

LETTERS TO THE EDITOR.

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Butterfly Migration in Relation to Mimicry.

THE last paragraph in Prof. Poulton's letter in NATURE of JUNE 13, referring to Mr. Swynnerton's experience that adult birds possess "a very fair knowledge of the main types of pattern and relative edibility of the local butterflies," reminds me of the only occasion on which I have seen a butterfly attacked by a bird during five years' observation in this district.

While walking in the observatory compound my attention was attracted by a Lycaenid butterfly of an unfamiliar species, probably a migrant from a much lower elevation (the observatory is situated in the Palni Hills at an altitude of 7700 ft. above sea-level). I was watching the mazy flight of the insect in the expectation that it would settle, when I noticed a shrike sitting on a post near by, also observing it attentively. He evidently had a fair knowledge of the local butterflies, and considered this to be something new and worth eating, for he suddenly jumped from his perch and very cleverly caught the butterfly on the wing, a surprising feat for a bird having a rather clumsy build and heavy flight. Apparently he swallowed the insect entire, for I could discover no wings at the spot afterwards.

The general immunity of butterflies and day-flying moths from attack by insectivorous birds is as strikingly evident here as it is in England or America, and seems a serious difficulty in the way of accepting the Batesian theory of mimicry. Not only do the birds of this district pay no attention to the common butterflies, but the latter seem to despise the former. I have even seen a small bird frequenting the bracken of the uplands chased for a considerable distance by the vigorous and somewhat aggressive *Argynnis castetsi*!

In contrast with this immunity I have found that nocturnal moths, if forced to take long flights during the daytime, are very liable to attack, and in these circumstances stand a very poor chance indeed of reaching a haven of refuge. The watchful birds seem ever on the alert to snap up strangers.

It would seem, then, that unfamiliar lepidoptera are much more liable to attack than the common everyday kinds. May it not be that the real danger to a species occurs during migrations, and that mimetic resemblances may afford a real protection during such flights? In entering a new district a mimetic species would be immune from attack if the birds were familiar with the model, even if the latter were not unpalatable, while, on the other hand, unpalatable species migrating would be liable to attack if unfamiliar to the local birds.

In this district annual migrations occur across the Palnis during October and November of a considerable number of species from the plains, including the following mimics and models:—*Hypolimnas bolina*, *H. misippus*, *Euploea core*, *Danais plexippus*, *D. septentrionis*, *D. limniace*, *Papilio polytes*, *P. hector*. In these migrations it is noticeable that the mimetic species, *H. bolina* and *H. misippus*, are very liable to have torn wings, suggesting attack by birds, and it appears that the models as well as mimics are also sometimes attacked. An instance has been recorded by H. Leslie Andrewes (Journal of the Bombay Natural History Society, xx., 850), who found evidence of systematic onslaught by King crows (*Dicrurus*) on

Danaids and Euploëas, also *H. bolina* ♀ and *Catopsilia crocale*. This was near Ootacamund in the Nilgiris in October. All the species mentioned by him are migrants from the plains, and I believe do not normally inhabit the Nilgiri plateau, although commonly seen at that particular season. There is a significant absence in the list of the very abundant and indigenous *D. nilgiriensis*, which would be well known to the local birds.

P. hector (the model of one form of *P. polytes* ♀) appears to be specially liable to attack when migrating across the Palnis, if one may assume that wings on the ground are good evidence of attack by birds.

This liability to attack of migrants passing over the Palnis or Nilgiris appears, however, not of much significance when large areas are considered. A mimic such as *H. misippus* ♀ possesses, so to speak, a passport over the whole of the plains of India, Persia, Arabia, &c., owing to its close resemblance to the very abundant and widely distributed plains butterfly *D. chrysippus*. The facility thus afforded for dispersal would surely be an important factor in the life of the race.

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Kodaikanal Observatory, South India, July 9.

Parallel Mutations in *Oenothera biennis*.

IN a culture of a particular strain of *O. biennis*, L., a series of forms has been observed which constitute a parallel series to the well-known mutants from *O. Lamarckiana*, Ser. *O. biennis*, unlike *O. Lamarckiana*, has small flowers and a short style, rendering the flowers rather strictly self-pollinating. The particular race in question I received from the Madrid Botanical Garden. It has typical *O. biennis* flowers, as mentioned above, but the foliage closely resembles that of *O. Lamarckiana*. These plants were grown, to the number of 131 this year, at the John Innes Horticultural Institution, Merton, in connection with my other *Oenothera* cultures, which number in all more than 10,000 individuals.

While in the majority of the plants in this culture the foliage resembles *O. Lamarckiana* or *O. rubrinervis*, several have leaves corresponding to the mutants, there being six *laevifolia*, one *lata*, and possibly one *gigas*. With larger cultures probably other mutant types will also be found. The peculiar characters of the *lata* foliage are even correlated with sterility of the anthers, as in the *lata* from *O. Lamarckiana*, though the flower otherwise is that of *O. biennis*.

Though the foliage characters of these *O. biennis* forms are not identical with those of the *Lamarckiana* mutants, yet they differ from each other in corresponding ways, and thus form a parallel series.

The interesting question as to the origin of this strain of *O. biennis* cannot be answered at the present time. Even if they originated through crossing (as seems probable), their flowers are now self-pollinating, so that each individual, with occasional exceptions, must represent a "pure line." The most probable assumption is that, as in the case of *O. Lamarckiana*, the aberrant forms all originated from one type having *Lamarckiana*-like foliage. Of the mutant types in this culture, the *O. biennis lata* at least has evidently taken its origin directly from one of the other types, since it produces no pollen. It has probably arisen through such irregularities in the distribution of chromosomes during the meiotic processes as I have described for the *O. Lamarckiana* series of forms, and the presumption is that some of the other mutant types have had a similar origin. This is in harmony with my hypothesis that the mutation phenomena in *O. Lamarckiana* are not due merely to hybrid splitting,