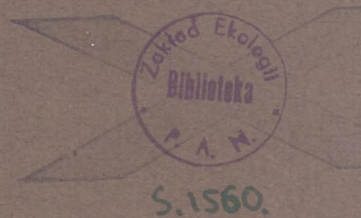
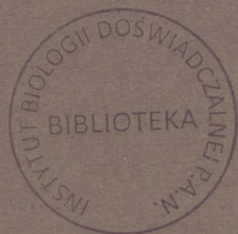

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Mimicry in the North American Butterflies of the Genus *Limenitis*.

By Prof. E. B. POULTON, F.R.S., F.L.S. Read October 23rd, 1913.

(The paper of which an abstract is given below was illustrated by numerous lantern slides.)

The models *Danaida plexippus (archippus)*, *D. berenice* and *D. strigosa* belong to the old world Danaines, and are to be regarded as modern invaders of the American Continent. *D. plexippus* probably came in by way of the north, and it even now ranges far into Canada. It is to be looked upon as the American equivalent of the old world *D. genútia (plexippus)* which may probably have extended north along the eastern Asiatic coast, and crossed at Behring Strait during some temporary amelioration of climate. That it invaded America by way of the north is well shown by the fact that it has produced an excellent mimic in temperate North America only. It ranges with slightly varying pattern through tropical America to the temperate south, but nowhere has it produced an undoubted mimic except in the north.¹ The other two Danaine forms, *D. berenice* and *D. strigosa*, are the New World representatives of *D. chrysippus*. These are less suited to a cold climate, and are only found in the southern States. They also may have invaded America by way of the north—although considerable amelioration would here be required—or it is possible that they were accidental immigrants across the Pacific. They are probably not distinct species, but geographical races the one of the other, and, like *plexippus*, extend southward through tropical America with slight changes of pattern. They also resemble *plexippus* in the fact that they have undoubted mimics in North America only.

The Nymphaline *Limenitis*, or as its North American forms are called *Basilarchia*, is a characteristic circumpolar group, of which the majority of forms in both the Old World and the New, possess the well-known pattern made up of broad white markings upon a black background. A good example is our English *sibylla*, and the European *camilla*, and a very similar pattern is found in the North American *arthemis* and *weidermeyeri*, as also in *lorquini*, although here the pale part of the pattern is cream coloured.

¹ It is possible that there is an incipient mimic among the South American *Acræinæ* of the genus *Actinote*.

According to the theory of mimicry as due to the influence of environment, we should expect that the Old World invaders when they entered North America, would have acquired a North American pattern. We find, however, that they retain the characteristic appearance of an Old World group of Danaines, and that they impress this pattern upon the ancient North American genus *Limenitis*, producing admirable mimics. The facts are, therefore, the reverse of what we should expect on the theory of mimicry as a direct result of geographical conditions.

If the mimetic pattern of *Limenitis archippus* be compared with that of the ancestral forms of the genus, it will be seen that those parts of the old markings that were available for the purpose, have been retained and worked up into the mimetic resemblance, while other parts that would interfere have been removed. A single element in the old pattern which interferes with the resemblance has been retained, namely, the black line crossing both the upper and lower surfaces of the hindwing. This line is clearly the black outer border of the old white band of the genus, and traces of white may still be found clinging to its inner border on the under surface of many specimens. It is extremely interesting to find that in the Hudson River district the black line has disappeared from the upper surface of the hindwing in a large proportion of the males, while others show a transition.

In Florida the model *D. plexippus* exists side by side with *D. berenice*, but the latter is far commoner, and influences *L. archippus* more strongly, so that the mimic here gains the rich chestnut-brown colour of *berenice*, and is known as the local form *floridensis* (*eros*). There can be little doubt that *floridensis* is merely a geographical race of *archippus*, and it would be extremely interesting to ascertain whether the two combine to form an interbreeding community along the line of their overlap. That *floridensis* has been produced by the transformation of *archippus* is proved by the fact that the old *archippus* pattern, with its heavily marked veins, can still be detected beneath the rich deep ground-colour, although it tends to interfere with the resemblance to the new model *berenice*. The blackened veins of the upper surface are to be looked upon as a persistent vestige of an older mimetic resemblance.

In Arizona we meet with the still more interesting mimic *Limenitis hulsti*, or *obsoleta*, resembling the local Danaine, *D. strigosa*. I have recently had an opportunity for studying a long series of this mimic, and find that its pattern is certainly more ancestral than that of *archippus* and *floridensis*. It retains persistent vestiges of the old white band on both surfaces of the hindwing, and more evident traces of the same feature are retained by the forewing than in the other two forms. The most interesting vestige is a short white stripe which represents the inner marginal termination of the old white band on the upper surface of the forewing.

Mr. H. Eltringham has kindly made preparations of the male armature of these three forms of *Limenitis*, together with those of the ancestral North American species of the genus; and the comparison of these organs entirely supports the conclusions drawn from a study of the patterns. The form of armature in *archippus* resembles that of *floridensis*, while the armature of *hulsti* is transitional between these two and the ancestral forms *arthemis* and *weidermeyeri*. A full account of the relationship between these North American species of *Limenitis* has been recently communicated to the Academy of Natural Sciences of Philadelphia, and it is hoped that reproductions of Mr. Eltringham's drawings will appear in the publications of the Society.

With regard to *L. lorquini*, it is probable that mimicry has proceeded in another direction, and that the cream colour of the pale markings and the bright fulvous tip of the forewing have been produced in mimicry of *Adelpha* (*Heterochroa*) *californica*, the single northern representative of a large tropical American group. That the bright fulvous tip has been produced by mimicry, is supported by the fact that it tends to decrease in British Columbia and Vancouver's Island, well to the north of the geographical range of the model, as shown in Plate XXV. of "Trans. Ent. Soc.," London, 1908.



