



3. Observations on Mimicry in Bornean Insects.

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The following paper is an abstract of results obtained by Mr. R. Shelford, B.A., Curator of the Sarawak Museum, British North Borneo. The vast majority of his observations were made at or near Kuching, the capital of Sarawak; a few, however, in Singapore. When no locality is mentioned, Sarawak is to be understood. The observations form a very important addition to our knowledge of mimicry in Malayan insects, especially the Coleoptera.

Among Lepidoptera an *Elymnias*, believed to be a new species from Mount Penrissen, is a tolerable mimic of the well-known *Euplœa*, *Tronga crameri*. Among the Chalcosid moths, three species of *Isbarta* mimicked two of *Euplœa* and one of *Pierina* (*Delias cathara*). The latter is of considerable interest, inasmuch as the Pierine model appears to be excessively rare. There can be little doubt, however, as to the true relationship, for another species of the same genus, *I. pandemia*, is a magnificent mimic of another species of *Delias* (*D. pandemia*), both coming from Mount Kina Balu in North Borneo.

In the Neuroptera the Mantispides are shown to be mimics, a splendid new species (*M. simulatrix*, McLachlan) resembling a common Bracon flying with it on Mount Matang, near Kuching, while a small species from Singapore (*M. ? cora*) exactly mimicked an ichneumon flying with it.

It is in the Bornean Coleoptera, and especially the Longicornia, that by far the largest additions to the subject of mimicry have been made. Many Longicorn species, chiefly of the genus *Oberœa*, were excellent mimics of the *Braconidae*, and perhaps other Hymenoptera. The long narrow form of the beetle resembled the *Bracon* at rest with wings folded. As seen from the side, certain species of *Oberœa*, notwithstanding their uniform diameter, were apparently 'waisted' like a Hymenopterous insect, the effect being due to a conspicuous white patch on the side of the anterior abdominal segments. The part of the body thus covered is obliterated, while the outline of the patch is such that the uncovered, and therefore conspicuous, part of the body conforms to the shape of a slender 'waist,' from the posterior end of which the abdomen gradually swells. The effect in one species is as perfect as if an artist had deliberately painted the profile of a Hymenopterous abdomen upon that of a beetle. Among other examples of the same form of mimicry was a magnificent Cerambycid from Mount Penrissen (*Nothopeus* or n. gen., n. sp.), a beautiful mimic of the abundant wasp, *Salix sericosoma*, which flew with it. The common Damar Bee (*Trigona apicalis*), which does not sting, but is formidable because of its bite, is the centre of a group of three species with the most remote affinities. Not only is there a Longicorn, *Epania singaporensis*, but a *Bracon* and a Reduviid bug. The mimicry is probably Müllerian in most, if not all, of the species of this group.

Another important set of Longicorns, species of *Entelopes*, *Tropimetopa*, *Chreonoma*, and *Astathes* were extremely perfect mimics of Phytophaga (*Galerucide*). In one large group both models and mimics were reddish brown, in another iridescent blue-black, in a third anteriorly blue-black, posteriorly reddish brown. Another species of *Entelopes* (*E. glauca*) resembled a common Coccinellid (*Caria dilatata*), a Cassid also falling into the group.

The *Lycide* were models for Longicorns and other insects in Borneo no less than in South Africa. Species belonging to the Longicorn genera *Erythrus*

Ephies, *Xyaste*, and *Eurycephalus* mimicked Lycids with remarkable accuracy. In the last-named genus one species, *E. lundii*, was a mimic, while another closely related (*E. cardinalis*) exhibited a warning coloration of the most startling character, an indication that the genus is distasteful and the mimicry Müllerian. In addition to these, the Lycids were mimicked by a Clerid beetle, by numerous Hemiptera and a Zygaenid moth, the latter from Singapore.

The resemblance of certain Longicorns to the Rhynchophora was far more evident than in South Africa, for not only was there a mimic (*Trachystola granulata*) of a Curculionid (*Sipalus granulatus*), but there were species belonging to no less than four genera mimetic of the *Brenthidæ*. These latter mimics hold their long antennæ extended forwards side by side, the tips only, or in some species the anterior halves, diverging. Thus the rostrum of the *Brenthid*, together with its usually short antennæ, are represented by the long antennæ of the Longicorn. The *Anthribidæ* were mimicked by Longicorns of the genera *Ereis* and *Cacia*.

A feature of both Rhynchophorous models and their mimics, and one very unusual in mimicry, is the inconspicuous mottled colouring and the absence of strongly contrasted tints.

A very interesting Longicorn mimic of an Endomychid beetle (*Spathomeles* sp. near *turritus*) was a rare species of *Zelota* as yet undescribed. The curved spine on the elytron of the model was represented by a brush of hairs on that of its mimic. Experiments indicated that the *Endomychidæ* as a group were distasteful, and large synaposematic sets of purplish black, yellow or orange spotted species were found near Kuching together with several species of *Erotylidæ* and a Pentatomid bug with the same general appearance. Another group of dark Endomychids was rendered conspicuous by numerous spines (*Amphisternus*).

Two groups of Longicorns were mimicked by other Longicorns belonging to entirely different sections. The iridescent green *Cerambycidæ* of the genus *Chloridolum* were closely resembled by two *Lamidæ* (*Saperdinæ*? genus, and *Chlorisanis viridis*) and by the Cerambycid genera *Xystrocera*, *Psalanta*, and *Leptura*. Many genera and species of the banded Cerambycid *Clytinæ* were very closely mimicked by *Lamidæ* and other *Cerambycidæ*. This last case is of peculiar interest, inasmuch as the *Clytinæ* are themselves perhaps the most conspicuous mimics of Hymenoptera to be found in the whole of the Longicornia. All over the world their numerous species commonly present a black yellow-banded appearance bearing a general resemblance to wasps, while mimicry of *Mutillidæ*, *Cicindelidæ*, and, in the allied *Tillomorphinæ*, of ants is also found. When, therefore, we also find that this group itself furnishes numerous models to other Longicorns we are driven to conclude that it is in some way specially defended, and that its resemblance to Hymenoptera is Müllerian rather than Batesian.

The mimetic resemblance to the aggressive and active *Cicindelidæ* was very marked, examples being afforded not only by Longicorn beetles of the genera *Sclethrus* and *Collyrodes*, but also by a Dipterous insect found flying together with its model (*Collyris emarginata*) on Mount Seramba, December 1898. This is the first example of the mimetic resemblance of a fly to a tiger beetle. The remarkable Locustid mimic *Condylodera tricondyloides* (or a closely allied species) described by Professor Westwood from Java was also rediscovered in Borneo, and its habits for the first time observed.

Indirect evidence that the mimicry of *Cleridæ* is Müllerian rather than Batesian is similar to that which pointed to the same conclusion in the Longicorn *Clytinæ*. One Bornean species of a Clerid genus (*Thanasimus*) resembled a Mutillid, another (genus near *Tenerus*) a Lycid, while a third, a species of *Lemidia*, was mimicked by the Longicorn *Daphisia pulchella*.

Among the Diptera a splendid black *Hypercheia* (*H. fera*) was a beautiful mimic of the abundant *Xylocopa latipes*, another example of parallelism with South African bionomics. An allied species, *Laphria* sp. near *Terminalis*, was an excellent mimic of *Salius aurosericeus*. Dipterous mimics of Hymenoptera are extremely abundant in Borneo: remarkable among them was a species which mimicked an ichneumon of the genus *Mesosternus*. The short antennæ of the

fly in no way resembled the very long black and white ones of the ichneumon. The fly, however, held up its black and white legs, applying their bases to its head and moving them so that they closely resembled the antennæ of the Hymenopterous insect in movement as well as in colouring and proportions. Another species of fly possessed true antennæ which were remarkably long for this order and thus closely resembled those of an ichneumon.

With few exceptions, the whole of the material here briefly described may be seen in the Hope Department of Zoology, Oxford University Museum.

