TRAVELING INTO THE WORLD OF BUTTERFLIES AND MOTHS: PART III

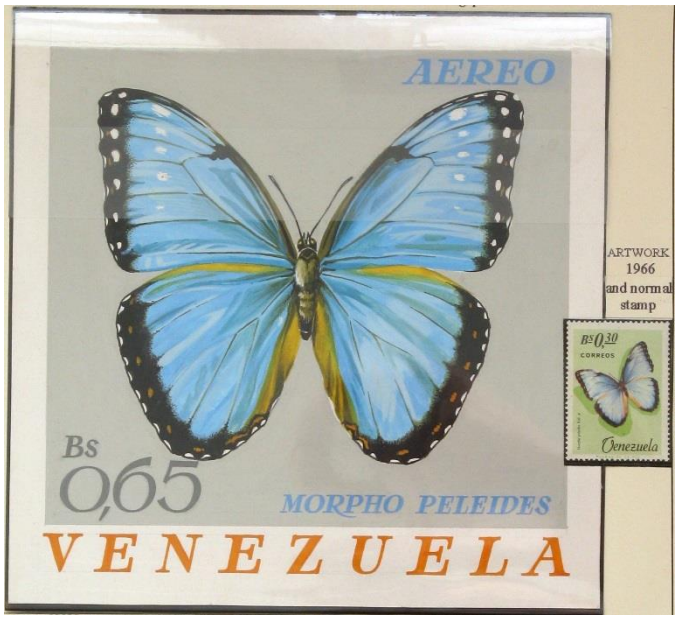
Vladimir Kachan, Belarus

[*Ed. Note: This article is the third in a four-part series on the study and science of Lepidoptera by Vladimir Kachan from Belarus. The first installment appeared in Volume 63, Number 3, and the second installment in Volume 63, Number 4. Readers can contact the author via email at:* vladimirkachan@mail.ru, *or post at: P.O. Box-36, BY-220089, Minsk-89, Republic of Belarus.*]

3. Biological Peculiarities of Butterflies and Moths

BUTTERFLIES

Butterflies are most remarkable insects, brightening up the landscape on sunny summer days. Thanks to their bright coloring and the variety of wing patterns they have been a favorite object of collectors and of scientific study for several centuries. Distinctive peculiarities of butterflies are club-shaped antennae, wings laid together vertically over the body in the state of rest, and daytime flight.



Morpho helenor peleides
Venezuela Sc#890
preliminary artwork & issued stamp

The coloring of butterflies has a heat regulating purpose. The butterflies with light coloring keep in well-lit places: in the crowns of the trees, on the edge of forests, or on the sand at river banks. Butterflies with dark coloring (brown or black) in most cases fly in the shade. The wings of tropical butterflies are covered with optical scales. Because they are exposed to the direct rays of the sun, their shiny metallic coverings reflect the rays and serve as protection from excessive over-heating. Some butterflies of the family Morphidae inhabiting the forests of tropical America, have their upper sides of wings colored in blue and dark blue strongly playing metallic colors. During the daytime, each wing flap can be seen up to a distance of one third of a kilometer.

[*Ed. note: The apparent blue color of the upper wings is not due to pigmentation, but to the structure of the wings scales that refract the sunlight in the blue spectrum.*]

The biological purpose of bright, motley colors on the upper side of the wings is the distinguishing of individuals of different species from long distances (males and females attract each other by their colorings).

An imperfect respiratory system limits the size of butterflies. The colorless blood of butterflies cannot carry oxygen, the flow of which to their organs depends only on diffusion. That is why the biggest butterflies live in the tropics. Queen Alexandra's Birdwing (*Ornithoptera alexandrae*) inhabiting the tropical jungles of Papua New Guinea is one of the largest, most beautiful, and rare butterflies in the world. The wing-span of a female may be more than 28 centimeters (cm), and that of a male about 16 cm.

Ornithoptera alexandrae
Papua Sc#1043

Papilio antimachus
Central Africa Sc#253

The African Giant Swallowtail (*Papilio antimachus*) is the largest one in Africa and has a wingspan about 23 cm.

Practical aspects of butterflies is that they immediately react to changes of existing conditions, and one can judge about the results of human activities and about our influence on nature by changes in butterfly distribution and numbers.

MOTHS

The distinctive peculiarities of moths are that they have pale wing coloring and in the state of rest their wings are put in a roof-shape. Mainly they fly at twilight and at night. Moths fly to the light. They use the light of the sun and the moon for orientation during flight. In flight, they follow a rectilinear course and try to keep the rays of a distant luminary at an angle of eighty degrees. When confused by a ground light source, they fly in narrowing spiral turns, which often causes them to perish. That is why some nature reserves do not allow the use outside electric lights during warm seasons. In addition, the use of street lights with intensive ultra-violet radiation is undesirable and especially their use away from settlements.

Actias luna
Belgium Sc#B879

Males of moths and crepuscular butterflies share certain peculiarities. Their fern-like antennas are dotted with sensory cells, the organs of sense of smell. Females attract males by secreting special scent. The only function of a mature male during his short life is to find a female by this scent and to mate with her. For instance, the males of the Saturniidae family have such a developed sense of smell that they can find a female at a kilometer distance. The German chemist Adolf Butenandt studying silkworms determined that the female can attract the male from a distance of 11 kilometers.

Attacus atlas
Ryukyu Is. Sc#57

Among moths there are record setters in length of wings. The moths of family Tineidae, Geometridae, and Pyralidae have a wingspan from several millimeters to 30 centimeters. The Atlas Moth (*Attacus atlas*) with a wingspan of 25 cm is a representative of Asia.

Deilephila elpenor
Bhutan Sc#1143o

The moths of the family Sphingidae stand out with their unusual way of feeding. The moth does not land on a flower, but hangs over it like a helicopter and sucks nectar, stretching out its long proboscis. These moths are excellent fliers. They can cover hundreds of kilometers, and moreover their working wing muscles radiate considerable heat. During movement, the temperature of a flying moth can reach forty degrees Celsius (104°F).

PROTECTIVE PROPERTIES OF BUTTERFLIES AND MOTHS

In the process of evolution, different species of butterflies and moths gained specific attributes, which serve as a defense from enemies.

Butterflies usually have upper sides of wings colored in bright colors while lower sides imitate coloring and texture of bark and leaves and so on. For example, the butterflies of genus *Kallima* look like dry leaves. Because of their wing shape, venation, and color, these butterflies resting on a branch with their wings put together are difficult to distinguish from a leaf.

Kallima inachus
Vietnam Sc#1315

The butterflies of families Heliconidae and Danaidae and moths of family Zygaenidae are colored in contrast colors, but they are poisonous. This means that at the threat of an assault they secrete a liquid and strong frightening smell, which protects them from insectivores.

Noctua teixeirai
Madeira Sc#199

The butterflies of family Satyridae have brown and grey wings decorated with small eyes-looking spots. This is a specific biological application of butterflies, the function of which is to draw a predator's attention from vitally important parts of body and especially from the head.

Many moths of family Sphingidae, Arctiidae, and Noctuidae have their peculiar wing coloring, combining in it protective and demonstrative elements. The upper side of wings is a pale color with zigzag lines, hind wings have bright color on their upper sides. A moth sitting on a tree is barely noticeable, but when it is disturbed it spreads its forewings to the sides, showing its bright hind wings (or eye-like spots). The unexpected appearance of the bright signal frightens off enemies, usually birds.

A resting butterfly of species *Polygonia c-album* is unnoticeable by predators owing to the wrong angular outline of wings. The butterfly *Parnassius apollo* usually is not touched by birds. It warn them about its "inedibility" by falling to the ground, stretching its wings to display red spots, and scraping its body against the lower sides of leaves, making a hissing sound.

Polygonia c-album
Marshall Is. Sc#598l

Inachis io
Gr. Britain Sc#943

The butterfly *Inachis io* and some other butterflies of family Nymphalidae have eyelike spots on spread wings. It is supposed that the designs resembling the eyes of birds of prey can raise an immediate frightening reflex and stop an enemy's action.

The butterflies of family Lycaenidae always sit on plants with their head downwards and two wing appendixes stick up resembling antennae. It disorients birds. The butterflies of species *Caligo*, inhabiting the tropical forests of the Amazon, are known as very skillful fliers, able to avoid pursuing birds.

There are butterflies lacking in any protective properties that imitate inedible butterflies with their wing shape, colorings, and behavior. The African butterfly *Papilio dardanus* imitates the poisonous butterfly *Amauris niavius*. The edible *Hypolimnas misippus* imitates the inedible *Danaus chrysippus*.

Danaus chrysippus
Botswana Sc#357
(even the designer was confused)

H. misippus
Jamaica Sc#426

In the tropical forests of South America there are the butterflies that have lost their scaly covering, and their wings are almost completely transparent. Only the hind wings display eyes that are typical for this family. When such a butterfly is on the crown of a tree, it is quite unnoticeable because the design of a leaf on which it sits appears through its glassy wings.

Cithaerias aurorina
Brazil Sc#1620

The moths of some families resemble bees and wasps that birds avoid.

Syntomeida epilais
Guinea Sc#636