Study on Wing Venations of Some Papilionid Butterfly Species from Meiktila University Campus

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Abstract

The study on wing venations of some papilionid butterfly species from Meiktila University campus was conducted during November 2013 to February 2014 and resulted in the identification of 2 genera, 3 species, namely *Papilio demoleus malayanus*, *Papilio polytes romulus* (male and female) and *Graphium agamemnon agamemnon*. Differences observed among the respective wing venations were described and discussed.

Keywords: Wing venation, butterflies, Meiktila

Introduction

The Rhopalocera butterflies are among the most beautiful and attractive animals in the insect world.

Myanmar butterflies were studied by Bingham (1905, 1907) and Talbot (1939). Talbot recorded 1014 species of Myanmar butterflies in Fauna of British India including Ceylon and Burma. Butterflies are divided into two superfamilies, Papilionoidea (or butterflies proper) and Hesperioidea (skippers) (Wynter- Blyth, 1957).

All the butterflies are grouped under the name Rhopalocera, whilst all the other Lepidoptera, although more diverse in their origins and structure, are grouped as Heterocera or moths. This classification is based on the shape of the antennae. In the butterflies they are filiforms, definitely clubbed or thickened towards the tip and held erect. In the moths their shape and structure is extremely diverse, and at rest they may be folded under the wings. Most butterflies fly by day and when at rest, sit with the wings closed in an upright position above the body so that only the underside is visible. On the other hand, most moths hold their wings when at rest so that the upper surface of the forewings is exposed. Butterflies are included in that division of insect (the Holometabola) in which the metamorphosis said to be complete. In other words, during their lives they pass through four distinct phases, the egg or ovum, the caterpillar or larva, the chrysalis or pupa and the adult or imago (plural, imagines) (Corbet and Pendlebury, 1992).

All butterflies share one common feature-they can fly. The wings are of prime importance since they are the means of flying, the primary mode of progression for all butterflies. Compared with the wings of other flying insects, butterflies have relatively few veins. There are no muscles in the wing, most movement being controlled from the base of the wing. Many sit with their wings closed, while others open them a little and others hold them flat.

The connection between forewings and hindwings serves to distinguish butterflies from moths. In butterflies, the lower edge of the forewing and upper edge of the hindwing overlap. The area of overlap is increased by an extension of the hindwings called the humeral lobe, which is specially strengthened. In moths, the wings overlap but the costa of the hindwing possesses a stout spine or spines near the

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base, called the frenulum, which fits into a cradle of hairy bristles called the retinaculum, situated at the base of the forewing on the underside (Smetacek, 2000).

The shape and the pattern of wing venation are of very great importance in the classification of butterflies. This paper will be of some value and form a basis for the advance study in the field of entomology.

Materials and Methods

Study area

Meiktila was selected as a study area. Meiktila is situated in the central part of Myanmar and located between 20° 51' and 20°55' N and between 95° 49' and 95° 54' E (Fig 1).

Study period

The duration of study period was from November 2013 to February 2014.

Collection sites

To investigate the wing venation of some butterfly species, Meiktila University Campus was chosen as the study site.

Collection of specimens

Most of the collection was done with a simple net, a cane ring of about 18 inches diameter fastened on to a rigid bamboo stick about 4 feet long. Catching butterflies with a butterfly-net fall into two main methods. One method was the swift stroke in the direction of the oncoming butterfly and the other was the low speed which was usually employed in catching butterflies at rest. To kill a butterfly pinching method was applied. After killing, the butterfly was transferred into paper envelopes. The envelopes were made from good transparent paper a little longer than they are broad so that, after folding over diagonally, and turning over the edges, a closed triangular pocket is formed. The butterfly was put with its wings folded together, and the antennae placed along the costal margins of the forewings.

Setting of the specimens

When the specimens were properly relaxed they were retrieved, and pinned through the middle of the mesothorax and transferred into the grooved of spreading board. The wings as well as the legs and antennae were spread and properly arranged; especially the spread wings were secured with strips of paper pinned down at respective places.

Identification of the specimens

The specimens were identified and classified by using the keys based on Bingham (1905 and 1907), Talbot (1939 and 1947) and Corbet and Pendlebury (1992).

Preparation of the specimens for examination of wing venation

For the study of wing venation, the fore and hind wings were carefully detached from the thorax using a dissecting needle or scalpel. They are placed in petri-dish containing five percent of potassium Hydroxide solution for 24-48 hours according to the size of the wing. All scales were cleaned with a smooth brush. When transparent, the wings were washed thoroughly in tap water. Then they were left to

dry on the glass slide which was then covered with another slide and sealed with the help of cellophane tape to study the venation. The slide was examined under the tripod and drawings of venation were made.

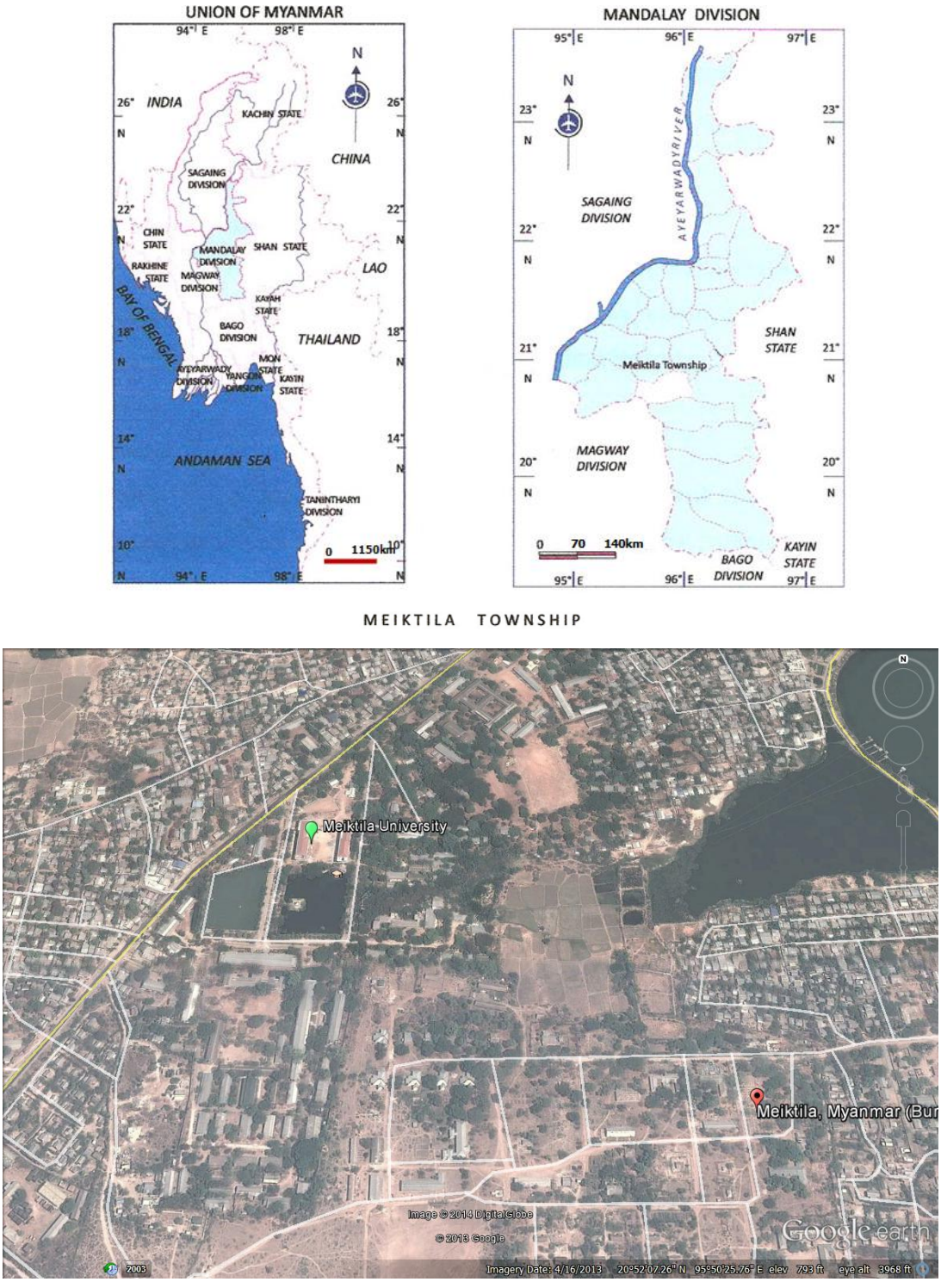


Fig. 1 Map of study area and site at Meiktila

Results

Systematic position of the recorded butterflies

Phylum	Arthropoda
Class	Insecta
Subclass	Pterygota
Division	Endopterygota
Order	Lepidoptera
Suborder	Rhopalocera
Superfamily	Papilionoidea
Family	Papilionidae
Subfamily	Papilioninae
Genus	*Papilio*
Species	*P. demoleus malayanus* (Wallace, 1865)
	P. polytes romulus (Cramer, [1775])
Genus	*Graphium*
Species	*G. agamemnon agamemnon (*Linnaeus, 1758)

Wing venations of recorded butterfly species

***Papilio demoleus malayanus* (Wallace, 1865)** (Plate 1 A, Fig. 2 A)

Common name – The Lime Butterfly or The Common Lime

Forewing shape and venation

Triangular in shape; costa widely arched; termen slightly straight concave below the apex; dorsum straight; apex widely rounded; tornus rounded; discoidal cell is closed and more than half the length of wing. In the forewing 12 veins are present; vein 1a and 1b present and arise from base of the wing and 1b is forked at the base; vein 2 arises from middle of the cell; veins 3and 4 arise from lower apex of the cell, veins 5 and 6 arise from lower apex, midpoint of discocellular vein, veins 7 and 8 on a stalk; vein 9 from the upper angle of cell, veins 10 and 11 free from cell, vein 12 arises from base of the wing.

Hindwing shape and venation

Pear shaped; costa slightly arched; termen slightly crenulate; dorsum arched; apex and tornus obtuse; discoidal cell is closed and it is about half the length of wing. In the hindwing 8 veins are present; veins 1a present and 1b absent, vein 2 arises from middle of the cell, veins 3 and 4 arise from lower apex of the cell; veins 5 and 6 arise from midpoint and apex of the cell; vein 7 arises from the about the upper middle of the cell; vein 8 arises from the base of the wing, vein 8 as long as forewing vein 1b. Precostal vein is present and directed distad.

***Papilio polytes romulus* (Cramer, [1755])** (Plate 1 B, C, Fig. 2 B)

Common name – The Common Mormon (male and female)

Forewing shape and venation

Triangular in shape; costa arched; termen slightly straight; dorsum slightly concave; apex rounded; tornus is obtuse angulated; discoidal cell is closed and two-third the length of wing. In the forewing 12 veins are present; vein 1a and 1b present, vein 2 arises from lower middle of the cell; veins 3and 4 arise from lower apex of the cell, veins 5 and 6 arise from lower apex, midpoint of discocellular vein, vein 7 arises

from vein 8; veins 8, 9, 10 and 11 arise from direct cell; vein 12 arises from base of the wing.

Hindwing shape and venation

Fan- shaped; costa arched; termen slightly arched and scalloped and usually with a spatulate tail at vein 4; dorsum slightly straight; apex acute and tornus obtuse; discoidal cell is closed and it is about half the length of wing. 8 veins present; vein 1a present, 1b absent, vein 2 from lower middle of the cell, veins 3 and 4 arise from lower apex of the cell; veins 5 and 6 arise from midpoint and lower apex of discocellular vein; vein 7 from the about the upper middle of the cell; vein 8 from base of the wing. Precostal vein present and directed distad.

***Graphium agamemnon agamemnon* (Linnaeus, 1758)** (Plate 1 D, Fig. 2 C)

Common name- The Tailed Jay

Forewing shape and venation

Triangular in shape; costa widely arched; termen straight, oblique and concave below apex; dorsum straight; apex widely rounded; tornus is obtuse angulated; discoidal cell is closed and it is more than half of the length of wing. In the forewing 12 veins are present; vein 1a and 1b present, vein 2 arises from lower middle of the cell; veins 3and 4 arise from lower apex of the cell, veins 5 and 6 arise from lower apex and midpoint of discocellular vein, vein 7 arises from vein 8; vein 8 arises from upper apex of the cell, veins 9, 10 and 11 arise from direct cell and fused at the near costa; vein 12 arises from base of the wing.

Hindwing shape and venation

Nearly fan- shaped; costa slightly arched; termen slightly crenulated; the hindwing has a short tail at vein 4; dorsum slightly rounded; apex is obtuse; tornus produced; discoidal cell is closed and it is about half the length of wing. 8 veins present; veins 1a present, 1b absent, vein 2 from lower middle of the cell, vein 3 and 4 arise from lower apex of the cell; veins 5 and 6 arise from midpoint and apex of discocellular vein; veins 7 and 8 arise from base of the wing. Precostal is present and directed distad.

(A) Dorsal View (B) Ventral View

(A) *Papilio demoleus malayanus*

(A) Dorsal View (B) Ventral View

(B) *Papilio polytes romulus* (male)

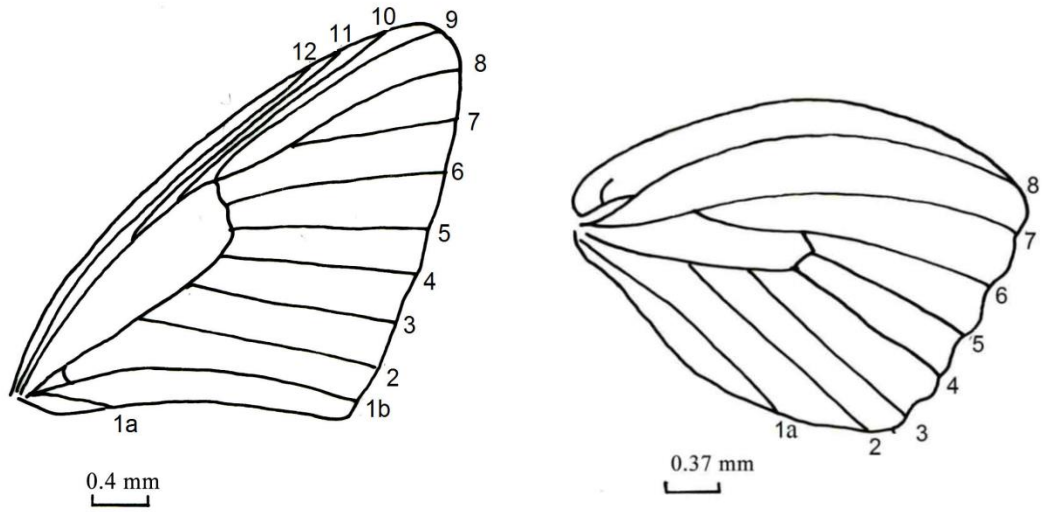
(A) Dorsal View (B) Ventral View

(C) *Papilio polytes romulus* (female)

(A) Dorsal View (B) Ventral View

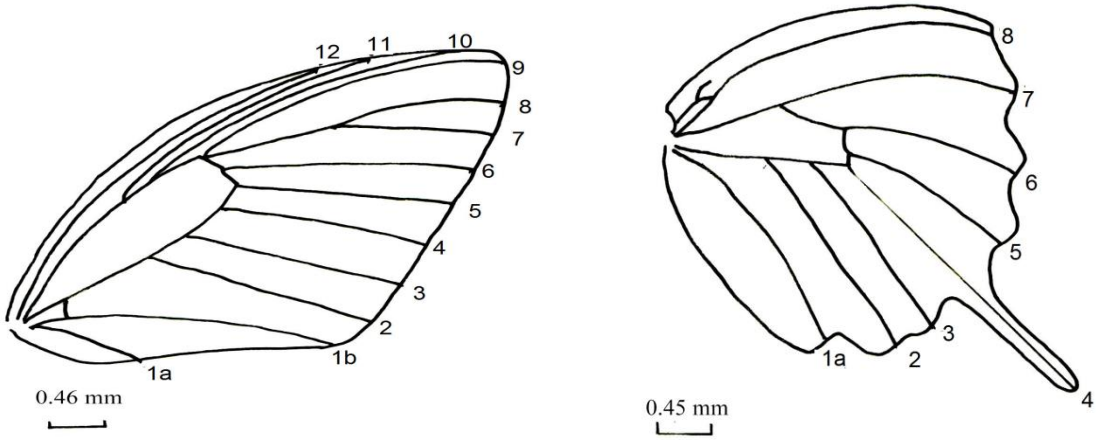
(D) *Graphium agamemnon agamemnon*

Plate 1. Collected studied species (Family- Papilionidae)



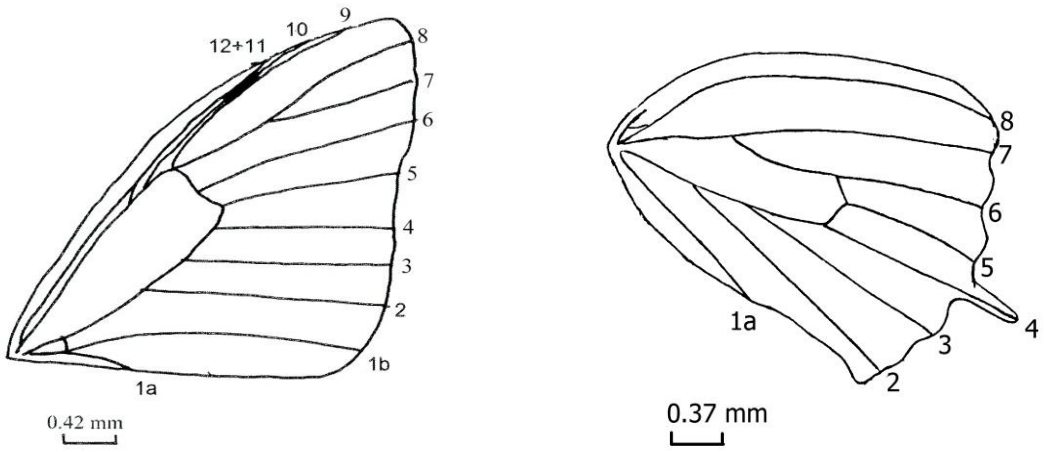
(A) Forewing (B) Hindwing

(A) *Papilio demoleus malayanus*



(A) Forewing (B)Hindwing

(B) *Papilio polytes romulus* (male)



(A) Forewing (B) Hindwing

(C) *Graphium agamemnon agamemnon*

Fig. 2. Wing venation of collected studied species (Family- Papilionidae)

Discussion

The study has been conducted from November 2013 to February 2014 in Meiktila University campus and its environs.

The Lepidoptera are divided into two suborders: Rhopalocera (butterflies) and Heterocera (moths). Vane-wright and Ackery (1984) divided Rhopalocera into two super families, Papilionoidea and Hesperioidea; the former containing four families: the Papilionidae, the Pieridae, the Nymphalidae, and the Lycaenidae; and the latter one family, the Hesperiidae.

The wings are membranous, with veins or nervures running longitudinally from the base to the wing margins. A typical butterfly forewing has twelve veins, the first and last arising from the base, the others from the cell. The hindwing has eight veins arising in the same way as those of the forewing (Corbet and Pendlebury, 1992).

In all the studied species twelve veins are present in the forewing and eight veins are present in the hindwing as recorded by Corbet and Pendlebury, 1992.

Talbot (1939) stated that family Papilionidae includes many large and magnificent coloured butterflies and 91 species were recorded from Myanmar. In present study, under the family Papilionidae, the subfamily Papilioninae comprised 3 species under 2 genera, *Papilio* and *Graphium* were recorded.

In the genus *Papilio*, dimorphic species *P. demoleus malayanus* tailless form and *P. polytes romulus* tailed form were studied. *P. polytes romulus* was found in pairs. In the members of the genus *Papilio* sexes are similar except in *P. memnon* and *P. polytes* (Pinratana, 1977).

In *P. polytes romulus*, male form is usually different from female form. In male, underside hindwing with a white band from vein 8 to dorsum and in the female form mimicking *Pachliopta aristolochiae*, with a white patch which enters bases of space 2-5 (Corbet and Pendlebury, 1992).

In the genera *Papilio* and *Graphium*, discoidal cells are closed in the fore and hind wings. The species studied have a precostal vein and directed distad.

Sometimes the coloration and pattern of wings of the same species may be different due to geographical, seasonal or some other reasons. In such conditions arrangement of wing venation and the presence and shape of precostal vein are definitely the best the proper identification species. So, the pattern formed by wing venation is of very great importance in the classification of Lepidoptera.

Acknowledgements

First author greatly indebted to Dr Ko Ko Kyaw Soe, Dr Khin Mg Htay, Dr Khin Phyu Phyu Aye and Dr Aung Khin Myint, Prorectors, Meiktila University for their encouragement. Thanks are also due to Dr Shan Shan, Professor and Head, Department of Zoology, and Dr Thet Thet Htun, Professor, Department of Zoology, Meiktila University for their suggestions in preparing this paper.

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