



## **A note on captive rearing of Common mime (*Papilio clytia*) at North Bengal Wild Animals Park, West Bengal**

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### **Abstract**

Aiming to contribute to the conservation of lepidopterans, North Bengal Wild Animals Park, West Bengal has established a butterfly conservatory within the park's premises. From May 2022 to April 2023, the rearing of common mimes (*P. clytia*) was practiced, and their life cycle from early development to the adult stage was recorded. The article explain the rearing process, morphological changes recorded with successive molting, and the challenges that were faced and resolved during the rearing of these ecologically important species.

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**Received:** 11 January 2024

**Accepted:** 09 February 2024

**Published:** 05 May 2024

### **Suggested Citation**

*Pariyar P., Sarkar S. K., Chowdhary A., Doley N., Basik S., 2024. A note on captive rearing of Common mime (*Papilioclytia*) at North Bengal Wild Animals Park, West Bengal, Prithivya, An Official Newsletter of WCB Research Foundation and WCB Research Lab. Vol 4 (1) 5-11.*

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### **Introduction**

Butterflies have always fascinated mankind due to their vivid coloration and ecological services, and are among the most studied groups of insects in the order Lepidoptera, meaning scaly wings. In addition to serving as pollinators and useful prey in the food chain (Larsen, 1988), these insects are also biological indicators reflecting the ecological balance of a given area (Ghosh et al., 2019). Furthermore, conserving these lepidopterans altogether requires a combined effort of conserving their respective host and nectar plants, hence their abundance in the given area is intimately related to the rich plant diversity (Naik et al., 2015). Despite their significance, butterfly populations are reportedly declining daily, mostly due to habitat loss and climate

change (Ghosh et al., 2019). North Bengal Wild Animals Park (NBWAP), to contribute to preserving these species, has established a butterfly garden within the park's premises on July 4, 2022. The project was funded by the Department of Environment, Government of West Bengal. The entire garden spans an area of 0.227 hectares and is divided into three sections: the open garden area where numerous host and nectar plants have been planted along with enrichments such as picturesque running streams, mud puddles, and information signages; the rearing room and kiosk center where rearing of caterpillars was done along with capacity building of the zoo visitors.

### **Rearing of Common mime at North Bengal Wild Animals Park**

Given that Common mimes (*P. clytia*; Schedule I) were the most prevalent species on park grounds, we continued to raise these species in our conservatory to record their life cycle between May 2022 to April 2023. The early stages (eggs and larvae) were brought to the laboratory and the substratum host plant. The rearing box was cushioned with tissue paper development stages and the host plant was staged on it. Caterpillars were placed inside the rearing box and the bed was cleaned and recharged with feed every day. A moist cotton ball was kept inside the rearing container for water supply. When handling eggs, this method was not applicable because over time the eggs disintegrated or crumbled along with the wilting leaves. As a result, we enforced a different strategy. For egg rearing, a clean container was filled with water till its rim and was covered with tissue paper that was secured with a rubber band. A small puncture was made at the center of the tissue paper lid and the twig was submerged in the water through the hole, such that only half the portion of the twig containing the eggs was dipped. The setup was placed in a brightly lit space. Thirty minutes or so later, bubbles of oxygen emerged from the twig. For as long as a week, this technique kept the twig alive and fresh, which was enough time for the eggs to hatch (Figure 1). The first instar was placed in the rearing box and the life cycle was recorded as described in Table 1 and Figure 2. We measured the approximate length of the larvae with the help of a thread and measuring scale.

**Table 1: Note on the different stages of development of common mime (*P. clytia*) observed during the study period**

<b>Developmental Stage</b>	<b>Description</b>	<b>Duration</b>
Eggs	Common mime eggs were collected from the young leaves and petioles of host plants like <i>Litsea glutinosa</i> and <i>Cinnamomum</i> spp., found in the butterfly garden and safari area of the park. The eggs were spherical, creamy white, or yellowish, and were mostly laid singly. Although sporadically, we also encountered clusters of eggs laid in close proximity.	3-4 days
Larvae Instar I	Instar I fed on the eggshell and proceeded to feed on the host plants. The caterpillar appeared delicate brown with a body length of about 3 to 3.5 mm with distinct white patches on the middle and posterior segments and comprised of a brownish-colored head.	2-3 days
Larvae Instar II	The blackish coloration on the dorsolateral side along with the orange dorsal patches and longitudinal white stripes at the central and posterior abdominal segments of the body had become more distinct. The caterpillar was a voracious feeder and quickly grew in size (~ 10 mm).	2-3 days
Larvae Instar III	The body appeared glossy although no drastic changes in its morphology were noted. The caterpillar fed voraciously and grew to reach a body size of about 18 mm in 3 to 4 days, after which they molted into instar IV	3-4 days
Larvae Instar IV	The white patch on the posterior abdominal segment had extended towards the entire body including the thoracic region. Black patches were present as stripes over the thoracic and posterior abdominal segments with yellowish patterns in between. They were voracious feeders and grew to a size of about 30 to 33 mm.	3-5 days
Larvae Instar V	Considerable changes were noted at this stage. The body appeared light greenish to yellow towards the dorsal side, lateral rows, and thoracic region with black stripes  Two rows of fleshy processes with a crimson spot at their base were seen. Crimson spots also appeared on the abdominal	4-5 days

	segments of the body. The body size was about 45 to 50 mm in length. At the end of this stage, the caterpillar had become sluggish and stopped feeding. At this time, we kept the caterpillar in another clean-rearing box.	
Pre-Pupation stage	The body appeared to be shortened in length as it was cured in a fetal position. Silk fibers and girdles were observed for anchorage on the wall of the rearing container.	1 day
Pupation stage	The posterior end of the pupa was attached to the walls of the rearing container, giving them the appearance of a dry broken twig	11- 15 days
Adult stage	Since Common mimes are favorable prey for most bird species, they have adopted a way of avoiding predators through Batesian mimicry (Ghosh and Saha, 2016). We could obtain both, memetic forms, the dissimilis memetic form that mimicked the blue tigers, and the nominate form which resembled the Common Indian crow during the study period. The butterflies were released in the garden of the park where numerous nectar plants such as <i>Tabernaemontana divaricata</i> , <i>Murraya paniculata</i> , <i>Clerodendrum paniculatum</i> , <i>Melastomama labathricum</i> , <i>Hydrangeaspp.</i> , <i>Hibiscus rosa-sinensis</i> , <i>Ixora spp.</i> , are planted.	

The overall duration required for rearing common mimes from egg to adult stage was about 29 to 40 days. Ecological factors and host-nectar plant availability might also affect the developmental period of butterflies (Ghosh et al., 2016). In this study, we found that the abundance of butterflies was highest in the summer and decreased as winter approached. Further, the methodology adopted was successful in rearing mimes with a low mortality rate of 10.71%. The challenges faced during the rearing process include infection caused due to parasitic wasps (Figure 3), severely wrinkled wings that may be caused due to parasites like *Ophryocystis elektroscirr* leading to loss of flight (Figure 4), and death during pupation identified by lack of molting and gradual change in pupal cage color to blackish brown. These problems could be avoided by maintaining proper hygiene such as regular cleaning of the rearing containers and washing the host plant before use. A similar method of rearing was also suitable for other species of lepidopterans such as Common mormon (*P. polytes*), Lime butterfly (*P. demoleus*), and Common crow (*Euploea core*) using their respective host plants like lime, curry leaves, and Nerium leaves.



*Figure 1: Rearing of eggs and caterpillars (Experimental setup)*



Eggs



Instar I



Instar II



Instar III



Instar IV



Instar V



Pre-pupation stage



Pupa



Adult (nominata and dissimilis forms)

*Figure 2: Different developmental stages of common mime recorded during their rearing*



*Figure 3: Parasitism in common mime caterpillar*



*Figure 4: Wrinkled wings in mime*

## **Acknowledgments**

The authors thank the Department of Environment, the Government of West Bengal, and the West Bengal Zoo Authority for their support and funding.



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