MORPHOLOGY AND LIFE CYCLE OF THE PIERID BUTTERFLY SPECIES, *DELIAS HYPARETE INDICA* WALLACE, 1867

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Abstract

The colour of head is deep black and rounded in shape. Two compound eyes lie on either side of the head. Long coiled proboscis, 13 to 15 mm in length, lies between the eyes that is creamy white colour. Labial palps tapered towards the tip have three segments named basal, middle and terminal with white hairs and 3.3 to 3.5 mm in length. Black antenna, which has 17 to 20 mm in length has 35 to 36 segments. In male the shape of forewing is more or less triangular. The base colour of upperside of forewing is white. Black colour veins are network on it. The hindwing is more or less rounded shaped or oval-shaped. The base colour of upperside is pale orange white. Weak veins are present on it. In the female, the forewing is mostly triangular in shape. The base colour of upper surface of forewing is black and white. The hindwing is mostly oval-shaped. On the upper surface, various colours are present with black coloured veins. Life cycle of the Pierid butterfly, *Delias hyparete indica* Wallace, 1867 was studied during the study period from June 2017 to May 2018 in Hpa-an University in Kayin State. The mated female mostly laid the eggs on the leaves of *Dendrophthoe pentandra* (L.) Miq. and *Loranthus pentapetalus* Roxb. A single batch of eggs laid by the mated female consisted of 31 to 45 eggs. The entire life cycle from egg to the emergence of adult from the pupa lasted for 31 to 38 days. The various developmental stages and the time taken for each stage were recorded and presented with tables and figures. Life span of male was shorter than that of female.

Keywords: Pierid butterfly, morphology, life cycle, developmental stages

Introduction

Butterflies are beautiful elegant creatures attracting the onlookers to see them flitting from flower to flower, in an apparently aimless way, fluttering and dancing as they go. However, most people know very little about the life of the butterfly. Most butterflies are inherently very suitable for conservation by breeding programmes in protected environments. An adult female will lay dozens, perhaps hundreds of ova. Even under "natural" conditions in the wild, almost all of these will fail to reach the adult stage. If habitats and food plants are destoryed, all butterfly species are likely to become extinct, Lewis (1985). Kunte (2000) stated that coloration and venation patterns on the wings are the principal diagnostic features of butterflies. In addition fold their wings erect over their body, partly or completely covering the hindwings with the forewings.

The relationship between butterfly species and the plants plays an important role in an ecosystem. Flowering plants need butterfly species for pollination and the butterflies require suitable plant species to serve as their host plants to complete their life cycle (Carter, 1992). The species *Delias hyparete indica*, family Pieridae is one of the most attractive, fragile and interesting species distributed throughout the year in Myanmar. Every butterfly species varies in the complexity of life. *Delias hyparete indica* was selected to study morphology and different developmental stages in this research.

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Material and Methods

Study area and period

Hpa-an University Campus with the coordinates of 17˚21′43.2″ N and 97˚40′25.9″ E, at Hpa-an Township, Kayin State was chosen as study area. The study period lasted from June 2017 to May 2018. (Fig 1)

Specimen collection

The adult butterfly specimens were captured aided by a butterfly net from selected natural environments. The captured butterflies were gently transferred into plastic basket laid with flowers and leaves to avoid mechanical injuries. The eggs, larvae and pupae were also collected from the host plants and placed in boxes to rear them in captivity.

Rearing process in captivity

The eggs on the leaves of the host plant were kept separately in rearing boxes (10cm x 8cm) at the temperature of 30˚C and humidity between 70% to 80% until the first larva hatched from the egg. The newly hatched larvae were individually placed in a cleaned rearing box with moistened leaves of the host plant. The larvae were reared in this manner until the larvae stopped feeding before transforming into pupae. The newly formed pupae attached to the substratum of the box or to a branch of the host plant (kept in the rearing box) were kept separately in thoroughly cleaned rearing boxes until the adults emerged from them. The duration taken to transform from one stage to the other was recorded to determine the duration of the entire life cycle.

Identification of the adult butterfly

Identification of the butterfly species is based on wing venation, parts of the head and legs accordin to Bingham (1907) and Talbot 1939).

Preparation of wing venation and the required parts for identification

The 10% potassium hydroxide solution was prepared by mixing 10g of potassium hydroxide crystals in 100 ml of water keeping for one night. Head parts and legs were disarticulated from the body and examined under a dissecting microscope. Scaled photographs were taken with a stereomicroscope (DN-117M).

Figure 1 Satellite map of study site (**Source** Google earth, 2018)

Results

Life cycle of Pierid Butterfly species, *Delias hyparete indica* **Wallace, 1867**

In Pierid butterfly *Delias hyparete indica*, development from egg to adult had four life stages, the egg, five larval stages, pupa and adult stages.

Egg

The recorded number of eggs varied with the type of host plant species. The eggs in a single batch were recorded as 37 to 45 eggs on mistletoe of mango plant and 23 to 35 eggs on mistletoe of wood-apple (Thanakha in Myanmar) plant (Fig 2). The size of fleshly laid eggs ranges from 1.05 to 1.20 mm in length and 0.62 to 0.73 mm in width. The egg is short-necked flask-shaped and the colour is white with longitudinal ridges (Plate 3 A and Table1). The first larva was hatched out from the egg within five to six days after being laid.

First larval stage

The white colour gradually turned orange within one day. The size of newly hatched first larva ranged from 1.00 to 3.00 mm in length and 0.50 to 1.00 mm in width. The first larva stage lasted for three to four days after hatching (Plate 3 B, Fig 2 and Table 1).

Second larval stage

The size of the second larva ranged from 3.00 to 4.00 mm in length and 1.00 to 1.50 mm in width. The larva molted into the third stage within two to three days when the outer covering could no longer accommodate the increased size (Plate 3 C, Fig 2 and Table 1).

Third larval stage

The size of the third larva ranged from 4.00 to 10.00 mm in length and 1.50 to 2.00 mm in width. The body was similar in colour to that of the second larva and the head was also black. The third larva molted after five to six days to transform into the fourth stage (Plate 3 D, Fig 2 and Table 1).

Fourth larval stage

The size of the fourth larva ranged from 10.00 to 21.00 mm in length and 2.00 to 3.00 mm in width. The body colour differed from the host plant leaves and became brighter. The duration of the fourth larva lasted from four to five days before molting into the fifth larva stage (Plate 3 E, Fig 2 and Table 1).

Fifth larva stage

The size of the fifth larva ranged from 21.00 to 35.00 mm in length and 3.00 to 5.00 mm in width. The fifth larva stops feeding after five to six days preparing to pupate by attaching with the last segment to the cover of the box (Plate 3, Fig 2 and Table 1).

Prepupating stage

The size of prepupa ranged from 21.00 to 23.00 mm in length and 4 to 5.00 mm in width. It lasted only one day (Plate 3 G, Fig 2 and Table 1).

Pupal stage

The size of the pupa ranged from 18.00 to 25.00 mm in length and 5.00 to 6.00 mm in width. The adult emerged from the pupa usually after six to seven days (Plate 3 H, Fig 2 and Table 1).

Adult stage

The whole wing span is between 72 to 88 mm in length. The colour of head is deep black and rounded in shape. Two compound eyes lie on either side of the head. Long coiled proboscis, 13 to 15 mm in length, lies between the eyes that is creamy white colour. Labial palps tapered towards the tip have three segments named basal, middle and terminal with white hairs and 3.3 to 3.5 mm in length. Black antenna, which has 17 to 20 mm in length has 35 to 36 segments. Its apex is club-shaped. Three segments, prothorax, mesothorax and metathorax are present in thorax. Its upper and lower sides are deep black colour. Legs are well-developed from it and creamy yellow coxa, trochanter and femur are present. Segmented tibia is dark brown with minute hairs and tapers towards the tip terminating with claws. In abdomen, dorsal side is black, ventral and dorsal sides are creamy-white. A pair of valves tapered at the posterior end of the abdomen.

In male the shape of forewing is more or less triangular. The base colour of upperside of forewing is white. Black colour veins are network on it. The hindwing is more or less rounded shaped or oval-shaped. The base colour of upperside is pale orange white. Weak veins are present on it. In the female, the forewing is mostly triangular in shape. The base colour of upper surface of forewing is black and white. The hindwing is mostly oval-shaped. On the upper surface, various colours are present with black coloured veins (Plate 2 and Table 1).

Recorded host plants

Host plant of *Delias hyparete indica* were recorded as *Dendrophthoe pentandra* (L.) Miq. (Thayetkyibound) and *Loranthus pantapetalus* Roxb. (Thanakhakyibound) under family Loranthaceae (Plate 1).

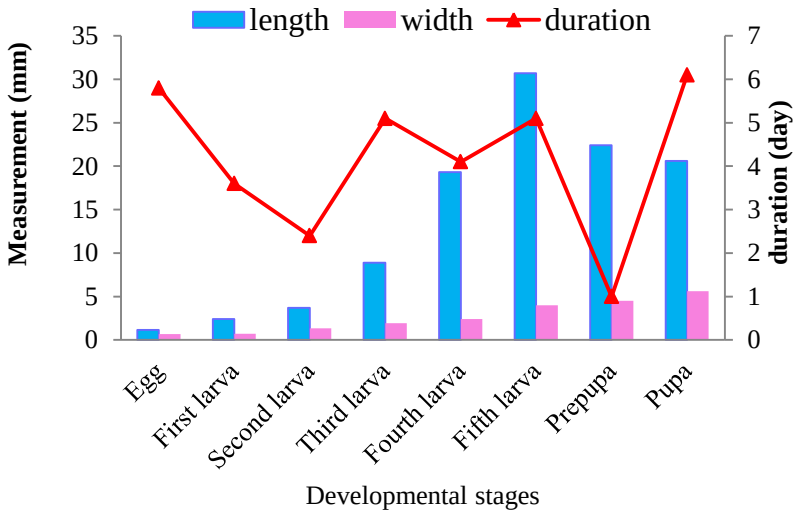


Figure 2 Measurement and duration of various stages (egg to pupa) of life cycle

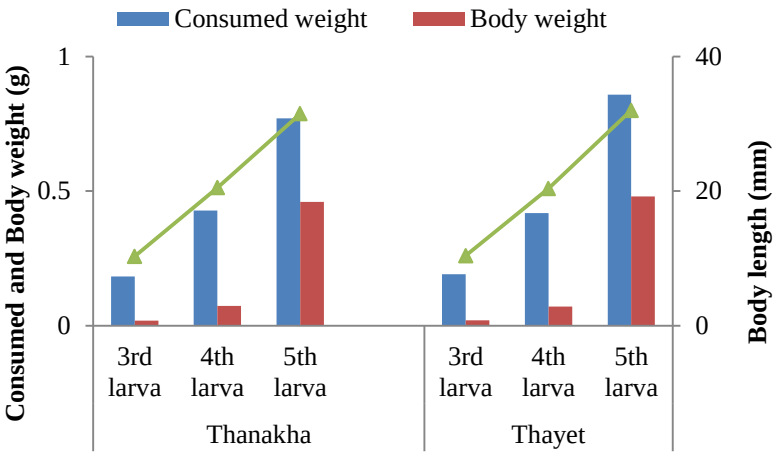


Figure 3 Relationship of consumed weight, body weight and body Length according to host plants Thanakhakyibound and Thayetkyibound

(A) *Dendrophthoe pentandra* (L.) Miq. **(**Thayetkyibound**)**

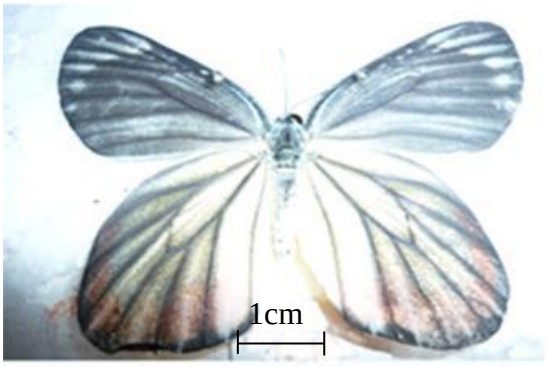
(B) *Loranthus pentapetalus* Roxb. **(**Thanakhakyibound**)**

Plate 1 Host plants of *Delias hyparete indica*

(A) Wing venation

(B) Upperside (male)

(C) Underside (male)



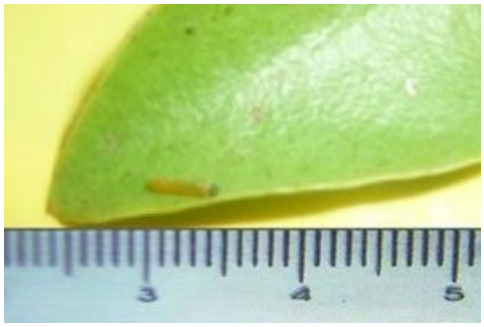
(D) Upperside (female)

(E) Underside (female)

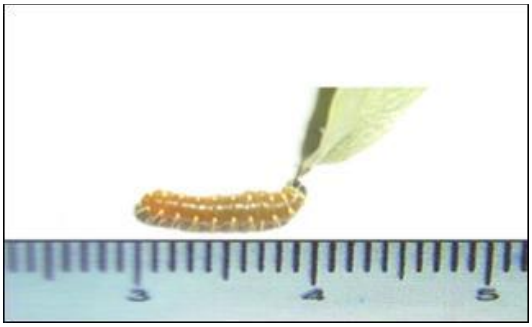
Plate 2. Wing venation and external morphology of *Delias hyparete indica*

(A) Egg (60 ×)

(B) First larval stage



(C) Second larval stage



(D) Third larval stage

(E) Fourth larval stage

(F) Fifth larval stage

(G) Prepupa

(H) Pupa

Plate 3 Developmental stages of *Delias hyparete indica*

(A) Protruding head of the adult from the split end of the pupa

(B) Partially emerged adult

(C) Emerged adult attached to the skin of pupa

(D) Emerged adult with hardened wings ready for flight

Plate 4 Emergence of adult from the pupa

Table 1 Measurement of various stages from egg to adult and duration of life cycle of *Delias hyparete intica*

Sr. no	Stage	No Observed	Min (mm)	Max (mm)	Mean±SD	Duration (days)		Mean±SD
						Min	Max	
1	Egg	10				5	6	5.8 ± 0.42
	Length		1.05	1.20	1.14 ± 0.05			
	width		0.62	0.73	0.68 ± 0.03			
2	1st larva	10				3	4	3.60 ± 0.52
	Length		1.00	3.00	2.40 ± 0.70			
	width		0.50	1.00	0.71 ± 0.23			
3	2nd larva	10				2	3	2.40 ± 0.52
	Length		3.00	4.00	3.70 ± 0.48			
	width		1.00	1.50	1.35 ± 0.24			
4	3rd larva	10				5	6	5.10 ± 0.32
	Length		4.00	10.00	8.90 ±1.85			
	width		1.50	2.00	1.95 ± 0.16			
5	4th larva	10				4	5	4.10 ± 0.32
	Length		10.00	21.00	19.30 ± 3.50			
	width		2.00	3.00	2.40 ± 0.52			
6	5th larva	10				5	6	5.10 ± 0.32
	Length		21.00	35.00	30.70 ± 4.56			
	width		3.00	5.00	4.00 ± 0.94			
7	Prepupa	10				1	1	1.00 ± 0
	Length		21.00	23.00	22.40 ±0.70			
	width		4.00	5.00	4.50 ±0.53			
8	Pupa	10				6	7	6.10 ± 0.32
	Length		18.00	25.00	20.60 ± 2.59			
	width		5.00	6.00	5.60 ± 0.52			
9	Adult							
	Male							
	Length	10	72	88	79.20±7.30	1	2	1.50±0.53
	Famale							
	Length	10	68	86	74.00±8.38	1	2	1.80±0.42

Discussion

The aspect of morphology and life cycle of the pierid butterfly species *Delias hyparete indica* from Hpa-an University in Kayin State was conducted during June 2017 to May 2018. Club-shaped antennae of *D. hyparete indica* is one of the differences between moths and studied butterfly species. Prominent orange patches on the margins of hindwings of male distinguished it from the female where the orange patches along the margin of hindwings are comparatively faint. This morphological characters are in agreement with the descriptive accounts as reported by Kunte (2000).

The eggs were found on either the upper or lower surfaces of young leaves of the host plants during study period. The mated female usually laid 23-45 eggs depending on the host plants.

The complete life cycle of *D. hyparete indica* lasted for a period of 31 to 38 days. Like other butterfly species, four stages namely egg (five to six days), larva (19-24 days), pupa (seven

to eight days including prepupa) and adult (10-16 days) are included. Metabolic process in the pupa (resting stage) is related to the process of development into the adult took place in the pupa.

Aung Cho (2007) stated that *Eurema hecabe* (Linnaeus, 1758), one of the species in family Pierdae lasted for a period of 20-27 days to complete the life cycle. The longest period was recorded in the pupa which took seven to eight days before the emergence of the adult. The duration of each developmental stage was recorded as two to three days before transforming into the pupa. The increase in size with minor development could occurred within two to three days in the previous stages of the development. The number of egg in one batch was 25-60 depending on its host plants. The mated female laid its eggs not only on the upper surface but also on the lower surface of the host plants.

Thida Swe (2007) stated that *Hebomonia glaucippe* (Linnaeus, 1758) one of the species of the family pieridae laid 17-37 eggs on their host plants and the life cycle lasted about 28-34 days.

Conclusion

The study species of *Delias hyparete indica* completed its all developmental stages in Hpa-an University Campus. Grassland, cultivated area, open area, scattered tree, human habitation, areal area and dense tree in the study site serve as good habitats of butterfly species. The present study provides as the university record of butterfly and also provides as a baseline information for further study.

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