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FERTILISATION OF FLOWERS BY INSECTS*
VII.

Butterflies the most frequent visitors of Alpine flowers.

IN the following article I wish to recommend for further inquiry a subject of peculiar interest which, in the environs of the Ortler, in Tyrol, forced itself on my attention last summer, but which, during my short stay in the Alps (8—25 July), I had not time to investigate so thoroughly as it deserves. Whilst occupied, along with my son, in observing the Alpine flowers and their fertilisation by insects, we were struck with the very small number of Apidæ met with in higher Alpine (subnival) localities, and with the predominant part which butterflies play in this region in relation to the fertilisation of flowers. In the environs of "Piz Umbrail" and "Quarta Cantoniera," 3,000—2,400 metres above the sea-level, we observed only four humble bees, and not a single individual of any other genus of Apidæ during a sojourn of five days, and in spite of very fine weather, whilst numerous Coleoptera (Dasytes, Anthobium, Anthophagus), many Diptera (especially Muscidae and Syrphidæ), and very numerous specimens of some species of Lepidoptera were found in the flowers of this region.† Between 2,400 and 2,100 metres (descending towards Bormio and in the environs of Franzeshöh and Trafoi) the number and variety of Apidæ, other Hymenoptera, Coleoptera, and Diptera proved to be much greater; but, at the same time, the number and variety of Lepidoptera increased to such a degree that this order of insects was in unmistakable preponderance also in this region.‡ In the plain, near Lippstadt, on the contrary, and in the lower mountainous region of Sauerland, Thuringia, and Fichtelgebirge, Diptera, but more especially Apidæ, are the most frequent visitors of flowers,

although in the latter region a considerable increase in the proportion of Lepidoptera may be remarked.

Consulting our highest authority on the geographical distribution of butterflies in Germany and Switzerland, Dr. Speyer, of Rhoden, I heard that the fact alluded to would be in direct opposition to the general distribution of the species of Lepidoptera in altitude, the number continually decreasing from the lower mountainous to the higher Alpine (subnival) region; only the plain, as it seems, being somewhat poorer. This contradiction, however, may be, and, as I am convinced, from my observations, is, only an apparent one; for, notwithstanding the smaller number of species, the absolute frequency of Lepidopterous individuals, and perhaps also of species, is considerably greater in favourable Alpine localities than in equally large tracts of the lower mountains and of the plain, firstly in consequence of the smaller number of Alpine species distributed over a very restricted area; and secondly, because many of these species are represented in their restricted localities by a surprising number of individuals. Dr. Speyer himself writes me: "I have also myself been frequently struck with the great number, not only of individuals, but also of species, met with in favourable Alpine localities." Moreover, the relative frequency of butterflies, which alone is concerned in estimating their importance in the fertilisation of flowers, seems to be still greater than their absolute frequency in the higher Alpine (subnival) region; insects of other orders, with exception of the Diptera, apparently decreasing in a still larger ratio towards the snow-line. In order to appreciate adequately the differences of frequency alluded to and the share taken by butterflies in fertilising flowers in different regions, it would be necessary to ascertain the exact number of individuals of Lepidoptera and of other insects that visit certain flowers of the different regions in a given time. Unfortunately I have neglected such observations, and can only give some statistical data as to the number of species of Lepidoptera and other insects observed by myself to visit flowers in different regions. These data can afford but an approximate idea of the above differences, but they will, I hope, sufficiently show that these differences are by no means a product of my imagination, but a matter of fact, and that in Alpine regions Lepidoptera are really of considerably greater importance in relation to the fertilisation of flowers than in the plains.

There are some few species of flowers which I have had the opportunity of observing as to their visitors both in the plain or in the lower mountainous and in the Alpine region; these, of course, will be the most useful for comparison. For the sake of a more easy survey of the statistical notes I shall make use of the following abbreviations: *a* = in the plain, near Lippstadt; *b* = in the lower mountainous region of Sauerland, Thuringia, Fichtelgebirge; *c* = in the Alpine region, near Trafoi, Franzeshöh, Quarta Cantoniera; *Ap.* = Apidæ; *Lep.* = Lepidoptera; *O.I.* = other insects.

The following is a list of the visitors to different plants, so far as I have observed.

1. *Helianthemum vulgare* :—

b. Ap. 5, Lep. 1, O.I. 16 species; Ap. 23, Lep.* 5, O.I. 72 per cent.
c. †, " 1, " 7, " 3 " " 9, " 64, " 27 "

2. *Lotus corniculatus* :—

a. Ap. 19, Lep. 5, O.I. 2 species; Ap. 73, Lep. 19, O.I. 8 per cent.
b. " 17, " 7, " 2 " " 65, " 27, " 8 "
c. " 2, " 4, " 0 " " 33, " 66, " 0 "

3. *Prunella vulgaris* :—

a. Ap. 8, Lep. 4, O.I. 2 species; Ap. 66, Lep. 33, O.I. 0 per cent.
b. " 4, " 2, " 0 " " 66, " 33, " 0 "
c. " 1, " 4, " 1 " " 17, " 67, " 17 "

* It should be noticed that as the flowers of *Helianthemum vulgare* do not secrete honey, Lepidoptera must either obtain a little of the juices of the flowers by boring, or are altogether deceived.

† In the Alpine region my observations have been made on the *var. grandiflorum*.

* Continued from vol. x. p. 130.
‡ Rhopalocera: *Pieris callidice* Esp., *Lycaena orbitulus* Prunn., *L. semiargus* Rott., *Melitæa merope* Prunn., *M. parthenie* Bkh. var. varia. M. D., *Argynnis pales* W. V., *Erebia tyndarus* Esp. Geometræ: *Psodes alpinata* Scop., *Pygmaea fusca* Thbg. Crambina: *Hercyna schrankiana* Hoch. (*Holosericalis* H.), *H. porygialis* H., *H. rupestralis* H., *Crambus lactiferellus* H.—according to Dr. Speyer's determination.

† We found here Rhopalocera 33, Sphingidæ 4, Bombyces 5, Noctuæ 3, Geometræ 3, Crambina 6, Tineina 2, Pterophorina 1, altogether 57 species of Lepidoptera visiting flowers.