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LIFE HISTORY OF *TIRUMALA SEPTENTRIONIS* (THE DARK BLUE TIGER) (LEPIDOPTERA – RHOPALOCERA –NYMPHALIDAE) FROM LANKAMALLAI HILLS, ANDHRA PRADESH – INDIA

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Abstract
The Danaid butterfly known as the Dark Blue Tiger (*Tirumala septentrionis*) (BUTLER, 1874) is native to South and Southeast Asia. According to the study, the best time to procreate is between August to November (2023), when the Danaid butterfly *Tirumala septentrionis* would be on wings. The only food used by the monophagous larvae is *Wattakaka volubilis*, which is also the food source used for rearing and research. With eggs lasting 3–4 days, larvae 11–16 days, and pupae 7-8 days, the life history was finished in 21–28 days at roughly 28°C to 30°C. The butterfly's short life span allowed for nine to ten broods every year, making it multivoltine.

Keywords: Tirumala septentrionis, Multivoltine, Wattakaka volubilis, Life cycle, Monophagous larvae, Breeding season.

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Introduction

As living things that are essential to our ecosystems, butterflies have the inherent worth and right to exist in the food chain and contribute significantly by providing food for other organisms at every stage of their growth. An essential ecological mechanism for global natural sustainability India, Sri Lanka, Nepal, Bhutan, Myanmar, Laos, Cambodia, China, Taiwan, the Philippines, Malaysia, and Indonesia are all home to the common and widely distributed species *Tirumala septentrionis*. However, habitat degradation is causing these beneficial flagship insect populations to decline, and the majority of them were affected by extension [1]. In many parts of the world, fine grain life history studies of butterflies from temperate regions are thought to be costly to conduct [2]. However, this information is crucial for creating conservation management strategies that work [3]. Such life history knowledge is dreadfully lacking for the majority of Indian butterflies [4-7]. This page contains information about the Danaidae's dark blue tiger butterfly, *Tirumala septentrionis*. Birds are poisoned by all kinds of Tirumala. When a bird attacks and consumes a Tirumala species, it immediately throws up and becomes nauseous. Although the markings of the male and female Tirumala species are identical, the males can be easily identified by the enormous pouch of androconial scales on each hind wing. The life cycle, larval performance and dietary energetics of this butterfly species are all covered in this work for use in conservation management.

Habitats

Numerous environments such as deciduous woodlands, parks, gardens, rainforests, and acacia scrub are home to this species. It can be found at elevations ranging from sea level to roughly 800 meters.

Description

Although it looks a lot like *Tirumala limniace*, Cramer, it is always different enough to be recognized, especially on the wing. In contrast to *Tirumala limniace*, the upper side has a darker ground color and narrower, more distinct, and bluer semi-hyaline markings. In the forewing, the two streaks in interspace were narrower, never coalescent, and the upper one forms an oval detached spot; the short streaks above vein 5 are always acute and never truncate. The lower streak in the hind wing never developed into a hook, and the two streaks of the discoidal cell that were joined at the base are widely separated at their apices.This species' undersides were often darker, with neither the forewing apex nor the entire ground color of the hindwing being the pronounced golden brown as they were in *Tirumala limniace*. In southern India, when many species migrate, this species is among the most common (78%)

during the migratory season. It seems that the number of male and female migrants is equal [8].

Materials and Methods

In southern Andhra Pradesh, we observed the common gull butterfly (species recognized by NCBI) Taxonomy *Tirumala septentrionis* of Danaidae laying eggs in the months of August to November, 2023 on the foliage of the bushy tribe *Wattakaka volubilis* while investigating the diversity and reproduction activity of butterflies in the scrub jungle adjacent to several field areas. In order to research the hatching time and success rate, larval development and survival, pupal development, and adult emergence, the leaves containing the eggs were picked and brought to the laboratory in petri dishes. They were then incubated and monitored on a regular basis. The aforementioned findings were made during *Tirumala septentrionis* activity's flight season. Every day, the larvae were fed delicate leaves, and their performance was examined each instar.

Results And Discussion

Life history stages

Oviposition host plants

This butterfly found both in plains and hill regions of Lankamallai, flying at low heights throughout the year recorded and abundant after rainy season. It heavily feeds on the floral nectar of the plant *Wattakaka volubilis* and uses the same plant for ovipositing and larval feeding. *Wattakaka volubilis,*a straggling shrub or climber with heart-shaped leaves and translucent green latex, is the most common host plant [6]. They fly close to ground and mud puddles.

Adult behavior

The butterflies are usually encountered singly or in two's and three's. They have a slow undulating flight, with fairly shallow wing beats, and patrol flowery areas (http://www.Indianfoundationbutterflies.com).

Eggs

Eggs were laid singly on the upper and underside of young and soft leaves of Asclepiadaceous family members particularly *Wattakaka volubilis*. They were cream white in color and barrel shaped, rather flattened at the base and dome shaped at the tip with criss crossing longitudinal and horizontal ridges. They became dull white on the day of hatching. They measured 1.00 – 1.20 (1.10 + 0.20) mm in height and 1.48 – 1.69 (1.60 + 00.9) mm in width. They were hatched 3 – 4 days after being laid. The larvae developed through five distinct instars.

Larvae

Instar I: This stage lasted 2 – 3 days. On the first day, the instar was 1.40 – 1.55 (1.50 + 0.10) mm long. By the end of the instar period, it grew to a length of 5.20 – 6.00 (5.60 + 0.40) mm. Body was soft and smooth and pair of tentacles was formed on head region. Head was smooth and it measured 0.30 – 0.40 (0.30 + 0.01) mm in diameter.

Instar II: This stage lasted 2 – 3 days. The instar progressed to a length of 9.5 – 11.5 (10.0 + 2.0) mm. Its head measured 0.4 – 0.5 (0.45 + 0.02) mm in diameter. Two pairs of tentacles, one at 3rd segment and the other at 12th segment became distinct. The body was banded with black, greenish-yellow and white rings. The spiracles were large, black and oval. The underside of the body was whitish, with greenish tinge and marked with white bands and blotches. The head had black and white stripes.

Instar III: This stage lasted 2 – 3 days. The instar grew to 17.00 – 22.00 (20.0 + 1.30) mm in length. Its head measured 0.61 – 0.69 (0.63 + 0.01) mm in diameter. Body was banded with black, greenish yellow and white rings. The tentacles increased in length.

Instar IV: This stage lasted 2 – 3 days. The larva grew to 26.00 – 30.00 (29.0 + 0.12) mm in length and 4.20 – 5.30 (5.00 + 0.02) mm in width. Head measured 0.80 – 0.90 (0.85 + 0.01) mm in diameter. There were 3 pairs of light brown coloured legs at thorax and 4 pairs of prolegs at abdomen. The basal region of the tentacles became pale black. Special Issue: Conservation of animal biodiversity and environmental monitoring[9].

Instar V: This stage lasted 3-4 days. The fully grown larva measured 43.00 – 4.00 (46.0 + 0.16) mm in length and 5.40 – 6.40 (6.10 + 0.02) mm in width. There were no changes in the other characters from fourth instar.

Pupae

The larva stopped feeding and contracted to enter the pupal stage. It was then 33.00 – 36.00 (33.5 + 0.13) mm long. This process took place for a day. The pupal stage proper lasted 6 – 7 days. The pupa measured 17.00 – 20.00 (18.5 + 0.20) mm in length and 7.00 – 9.50 (9.00 + 0.08) mm in width at the broadest region. It was fresh green in color and shiny. It was marked with gold spots on its dorsal surface. There was a single golden, beaded line on the 7th segment. Its maturity was indicated by its change to black color. Thus, the egg stage lasted 3 – 4 days, larval stage 11 – 16 days, and the pre-pupal and pupal period 7 – 8 days. Total developmental period from egg to adult stage spanned over 21 – 28 days.

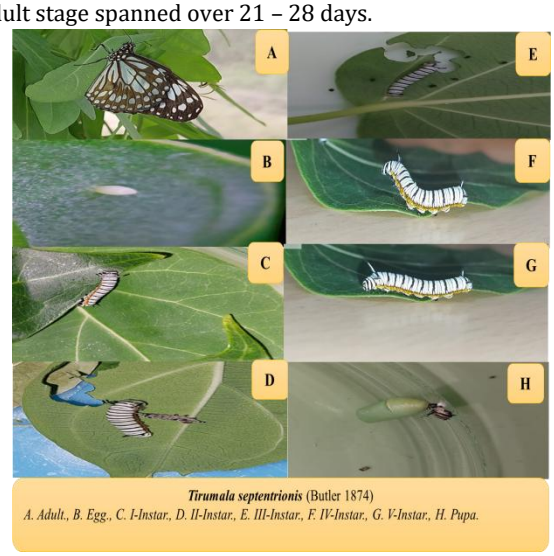

Fig : 01 Life History of *Tirumala septentrionis*

Discussion

The current study details the specific morphological and developmental changes that are seen throughout a lepidopteran species' whole life cycle, from egg to adult. Five separate instars, each lasting two to four days, made up the larval stage, which lasted 11 to 16 days in total. Morphometric investigation revealed a conventional pattern of growth and metamorphosis, with both body length and head capsule diameter increasing gradually with each moult.

Significantly, the range in development time (egg to adult: 21–28 days) probably corresponds to environmental factors that frequently affect insect development rates, like temperature, humidity, or food availability.

A typical holometabolous life cycle in Lepidoptera is reflected in the developmental progression seen across the five larval instars. This life cycle is characterized by successive moults with increasing body size, head capsule width, and morphological complexity, including the development of tentacles, body banding, and leg structures [10]. While the later stages demonstrated structural maturity and pupation readiness, the early instars displayed fast development and differentiation. As aposematism is a frequent adaptation in larval Lepidoptera, the emergence of characteristic colouration patterns and spiracles in Instar II and III may contribute to camouflage [11]. The development of a green, gold-spotted chrysalis and the halt of feeding and contraction that characterises the larval to pupal transition are consistent with characteristics observed in other nymphalidae butterflies [12]. The very brief 21–28 day embryonic phase indicates that this species is suited for quick life cycles, perhaps to take advantage of advantageous environmental windows [13]. These findings offer valuable baseline data for species monitoring and conservation and are in accord with past research on the development of butterfly larvae [9].

Conclusion

The study describes the insect's whole metamorphic cycle, emphasizing notable morphological and physiological changes at each phase. Rapid growth, appendage development, colouration, and adaptive features like tentacles and banding are characteristics of distinct instars. Lepidopteran larvae are known for their extremely ordered developing process, which is shown in the successive and quantifiable changes in size, colour, and body shape. The results offer useful baseline information for conservation biology, ecological monitoring, and species identification. Particularly in light of shifting climatic conditions, an understanding of these developmental patterns is crucial for ecological forecasting, pest management plans (where appropriate), and biodiversity conservation initiatives.

To better understand the flexibility of this species' life cycle, future research should examine how external influences such as temperature, host plant quality, or photoperiod affect development time and morphological traits.

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Author Contribution

All Authors contributed equally

Conflict of Interest

None Declared

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