Wing Venation of Butterflies (Order-Lepidoptera) in Shwebontha Environs, Pyay Township, Bago Region

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Abstract

Shwebontha Environs, Pyay Township was selected to study of Wing Venation of some butterfly species. The study period was from March 2016 to February 2017. Taxonomic characters and keys of four families, four genera, and four species of butterflies collected were described. Wing venation of each species was given with scaled photographs. The principal characters used in keying adult butterflies to family are those of wing venation. The best way to see the wing venation in a Lepidoptera is to bleach the wig. Suggestions for future research are outlined based on the present findings. Future research should be more studied in detail taxonomic character, wing venation, general morphology, identification of males and females of other families, genera and species of butterflies belonging to the order Lepidoptera. Habitat preference of various butterfly species need to be sought in Pyay environs. The larvae of wet and dry forms of some butterfly species should be further sought from physiological aspects.

Keywords: wing venation, adult butterflies, key characters, order Lepidoptera

* In shwebontha environs, Pyay Twonship.

Introduction

Butterflies are members of the insect order Lepidoptera, the literal meaning of which is ‘scale-wing’ and included with them are the moths. Members of the Lepidoptera are distinguished in the adult stage by the dense covering of overlapping scales on the head body and appendages, including the two pairs of membranous wings. Wingspans range from about 3 mm to 280 mm. A few species have reduced, non-functional wings; these are usually females, but in some species both sexes are flightless. The scales are coloured and arranged in innumerable patterns, from the subtle and cryptic in innumerable patterns, from the subtle and cryptic to the bright and showy. Many butterfly wing pattern elements have boundaries or symmetries related to vein positions: however, the relationship between vein development and the formation of many specific color pattern elements venous patterns typically have lines of symmetry along wing veins, although their widths along the proximodistal axis may vary dramatically. Butterfly wing vein mutants are exceedingly rare, yet can be highly informative about the processes underlying color pattern determination.

Wing coupling allows the fore and hind wings to beat together. Moths with homoneurous venation lock the wins with a jugum, a lobe on the inner margin of the fore wing near the base. Most moths in the Heteroneura use a hook and eye mechanism composed of a frenulum at the base of the hind wing and a retinaculum on the underside of the fore wing. In males the frenulum is a single, composite bristle; the retinaculum is a membranous lobe. Females have two or more bristles that mesh with a row of bristles in the forewing. Butterflies and some moths lack a frenulum, but have an expanded humeral area at the base of the hind wing grips the underside of the fore wing. Butterflies usually rest with wings held together above the body; moths hold the wing outstretched against the substrate, overlapped and flat over the body, roof-like or rolled around the body.

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The wings are the most prominent lepidopteron attribute. They are usually covered on both the veins and membrane with two layers of minute, socketed, flattened setae (scales), which normally contain colour pigments and are finely ridged and usually hollow and microscopically perforated. Iridescent colours are the result of scale structure. Many males have specialized scent scales that help to spread pheromones produced by associated glands. These scales may be scattered among other scales or are concentrated in patches, tufts or wing folds. The venation is relatively simple, with few cross-veins. The most ancestral groups have similarly shaped fore and hind wings and the venation in both wings is similar (nomoneurous), resembling that of the Trichoptera. Vein Rs has four branches, Sc and R1 may have two branches, M is almost always three-branched, CuP is present and normally there are three anal veins. The venation of the Heteroneura ("different veins") shows variable simplification through fusion and loss of veins, especially in the hind wing. The radius in the fore wing usually has five branches but Rs in the hind wing is unbranched and R1 is fused with Sc. The stem of the media is lost in most groups, resulting in the formation of the large discal cell in the centre of both wings and in the most advanced superfamilies CuP is absent in both wings.

Butterflies in the family Papilionidae have eyes, short antennae and three fully developed pairs of legs. The forewing has 11 or 12 veins; veins 1A and 2A are separate. Papilioninae (swallow tails) have tails on the hind wings. The family Papilionidae contains about 600 species in 26 genera worldwide. Most swallowtails are tropical and are especially diverse in the old world; they include the hugebridwing butterflies of the genera ornithoptera and Triodes. The Nymphalidae is perhaps the largest family of butterflies with about 6000 species in 350 genera in all areas supporting butterflies. Family pieridae includes the well-known white or yellow in colour, through red, brown and blue do appear in some members. This family as a whole totals of about 1000 species. The family Danaidae include the well-known milkweed or monarch butterflies and are mainly distributed in the tropical or sub-tropical region (Gooddan, 1975).

Myanmar butterflies were recorded by Bingham (1905-1917) in his fauna of British India including Ceylon and Burma. This genre of fauna diversity is largely due to Myanmar's different geographic regions and climatic conditions. However, the literature of the butterfly fauna (wing venation) of Pyay was relatively scarce. The present study, therefore, intends to partially fill the gap in the literature. The purpose of this study was,

- to record and identify the wing characters of some butterfly species.
- to describe the wing pattern (venation) of the order Lepidoptera.

Materials and Methods

Study sites

The study sites are located at shewbontha village and its near environs Township, Bago Region, located between latitude 18° 49' 29" N and latitude 95° 12' 96" E (Fig. 1).

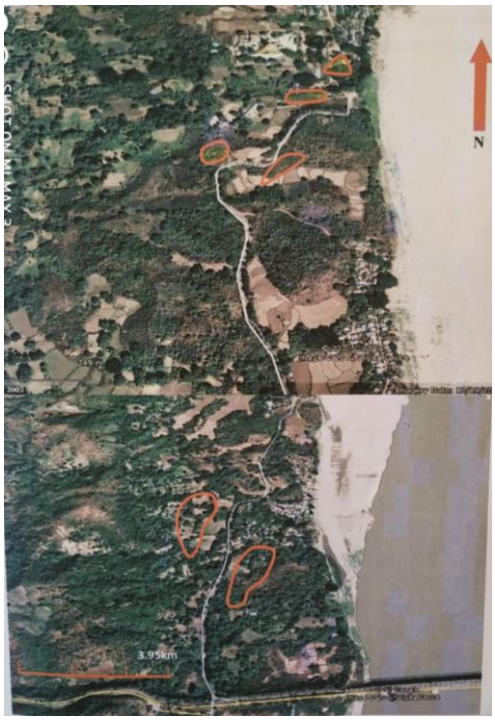


Fig.1 Study map (Source: Google earth, 11.8.16)

Butterflies species collection sites

Study period

The study was carried out from March 2016 to February 2017. Field surveys of the selected study sites were made two times per season.

Materials

1. Butterfly net
2. Plastic boxes (bottles)
3. Camera

Methods

The adult butterfly specimens were captured aided by a butterfly net from natural environments, around Pyay University Campus. The collected specimen was then transferred into an air-tight bottle containing a piece of cotton soaked with chloroform. The wings of dead butterflies were detached and placed in 10% Potassium hydroxide (KoH) (Plate. I). The wings when transparent after 2 to 3 days were washed thoroughly under tap water to remove the remains of KoH. The treated wings were then left to dry at room temperature. Ten individuals (male and female) of one species made to above test in one family. This enables the veins of the wings to become visible which is an important source of identification. Identification was followed Bingham (1905), Bingham (1907), Kunte (2000) (Fig. 2).

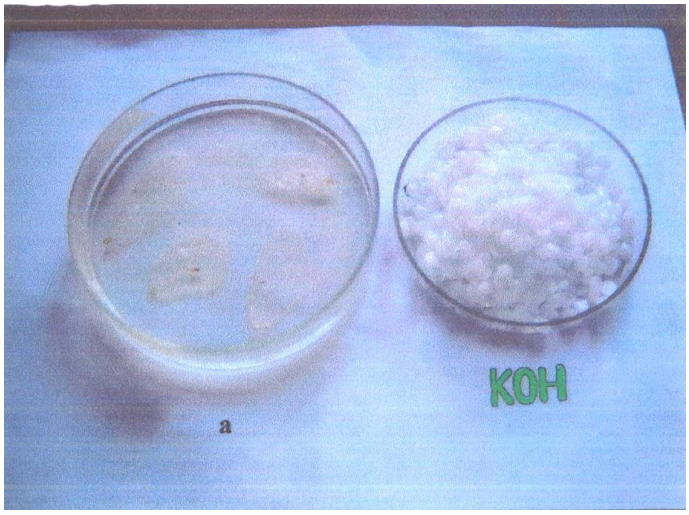


Plate I

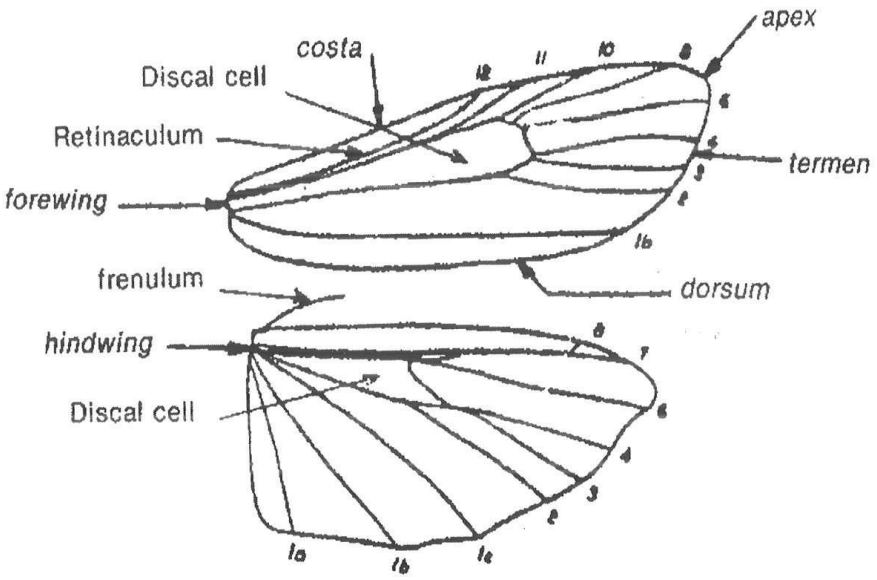


Fig. 2 General wing venation of a butterfly species

Names of Wing Venation

Costa (C)	The leading edge of the wing
Subcosta (Sc)	Second longitudinal vein (behind the costa), typically Unbranched
Radius (R)	Third langitudind vein, *one to five* brances reach the wing Margin
Media (M)	Fourth longitudinal vein, *one to four* brances reach the wing Margin
Cubitus (Cu)	Fifth longitudinal vein, *one to three* brances reach the wing Margin
Anal veins(A_1, A_2, A_3)	Unbranched veins behind the cubitus

Names of Crossveins are based on their position relative to longitudinal veins

C-Sc	Crossveins run between the costa and subcostal
r	Crossveins run between adjacent branches of the radius
r-m	Crossveins run between the radius and media
m-cu	Crossveins run between the media and cubitus
Frenulum	Bristle near base of hind wing that holds and hind wings together
Hamuli	Tiny hooks on a hind wing that hold front and hind wings Together

Results

A total of four species and four genera of butterflies around Pyay University Campus belonging to four families of Lepidoptera (Sub-order-Rhopalocera) were collected and recorded from the study sites. 10-20 individuals (male and female) of one species, one genus catched in one family.

Although wing venation of butterfly species are fundamentally similar to each other, these venations are slightly different between the families, wing venations of studied families are described in Plate II to Plate VIII and Table 1 to 4 (Fig. 3,4). Wing venation of *Papilio memnon agenor* wings very variable in shape male and female (Plate. II, III).

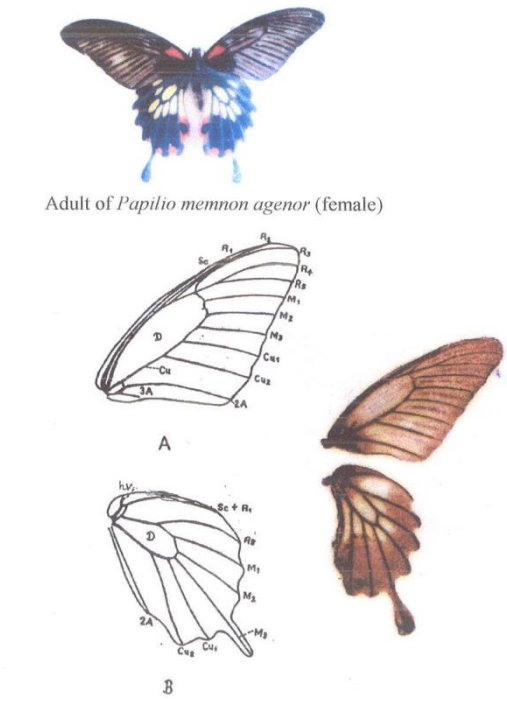


Plate II. Wing venation of *Papilio memnon agenor* (female)

Adult of *Papilio memnon agenor* (male)

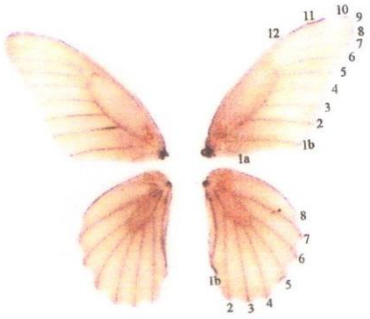
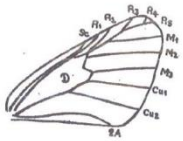


Plate III. Wing venation of *Papilio memnon agenor* (male)

Adult of *Eurema hecabe* (male)



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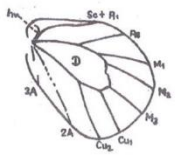

B

Plate IV. Wing venation of *Eurema hecabe* (male)

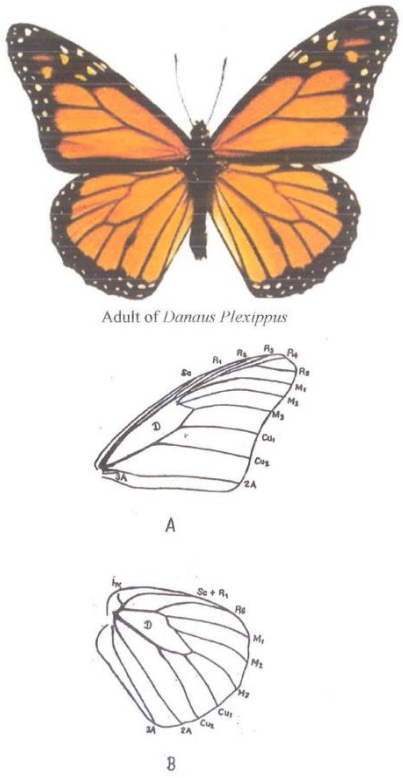

Plate V. Wing venation of *Danaus Plexippus*

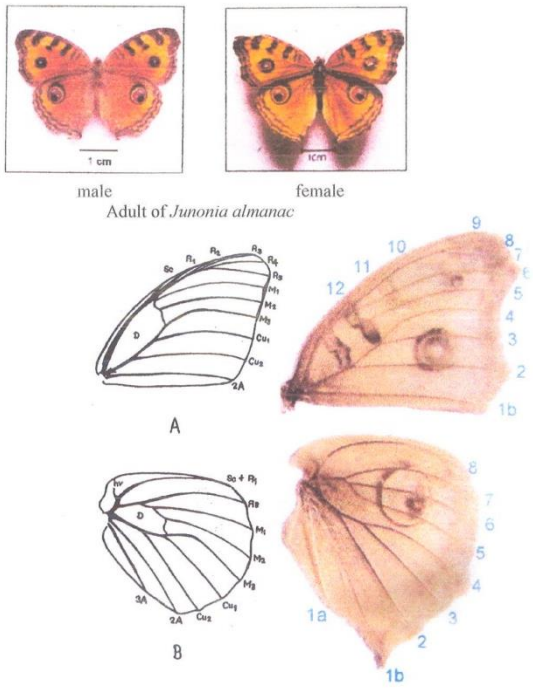

Plate VI. Wing venation of *Junonia almanac*


(A) *Ariadne Ariadne* (B) *Cethosia cyane*


(B) Junonia almana (D) *Junonia lemonias*

Plate VII. Butterfly species of subfamily Nymphalinae


(A) *Danaus chrysippus* (B) *Danaus genutia*


(B) *Tirumala limniace* (D) *Euploea core*


(E) *Melanitis leda* (F) *Acraea terpsicore*

Plate VIII. Butterfly species of subfamilies Danainae, Satyrinae and Acraeinae

Table.1 Distinctive characters of wing venation family Papillionidae

Species	Wings	Distinctive Characters
Papilio Memnon agenor	Fore wings	Triangular; costa widely arched, termen straight, oblique and slightly concave below apex, dorsum straight, apex widely rounded, Tomus rounded; discal cell closed, more than half the length of wing; veins R_4 and R_5 on a stalk, vein R_3 from the upper angle of cell. Vein 2A present. Vein R_2 and R_1 free from the cell – (12 veins)
	Hind wings	Very frequently with a tail, which may be slender or broad, but is always an extension of termen at vein M_3, vein 3A is absent. A precostal cell and a precostal vein are both present. The dorsal margin is frequently folded over. Costa arched, dorsum straight apex acute, vein 2A absent except female.

Table 2 Distinctive characters of wing venation in family Pieridae

Species	Wings	Distinctive Characters
Eurema hecabe	Fore wings	Triangular, costa arched, termen straight, tornus rounded, discal cell closed not quite half of the length of wing, both incurved vein R_1, R_2, and R_3- short, on a stalk, the stalk long, vein M1 from the Stem of R_5, R_4 and R_3 – vein R_2 from just before upper open of cell.
	Hind wings	Broad, broadly oval, costa arched, apex and termen continuous and strongly arched, dorsum broadly arched, tromus obtusely angular, the angle distinct, discal cell closed, broal at apex vein 3A present, precostal vein absent.

Table 3. Distinctive characters of wing venation family Danaidae

Species	Wings	Distinctive Characters
Danaus plexippus	Fore wings	Triangular, costa widely arched, termen below apex straightly Concave, dorsum straight apex broadly rounded, tornus rounded, distal cell closed, vein 1A forked at base, vein R5 and R3 on a stalk, vein R2 and R1 free.
	Hind wings	Pear-shaped; costa slightly arched, termen arched, dorsum straight, Tornus rounded, discal cell closed, long, more than half length of wing, lower bent at an angle, vein Cu always from before lower apex of cell, vein 3A present, precostal spur present.

Table 4. Distinctive characters of wing venation in family Nymphalidae

Species	Wings	Distinctive Characters
Junonia almanac	Fore wings	Vein twelve in number, vein Cu2, Cu1 and M3 arise from medium vein, vein M2 and M1 arise from the point of junction of the disco cellular, subcostal vein and its continuation beyond apex of cell is R2; vein R4 and R3 arise from vein R5, vein R2 and R1 free, vein 2A simple.
	Hind wings	Dorsal margin of hind wing channeled to receive the abdomen, vein 3A and precostal vein present. Discal cell in hind wing open.

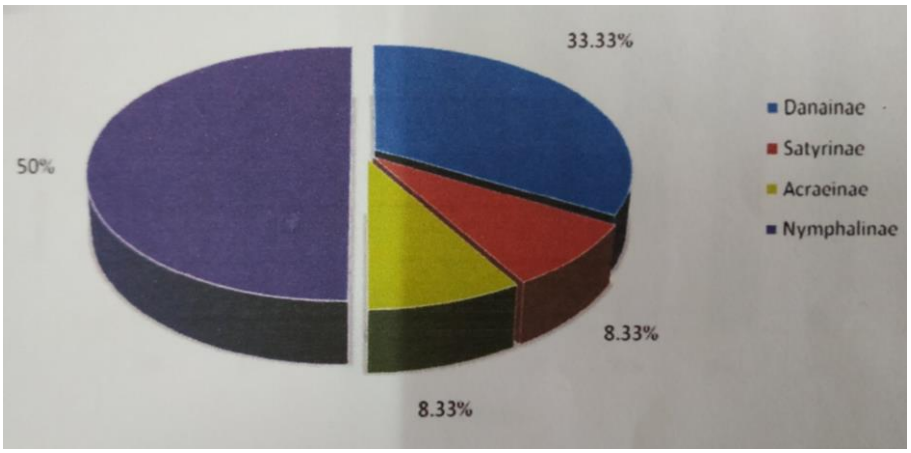

Fig. 3 Composition of butterfly species in four subfamilies of family

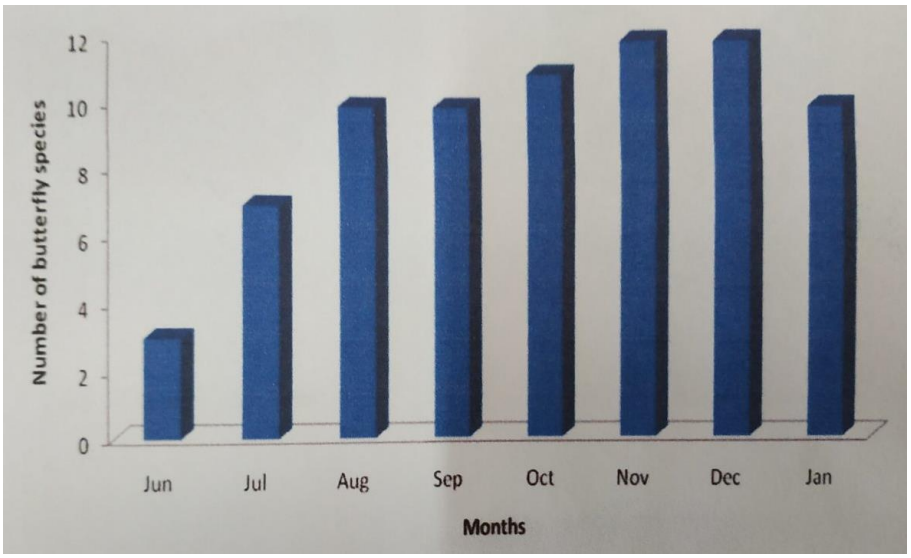

Fig. 4 Monthly occurrence of butterfly species in shwebontha environs, Pyay Twonship

Discussion

Butterflies belong to several related families of the insect order Lepidoptera, which are similar in their morphology, lifecycle, habits, and ecology. The insect order Lepidoptera having scaled wings includes butterflies, Rhopalocera and moths, and Heterocera. Butterflies fly by day and moths fly by night. Cowley and Gaston (2001).

The wing venation in the order. Lepidoptera is relatively simple. Veins indicated by dotted lines are atrophied or lost in some groups. The vein may fuse in various ways in the Rhopalocera and this fusing is used in the key. According to Carter (1992), Carter (1992), the principal characteristics used in separating families of Lepidoptera are those of wing venation.

The wing patterns and colouration of the two forms differ, even though the same specie were found in this study. The sexes show differences not only in the shape of the wings but also in the wing pattern and colouration were observed in family Papilionidae; wing venation pattern of *Papilio* memnon species (male and female) are quite dissimilar. Wing scales and the posterior edges of the hind wings tapering into narrow strips are referred to as swallowtails. Wings are very variable in the shape of the family *Papilionidae* and the wing venation is more variable in the forewing of family *Pieridae*. The *Nymphalidae* is a dominant family of butterflies in all Lepidoptera with beautiful colour patterns. The cell of both fore and hind wings closed, and terminal margins of wings never caudate was observed in family Danaidae. Corbet and Pendlebury (1992) described the key to identification including wing venations of butterflies in Malay Peninsula. The finding of Corbet and Pendlebury (1992) supported the present study.

Conclusion

Wing venation of forewings in four families of order Lepidoptera is variable of taxonomic characteristics. Veins R_4 and R_5 appear from one stalk of the discal cell in family Papilionidae. But dissimilar patterns were found in the family Pieridae; Vein R_1, R_2 and R_3 arise from one stalk of cell and different forms of forewings. The forewing venation pattern of family Danaidae and Nymphalidae are similar characters. Vein R_3, R_4 and R_5 out branches of only a stalk in forewing of Nymphalidae family. Forewings Venation patterns of three families (Papilionidae, Danaidae, Nymphalidae) were also observed as the same forms of cells.

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