Chromatic and Morphological Aberrations in the Butterfly *Danaus gilippus thersippus* (H. Bates, 1863) Insecta: Lepidoptera, bred in captivity

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Introduction

Aberrations in butterflies refer to significant deviations from the typical characteristics of a species, which can manifest in their morphology, physiology, or behavior. These atypical variations are of great interest to entomologists, geneticists, and ecologists, as they provide valuable data on phenotypic plasticity, environmental influences on development, and evolutionary processes.

There are basically five types of aberrations, which are classified into: morphological (chromatic and structural), chromatic (melanism, albinism, and pattern aberrations), structural, physiological, and behavioral. These aberrations arise due to genetic, environmental, biological, epigenetic, and transgenerational factors. They also indicate changes or issues within the ecosystem and the species' ability to adapt to changing conditions in certain environments.

The following provides a brief description of the life cycle and biological aspects of Danaus gilippus thersippus, followed by the aberrations observed in specimens bred at the Butterfly Sanctuary Mariposario Jardín Mágico in Puerto Vallarta, Jalisco, Mexico.

Life Cycle:

The eggs are pale yellow in color, 1.2 mm in height, and have a conical shape with vertical striations. They are deposited individually on the underside of the leaves of host plants, primarily species of the genus Asclepias (milkweeds). The larval stage (caterpillar) lasts between 9 and 14 days, consisting of five instars. In the first instar (2-3 mm in length), they are pale gray with a black head. Later instars develop the characteristic pattern of white, black, and yellow bands. In the final instar, they reach a length of 25-30 mm. The pupal stage (chrysalis) lasts 7 to 10 days and is characterized by a jade-green color with golden spots. The pupae are oval-shaped and smooth, measuring approximately 20 mm in length.

The adult butterfly has a wingspan of 70 to 85 mm, with reddish-brown wings, a black venation pattern, and white "spots" on the forewings in the apical, subapical, and wing margin areas. Males display a black androconial patch on the hindwings.

Distribution:

This butterfly is distributed from the southern United States to Central America. It inhabits warm, dry climates in urban and suburban areas, prairies, grasslands, and transition zones between deserts and mountains. Populations are abundant during spring and summer, and multiple generations can occur annually in favorable climates. The species exhibits Müllerian mimicry, meaning its coloration warns predators of its toxicity, similar to other species of the genus Danaus, such as the monarch butterfly.

The knowledge of its life cycle and docility makes it a species frequently bred in butterfly sanctuaries, as it is included in conservation management plans for species, such as the Butterfly Sanctuary Mariposario Jardín Mágico. Danaus gilippus thersippus has been bred at the sanctuary since its foundation in 2019, and several generations have passed without showing significant variations in its life cycle. However, chromatic and morphological aberrations have been reported in specimens during the larval and adult phases. These aberrations were observed in some individuals during the spring-summer season of 2024, raised under average temperature conditions of 28°C (±2°C), relative humidity of 70±5%, and a photoperiod of (14:10 L:D). The larvae were fed Asclepias curassavica cultivated in situ.

Observations

The following describes the aberrations observed in *Danaus* species bred in the butterfly sanctuary; however, it is necessary to conduct a systematic investigation and gather data to perform the corresponding analyses. Among the findings, chromatic alterations were observed, including partial melanism in the wing pigmentation pattern and the loss of filaments during the larval phase.

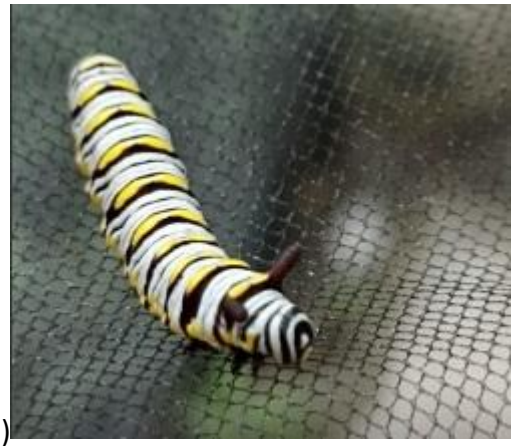
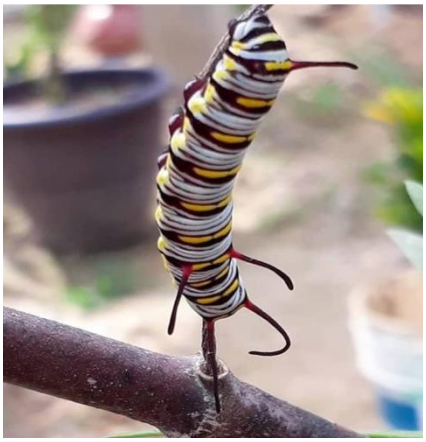
a)  b) 

Figure 1. Caterpillar of Danaus gilippus thersippus (H. Bates, 1863) with aberration

In Figure 1, a), a Danaus caterpillar in the fifth instar is shown, displaying a morphological aberration by lacking filaments known as tentacles. It is important to note that this species typically has three pairs of tentacles: one pair on the second thoracic segment (T2), one

pair on the eighth abdominal segment (A8), and a shorter pair on the last abdominal segment (Figure 1, b). These filaments are a distinctive feature of the genus and serve various functions, primarily for defense, sensory purposes, and chemoreception.

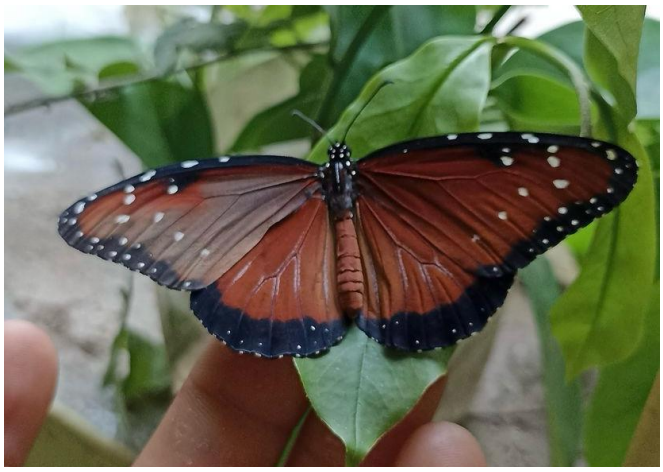


Figure 2. Danaus gilippus thersippus (H. Bates, 1863) dorsal view.

In Figure 2, a female with an average wingspan is shown. In the dorsal view, the wings display the characteristic pattern of the species regarding wing venation and the arrangement of white 'spots' distributed in the marginal, apical, subapical, and postdical areas. However, the left wing exhibits a chromatic aberration resulting in the partial absence of brown and reddish pigments, extending from the basal region to the submarginal region, and from the inner margin to the apex, covering the post-dical and submarginal areas up to the M1 vein.

a)  b) 

Figure 3. Danaus gilippus thersippus (H. Bates, 1863) a) Dorsal view. b) Ventral view.

In Figure 3 a), b), the specimen exhibits normal shape and wingspan; however, both in the dorsal and ventral views, it shows a chromatic aberration manifested as partial

depigmentation that extends diffusely across the wing surface. The observed discoloration on the wings may be due to a disruption in melanin production, a pigment crucial for the coloration of lepidopterans. A deficiency in the synthesis of this pigment could be caused by genetic, environmental, or nutritional factors.

Comments

The observed aberrations, based on the literature, can be attributed to several factors:

- Environmental stress: Temperature and humidity fluctuations, although minimal in the controlled environment, could influence the development of the chrysalids.

- Genetic factors: Inbreeding in the captive population could be expressing recessive alleles responsible for these aberrations, so it is important to exchange specimens to minimize inbreeding.

- Biological factors: Viral or bacterial infections, or damage caused by mites or nematodes, which is why strict hygiene protocols are maintained in the Butterfly Sanctuary Laboratory.

Conclusion

The study of aberrations in butterflies not only enriches our understanding of these fascinating insects, but also provides a unique window into observing evolutionary and ecological processes in action. As we face global environmental challenges, understanding how species respond through these variations becomes increasingly crucial for conservation and biodiversity management.

The findings presented in this paper highlight the importance of continuous monitoring in captive lepidopteran populations. It is recommended to conduct genetic analyses and expand studies on the influence of subtle environmental factors on the development of Danaus gilippus thersippus.

References

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