



## Identity and biology of the Blue Mormon, *Papilio polymnestor* Cramer (Lepidoptera: Papilionidae)

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**ABSTRACT:** Investigations were made on the morphology and biology of the Blue Mormon, *Papilio polymnestor* Cramer. Morphological details pertaining to the wing venation and external genitalia along with the details of immature and adult stages are given. The life history was completed in 40-46 days. *Euodia ridleyi* (family Rutaceae) was recorded as a new larval host plant of this butterfly.

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**KEYWORDS:** Blue Mormon, *Papilio polymnestor*, External genitalia, *Euodia ridleyi*.

### INTRODUCTION

*Papilio polymnestor* Cramer (Blue Mormon) is a tailless black swallowtail butterfly measuring 120- 150 mm in wing span. The hind wings have a glistening bluish tinge. It is closely similar to the Sri Lankan form *P. polymnestor parinda* Moore except for the buff coloured female form of the latter. It is widely distributed in India being recorded from Jharkhand, Madhya Pradesh, S. Gujarat, W. Bengal, Kerala, Karnataka, Goa, Tamil Nadu, Maharashtra and Sikkim (Talbot, 1939; Konte, 2000). The larvae feed mainly on Rutaceae plants and it has been reported as a minor pest of cultivated citrus plants although no severe outbreak has been so far reported from India. Recently, an investigation has been made on the systematics of the Swallowtail butterflies of Kerala. Information generated on the taxonomy and biology of *P. polymnestor* butterfly is presented in this paper.

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## MATERIALS AND METHOD

Morphological studies were carried out using samples collected from different locations in Kerala during 2010-2012. The areas covered included Nilambur (11°17' 58" N 76°15' 03" E), Peechi (10°31' N, 76° 24' E), Vazhani (10° 36.75' N 76° 24.42' E), Athirappilly (10°17' 19" N, 76° 32' 54" E), Vazhachal (10° 14' N, 76° 25' E) and Thenmala (8°57' 0" N and 77°4' 0" E). Microscopic slide mounts of body parts were prepared using standard methods (Mathew and Ramadas Menon, 1985). For preparing slide mounts of external genitalia, the parts were dissected out from samples treated with 10 % KOH. It was then stained with Acid Fuschin (in acetic acid) and cleared in Carbol- Xylol (solution of Carbolic Acid and Xylene in 2: 3 ratio) and then mounted in Canada balsam.

The biology was studied by rearing the field collected eggs in small glass jars (16 x 10 cm in size) covered with a clean, dry cloth and securely fastened with a rubber band. The containers were kept moist by placing a small piece of moist absorbent tissue. Frass and excreta accumulated in the container were removed daily and the larvae were provided with fresh leaves of citrus. The duration of the larval instars was recorded based on observations of the moulted shells of the caterpillar's head that remains inside the container after moulting. The size of the caterpillar (length and breadth), mode of feeding, pupation and emergence were also recorded. Towards the end of the final instar, when the larva shows signs of pupation, a dry twig was placed within the container so as to provide anchorage to the pupa.

## RESULTS AND DISCUSSION

Taxonomy: *Papilio polymnestor* Cramer (Blue Mormon)

Cramer, 1775. *Papillons exot.* I: 83.

Wynter-Blyth, 1957. *Butterflies of the Indian Region*, Bombay Natural History Society, p. 383.

D' Abrera, 1982, *Butterflies of the Oriental Region*, Part 1: 74.

Kehimkar, I. 2008. *The Book of Indian Butterflies*. Bombay Natural History Society and Oxford University Press, Mumbai, India, p. 130.

Material in collection: 3♂ & 3♀, 25.xi.10, Peechi; 14.x.11, Thenmala; 12.ix.11, Nilambur.

Wing span: 120.30 (± 13.15) mm.

Distribution: India (Peninsular and Central India), Sri Lanka and Myanmar: In India, specifically recorded from Jharkhand, Madhya Pradesh, S. Gujarat, W. Bengal, Kerala, Karnataka, Goa, Tamil Nadu, Maharashtra and Sikkim. During the present study, it has been recorded from Nilambur, Nadukani Ghat, Aralam, Thirunelli, Thrissur, Palakkad, Peechi, Vazhani, Athirappilly, Vazhachal, Valppara, Chinmoni and Thenmala.

Status: Common (Gaonkar, 1996).

Hosts: *Atalantia racemosa*, *Atalantia wightii*, *Glycosmis arborea*, *G. pentaphylla*, *Paramigyna monophylla*, *Citrus grandis*, *C. limona*, *C. documana*, *C. maxima*, cultivated limes (Rutaceae) and *Garcinia xanthochymus* (Clusiaceae). *Euodia ridleyi* was recorded as a new host plant at Peechi.

Description: Blue Mormon the second largest of the Southern Indian butterflies, has an expanse of 120.30 ( $\pm$  13.15) mm. Upperside of forewing is black, with a pale blue discal band which narrowing towards the apex. This pale blue band is traversed by black transverse stripes along the veins. The underside is opaque black with an elongate dark red spot at the base of the cell in the forewing. The one-third of the upper side of the hind wing is black and the remaining part is pale with a row of black discal spots, a similar row of black sub-marginal spots and a row of marginal black spots. Some of the sub-marginal spots coalesce with the marginal spots. The hind wings are tail-less. The underside of the hind wings have five irregular small patches of reddish at the base. The head, thorax and abdomen are uniformly blackish brown.

Wing venation: There are 12 veins in the forewing with a large, closed, discal cell with several veins radiating from it. Among the 12 veins, the first and the last are arising from the base and the remaining from the discal cell. On the forewing, vein 12 (Subcosta; Sc) coalesces with the 11<sup>th</sup> (R5) vein. All the five branches of the Radial veins (Veins 11 to 7; R1-R5) are present. Veins 6 to 4 form the Median veins (M1 to M3). Veins 3-2 are the Cubital veins, Cu1a and Cu1b and the last vein is the Anal vein, which has two branches viz., 1A and 2A. The second Anal vein is short and third Anal vein is totally absent.

In the hind wing, the first radial vein is fused with Subcosta (vein 8) forming Sc + R1 are fused). The Radius (7<sup>th</sup> vein) which is undivided and is termed Radial sector. The Median vein (M) has three branches (veins 6-4) viz., (M1-M3). Veins 3-2 are the Cubital veins termed Cu1a and Cu1b. Only one Anal vein is present viz., 1A. There is a small spur near the base of 8<sup>th</sup> vein, projecting towards the costa called Humeral vein (Plate I. Fig. 1).

External genitalia- Male: (Plate II. Fig. 1). Uncus short, blunt. Socii present. Gnathos composed of two spiral processes, joined apically. Tegumen and Vinculum slender and bar-like. Valve broad in the apical half. Apical and outer margins bordered by a setosed and sclerotised band. Cucullus slightly curved and sclerotised. Costal margin slightly concave. Harpe spatulate, having a broad apex with a tapering proximal part. Juxta with acute lateral lobes. Sacculus straight. Saccus short, U-shaped. Phallus long, stout bow-shaped and curved in the middle. Apex broadened with flat edge. Vesica prominent, extending the entire apex.

Female: (Plate II, Fig. 2). Ovipositor lobes oval, short and fringed with short hairs. Apophysis more or less similar in size. Sinus vaginalis, broad. Ductus short and narrow. Corpus bursae elongate oval, proximally narrowed. Signum prominent, sickle-shaped and swollen in the middle.

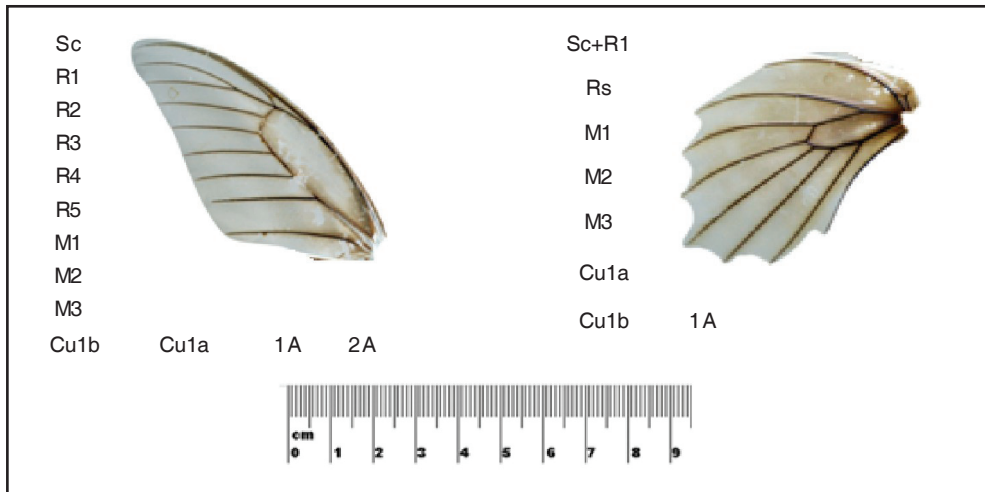


Plate I. Fig. 1 Wing venation of *P. polymnestor* Cramer

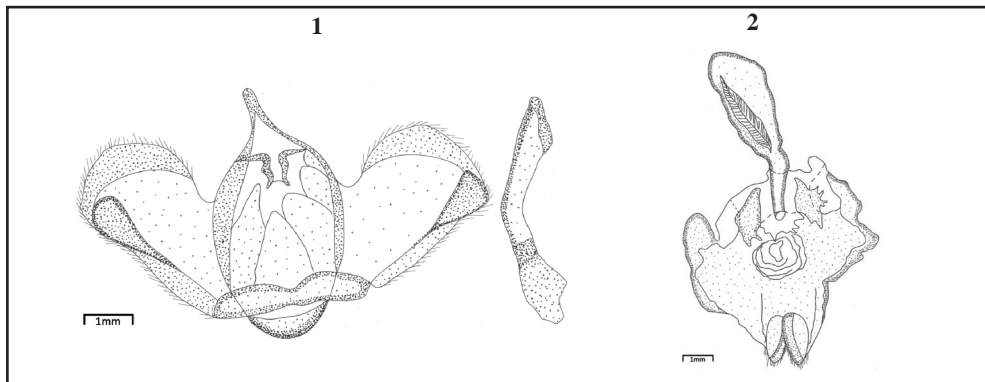


Plate II- Figs. 1 and 2: Male and female genitalia of *Papilio polymnestor*

**Biology:** Biology of this species, studied by rearing it on *Citrus grandis*, gave an account of the immature stages along with developmental periods is presented below (Plate III, Figs. a - i).

**Egg:** The eggs are laid singly on the underside of leaves of the host plant. It is pale creamy yellow with a finely roughened surface and is nearly spherical having a diameter of about 1.8 mm. Mean incubation period is  $4.43 (\pm 0.53)$  days.

**Larva:** The duration of various instars is presented in Table 1. Detailed description of each instar is given below.

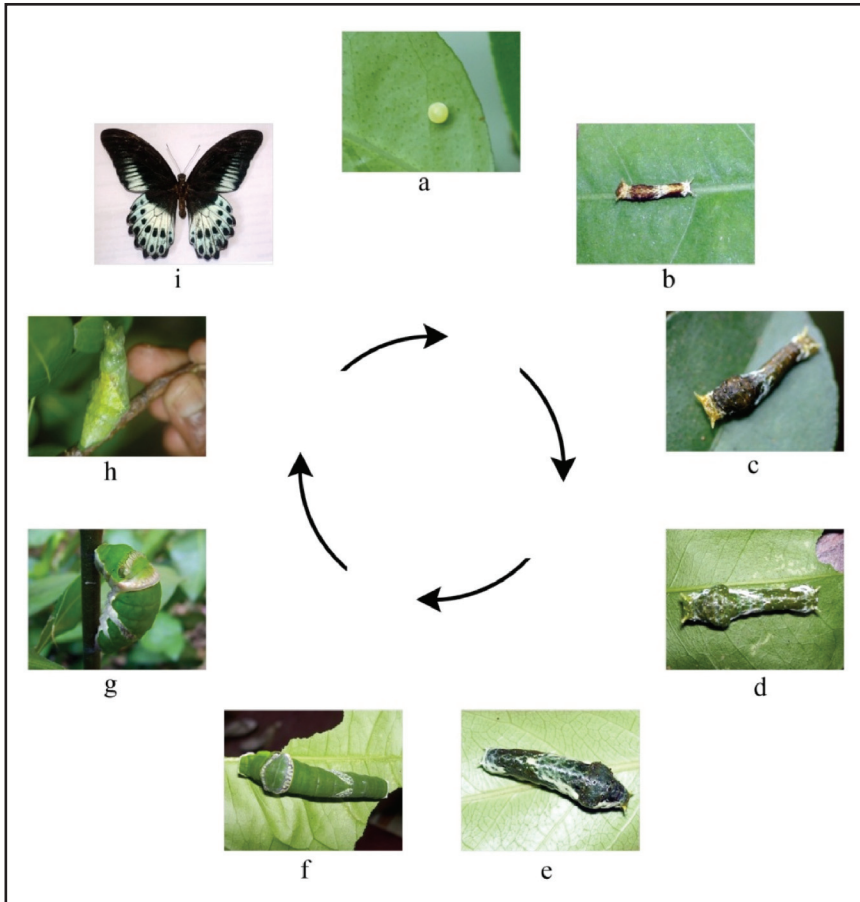


Plate III- (Figs. a - i): Life stages of *P. polymnestor*

Table 1. A comparison of larval instars of *Papilio polymnestor*

Stage	Length (mm)			Width (mm)		
	Range (mm)	Mean (mm)	SD	Range (mm)	Mean (mm)	SD
First instar	5-6	5.7	0.48	-	0.50	-
Second instar	17-19	18	0.67	5-7	6.1	0.57
Third instar	24-26	24.7	0.68	8-9	8.2	0.42
Fourth instar	32-35	33	1.05	9-10	9.5	0.53
Fifth instar	43-45	44	0.94	12-13	12.2	0.42

SD- Standard deviation

**Table 2. Duration of various stages of *Papilio polymnestor***

Developmental stage	n	Range (days)	Mean (days)	SD
Egg	10	4-5	4.43	0.53
Larva	10	21-24	22.22	0.97
Pupa	10	18-23	20.78	1.56
Duration (egg – adult)	10	40-46	43	1.80

SD- Standard deviation

First instar larva: It measures about 5.7 ( $\pm 0.48$ ) mm in length and 0.5 mm in width. The freshly emerged larva is transparent, greyish white dorsally and dark brown laterally with faint whitish markings on the body. Gradually the whitish dorsal patches change to greenish brown with clear white markings on the prothorax and posterior abdominal segments. After about 3 days, the larva moults to the next instar.

Second instar larva: The larva measures 18 ( $\pm 0.67$ ) mm in length and 6.1 ( $\pm 0.57$ ) mm in width and the larval duration lasts for 3 days. Body is bright greenish yellow with distinct white markings on the anterior, middle and posterior body segments.

Third instar larva: The larva grows upto a maximum of 24.7 ( $\pm 0.68$ ) mm in length and 8.2 ( $\pm 0.42$ ) mm in width. There is no drastic change in physical appearance except that the larva is more green in colour.

Fourth instar larva: The larva measures 27 mm in length and 9.5 ( $\pm 0.53$ ) mm in width. As the growth proceeds, light to dark green coloured cryptic markings mixed with white streaks of the body become prominent.

Fifth instar larva: The larva attains a maximum of 44 ( $\pm 0.94$ ) mm in length and 12.2 ( $\pm 0.42$ ) mm in width. The larva is bright green in colour with two eye spots on the third thoracic segment, a transverse band at the abdominal segments 1 and 2 and oblique bars on the mid-abdominal segments. The eye spots on the 3rd thoracic segment are connected by a transverse green dorsal band. A similar band occurs between the abdominal segments 1 and 2, with pale bluish gaps between the markings. There are oblique bars extending from the base of abdominal segment 3 to segment 4 one on each side. The second oblique bar occurs at the two sides of abdominal segment 5, wide at the base and tapering to the dorsum. Both sets of oblique bars are mainly whitish dotted with tiny greenish and bluish spots. Pale rose coloured osmeterium is also present just behind its head.

Pupa: Pupa is greenish in colour with large yellowish markings. It bears cephalic horns and is humped in the thoracic area. The pupa measures 37-38 mm in length.

Duration of life cycle: The life cycle is completed within 43 ( $\pm$  1.80) days under laboratory conditions. The duration of various stages is given in Table 2.

*Papilio polymnestor*, which is generally found in different habitats including homesteads thrives well in Kerala, on account of the fact that most of its larval host plants are commonly found in our surroundings including wild, ornamental and cultivated plants.

#### ACKNOWLEDGEMENT

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