



**1994  
ANNUAL PHOTO CONTEST**





# LIFE HISTORY OF *TROGONOPTERA BROOKIANA ALBESCENS* IN MALAYSIA (LEPIDOPTERA: PAPILIONIDAE)

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**ABSTRACT.**— The complete life history of *Trogonoptera brookiana albescens* is documented for the first time in Malaysia. It serves to show the success of breeding this supposedly highland species on the edge of lowland forest where the host, *Aristolochia foveolata* (Aristolochiaceae) can also adapt to lowland conditions.

**KEY WORDS:** Acanthaceae, Aristolochiaceae, biology, Borneo, distribution, egg, Indonesia, larvae, morphology, Oriental, Palawan, Philippines, pupae, Southeast Asia, Sumatra, Verbenaceae.



Fig. 1. *Trogonoptera brookiana albescens*, male (left) and female (right), Penang.

Straatman and Nieuwenhuis (1961) and Igarashi (1979) have made important contributions to our knowledge of *Troides brookiana* (Wallace). Straatman and Nieuwenhuis dealt with the Sumatran subspecies, *T. brookiana trogon* (Snellen), whereas the illustrations of the early stages (first and final Instars) in Dr. Igarashi's book mainly treat *T. brookiana mollumar* D'Abrera, which is distributed only in South Johor and West Trengganu of Peninsular Malaysia; Parrott (1991) noted other subspecies.

The distribution of Rajah Brooke's Birdwing, *T. brookiana albescens* Rothschild, is confined to the central states of Perak, Pahang and Selangor. The females are supposed to only occur from 230m to 1000m, whereas the males are found as low as at 6m to 12m (Corbet and Pendlebury, 1992). Observations made in the Cameron Highlands, Perak, during recent years show that females also occur below 30m.

Based on information supplied in part by Mr. Hiromi Detani (a Japanese lepidopterist based in Bali), there are now eleven recog-

nized subspecies of *Trogonoptera brookiana* (Wallace):

1. *Trogonoptera brookiana albescens* Rothschild (Malaysia: Perak, Pahang, and Selangor)
2. *Trogonoptera brookiana mollumar* D'Abrera, Doggett & Parker (Malaysia: South Johor and West Trengganu)
3. *Trogonoptera brookiana brookiana* (Wallace) (Borneo: Sarawak)
4. *Trogonoptera brookiana haugumei* Parrott (East Kalimantan)
5. *Trogonoptera brookiana trogon* (Snellen) (Indonesia: Sumatra)
6. *Trogonoptera brookiana trojana* Honrath (Philippines: Palawan)
7. *Trogonoptera brookiana natunensis* Rothschild (Indonesia: Natuna Island)
8. *Trogonoptera brookiana jikoi* Kobayashi (Indonesia: Tuanku Island, Banyak Is.)
9. *Trogonoptera brookiana cardinaali* Haugum & Low (Indonesia: Singkep Island, Lingga Is.)
10. *Trogonoptera brookiana apolloniae* Neukirchen (Indonesia: Siberut Island)
11. *Trogonoptera brookiana mariae* Neukirchen (Indonesia: Batu Island)



TABLE 1. Egg deposition of female Rajah Brooke's Birdwing from the Cameron Highlands, Malaysia, showing hourly oviposition per day.

Hour	August 1992											September 1992				
	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5
0800					1											
0900																
1000					1											
1100														1		
1200		3				1						6				
1300												2				
1400		1		4		4	2	5				2		1	4	
1500		1										3		4	3	
1600	6	1			1		8	4			12	1				
1700	6	1			9	4										
1800	7				4											
Second Female											Third Female					

## MATERIALS AND METHODS

The female described in this paper was captured at Sahom Village (below 30m), near Chenderiang, Perak State, on 23 September 1990. Observations were done in a captive environment at the edge of a lowland forest reserve in a semi-shaded condition behind the Penang Butterfly Farm at Teluk Bahang, Penang. The enclosure used for oviposition measured 9.0m x 6.0m x 2.0m and was made of wooden frames with aluminum mosquito netting. The enclosure included seven other species of butterflies (mainly papilios and nymphalids), with a total density of about 40 specimens plus their individual host plants. Flowering plants used as a nectar source for the *T. brookiana albescens* female were *Crossandra infundibuliformi* (Acanthaceae) and *Duranta lorentzii* (Verbenaceae). Maximum and minimum temperatures were recorded as 22°C and 36°C respectively, with relative humidity ranging between 70% and 90%.

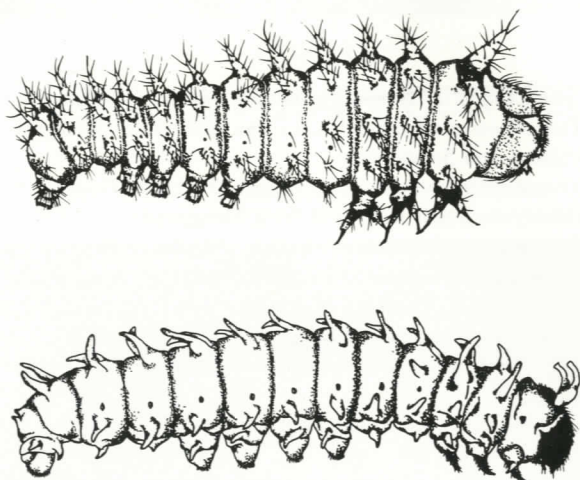


Fig. 2. *Trogonoptera brookiana albescens*, larvae: a) 1st instar (enlarged); b) 5th instar.

Observations on oviposition were not carried out thoroughly for the first female. However, subsequently two other females were observed at hourly intervals (see Table 1) and it was found that fewer than 10% of all the ova were deposited before 1200h and the rest were between 1200h to 1800h: more than 50% of the eggs were deposited between 1200 and 1800 hours. All ova were oviposited singly on a suspending potted plant identified as *Aristolochia foveolata* (Aristolochiaceae) which was collected from the 14th mile, Cameron Highlands road.

The first female was observed ovipositing not just on the young leaves of its host, but all over the vine, as well as nearby vegetation. All the eggs (139 eggs) from the first female were collected from 26 September to 4 October 1990.

All the eggs and the 1st instar larvae were kept in small ventilated plastic containers measuring 6.0cm x 6.0cm x 2.5cm. Larvae of 2nd and 3rd instars were kept in larger containers measuring 9.0cm x 4.0cm x 4.0cm. Feeding for the larvae from 1st to 3rd instars was done with cut young leaves which were changed twice a day; at the same time, the larvae were sprayed with tap water twice a day. Larvae of the 4th and 5th instars were sleeved on the planted host plants.

Early stages of the 1st to 5th larval instars are preserved in 70% alcohol at the insect museum of the Penang Butterfly Farm, Penang, Malaysia.

## IMMATURE STAGES

### Ovum

The ovum is spherical and between 2.0mm-2.2mm in diameter. It was yellowish green when freshly laid at about 1100h on 26 September 1990 and turned to yellowish orange with a black ring on the upper part of the ovum at 0845h on the 5th day. On average, the incubation period is between 6 to 7 days.

### 1st Instar

Head capsule width is 0.8mm and body length at hatching is 6.0mm-7.0mm. Ground colour is brown. The larger spines at the 2nd and 3rd thoracic segments and 1st abdominal segment are lighter brown at the spine base, and tipped with creamy white.

The other similar spines at abdominal segments 4, 7, 8 and 9 are only chalky white throughout. The rest are shorter spines at abdominal segments 2, 3, 5 and 6, with the same colour as the body (see illustration and coloured plate). All these big and small spines have tiny black setae branching out, while these black setae are totally absent in the subsequent instars.

The newly hatched larva consumes the whole chorion before it moves on to feed on the host plant, by first eating out a small hole in the central part of the young leaf, and then moving on to continue to feed on the edge of the leaf. The first moulting takes place at around 1400h on the 5th day.

### 2nd Instar

Head capsule width is 1.6mm and body length at hatching is 14.0mm-15.0mm. After moulting, it does not eat the 1st instar skin as done in subsequent instars. This phenomenon is perhaps due to the hairy nature of the 1st instar skin. The 2nd instar lasts for 4 days.

### 3rd and 4th Instars

3rd instar head-capsule width is 2.7mm and measures 19.0mm-20.0mm in length. After 5 days, it enters the 4th instar with a head-capsule width of 3.8mm and a body length of 43.4mm. The 4th instar lasts 7 days.

Fig. 3-12. *Trogonoptera brookiana albescens*: 3) egg; 4) 1st instar; 5) 2nd instar; 6) 3rd instar; 7-8) 4th instar; 9) 5th instar; 10) prepupa; 11) pupa; 12) hostplant, *Aristolochia foveolata* (Aristolochiaceae).









Fig. 13. *Trogonoptera brookiana albescens*: emergence sequence.



**5th Instar**

Head-capsule width is 6.7mm and body length at hatching is 64.0mm. The tubercles do not point vertically anymore; they fall and point backward, with a transverse white band which starts at the base of the 5th segment and slants right up to the pair of tubercles on the 6th segment. This instar lasts for 9 days. Throughout all the 5th instar, the larva usually feeds from the underside of the leaves.

**Pupation**

In the morning of the 31st day, the larva stops feeding and wanders around to look for a place to pupate. Observation shows that its preferred pupation site is on the stem of its host. After mid-day, it attaches to the site at its anal end. But, it is in a curled position only in the morning on the next day. It remains in the same curled position until the early morning of the 34th day, when it begins to change into a pupa.

**Pupa**

The ground colour is apple green. It has 2 pairs (instead of 3 pairs as in *Troides helena*) of sharp-pointed dorsal processes, with the pair at the 5th segment directed towards the midline. The antennal lines are greenish white. The pupa has a small marginal violet spot towards the apex. The pupal stage lasts between 22 and 25 days.

**ACKNOWLEDGEMENTS**

I thank Mr. B. T. Chin, Technical Manager of Penang Butterfly Farm, who has assisted me in the documentation work; Mr. Rowell Rodriquez, from Palawan, Philippines, who was at Penang Butterfly Farm for more than a year in the research on butterfly-breeding; Mr. C. H. Ang, Penang, who did the photography for this paper; the late Dr. Tho Yow Pong, Forest Research Institute Malaysia, Kuala Lumpur, and Mr. Tan Man Wah, Kuala Lumpur, for their comments on the manuscript; Dr. Jason Weintraub, New York, and Dr. Michael Parsons, Los Angeles, for editing the manuscript; Mr. Jasni Bin Abdul Razak, Penang, and Mr. Mohamad Anuar Bin Ismail, Penang, for their technical assistance; and Ms. Rofidah Bt. Hussein, Penang, for her larval illustrations; and to Mr. Arbaimun, from Bandar Baru, North Sumatra, for the identification of the host plant.

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