back end remained orange.

The first moult occurred three days after hatching, the second at the end of five days. It was then that isolated tiny black head casts stuck to the ends of the larvae's hairs were noticed (Figs. 4, 7). The third moult was on day 10 when they were about 10 mm long. Only 19 larvae survived, with one dried up while another was blown or nudged off as a result of overcrowding (Fig. 8). The fourth moult was on day 13.

Subsequently, feeding was rapid, with the 19 larvae consuming one leaf in less than a day. By now they were about 20 mm long. Prior to the fourth moult when the larvae were 13 days old, they had eaten the entire branch bare. They were then clinging on to the bare twig before moving on to a new leafy branch. In the process, one or more were blown off the twig, but always hanging on by its silk thread (Fig. 9). They were then about 25 mm long and dark orange.

Fig. 3. Two-day old larvae, 21 in all, grazing on the star-shaped trichomes on the leaf blade's undersurface.

Fig. 4. Five-day old larvae turning orangey, still grazing on the undersurface of the original leaf. Note the individual black head casts from the earlier moult.

Fig. 5. Only the black heads of the larvae are visible from above. A single larva somehow ended on the upper surface of the leaf.

Fig. 6. Seven-day old larvae resting on the undersurface of their second leaf. Note that they have eaten part of the leaf on the right.

Fig. 7. Five-day old larvae in profile showing the head casts at the ends of their hairs.

Fig. 8. Twelve-day old larvae eating away the last leaf on the branch they are on.

The fifth and final moult was on a bare twig (Fig. 10). Before completely divesting its old skin, the cast of the old black head was suddenly detached and blown off. The new head appeared light green before turning darker and finally black. By this time only 18 larvae remained.

Running the Gauntlet of Ants. – The mistletoe plant was swarming with ants (*Dolichoderus* sp.), attracted to the sweet exudates of the flowers and fruits. The ants congregated around the main stems where the flowers and later the fruits developed. Thus, when a secondary branch was defoliated and the larvae moved to a leafy branch, the ants that patrolled the main branch bit them, preventing them from moving to the next secondary branch (Fig. 11). Of the 18 larvae that survived to the fifth moult, only 11 managed to move past the ants to reach a new leafy branch. The remaining seven found another way to another branch where they fed on three different leaves.

Fig. 9. One thirteen-day-old larva being crowded off the branch and hanging by its silk thread.

Fig. 10. Final moult of the larvae on a bare twig.

Pupating. – Prior to pupating, the 18 larvae were 30–35 mm long and 4 mm wide. They were moving along various leafless branches in search of leaves to feed on. Once ready to pupate, they moved away from the host plant in different directions (Fig. 12).

One larva was monitored for more than 90 minutes and shown to move with a mean speed of about 3 mm per second (1,600 mm in 470 seconds). Once when it was blown off its perch and dangled by its silk, it descended to about 2 m from the ground before pulling itself up and continuing its journey. On the second occasion it simply descended to the ground and moved among the leaves of the grasses where it disappeared.

Fig. 11. Moving to a new branch with fresh leaves but confronted by ants.

Fig. 12. One of the larvae moving away from the rest to pupate.

Fig. 13. Six-day-old pupa attached to the underside of a leaf.

Fig. 14. Final stage of pupation just before butterfly emergence.

Fig. 15. Newly emerged adult butterfly with its empty pupal case

Of the 18 larvae that moved away to pupate, only one was subsequently located, attached to the undersurface of a jasmine leaf near where the mistletoe grew. The 25 × 6 mm larva laid out a thin layer of silk on the leaf surface, shrunk slightly in length but increased in girth (Fig. 13). It then attached itself to the surface with a silken girdle. The anal end that was facing down was also firmly attached to the surface. The pupa was yellow with short black stumpy spikes. The wings became visibly black towards the end of the pupal stage (Fig. 14). After nine days the skin of the pupa split along the dorsal surface and the adult butterfly crawled out, hanging down to allow its crumpled wings to fully expand before flying off (Fig. 15).

Food Plant Defoliation by Larvae. – One surprising thing we observed, after all the larvae had moved away to pupate, was that the mistletoe was left totally devoid of foliage. The plant never recovered and the branches slowly dried up and broke off. We thought this was an exceptional case but months later we observed another plant also dying after it was defoliated by the larvae of the painted jezebel. This butterfly may act as a natural control against excessive infestation of mistletoe plants in our urban gardens.

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