

in others is now almost exhausted is particularly worthy of attention, whatever its value. We know that innumerable species have become extinct in past ages, and have been followed by those which now furnish our collectors with their favorite occupation. We further know that within the memory of man many species, as for instance among birds the great auk and the dodo, have vanished, while others are even now crossing the threshold. Variations in climatic conditions, with consequent alteration of habitats, must account for the vast majority of changes in the terrestrial fauna. What percentage, if any, can be ascribed to an inherent lack of specific vitality appears to be a problem offering but little prospect of solution. Not being a lepidopterist I can merely offer a suggestion, or rather I will put a few queries, as to the sterility of the autumn-emerging females of the Sphingidae, a characteristic of some of our own species as well as of the European ones mentioned. Can we consider these autumn specimens as immature individuals, which, under exceptional conditions, attain the perfect form without a corresponding perfection of the generative organs? Had they the necessary vitality and ability to exist during the winter, and until the spring individuals (sexually mature) emerge, would the *ova* become developed? Does the appearance of such specimens after a hot and prolonged summer indicate descent from species which in more southern localities, or under different conditions of temperature in their present range, were double-brooded? A writer in "Science Gossip" some time ago recorded the occurrence in North India of species which are also taken in England, and stated that species which are single-brooded in the latter place are double-brooded in India, and also appear in great and often astonishing abundance. Among them is *Sphinx concolor*, which apparently is only a visitant of the British Isles, where it appears to be incapable of continuing the species owing to unfavorable climatic conditions. The last point brought forward in Mr. Bowles' instructive paper is the tendency of imported insects to supplant in some instances our native species and to cause them to become rarer. This is often due to the energetic measures taken to suppress the new comers, and which tend equally to thin out the native species which, although they have similar habits, are not so prolific or destructive as to rouse agriculturists to take up arms against them. The precautions taken

against *Pteris rapae* are equally effective against *Pteris oleracea*, and have doubtless tendered to its decrease in the districts invaded by the foreigner.

W. HAGUE HARRINGTON.

Ottawa, 5th April, 1883.

#### CAUSES OF RARITY IN SOME SPECIES OF INSECTS.

I have been much interested in an article by G. J. Bowles in *The Canadian Sportsman and Naturalist* for March, 1883, bearing the above title and although I can offer little towards the elucidation of the subject, yet I may attempt a few suggestions and facts which may not be uninteresting. For a convenience and purpose, I class them under the following heads:—

1. Drainage and cultivation.
2. Variations of seasons.
3. Migrations.
4. Holding over.
5. Occasional visitants.

1. The drainage and cultivation of land by destroying or causing a scarcity in the natural food plant or plants of any particular insect must of necessity make the species rare in that district, ultimately leading to their extinction, but on the other hand, cultivation may have the effect not only of producing other species in that district, but of almost changing its fauna. This according to Mr. Bowles' statement, is now in progress in the Gamin swamp near Quebec, in the case of *C. julia*, and the same effect is remarkable in the Lincolnshire and Cambridge-shire fens (England). In Yaxley fen and Whittlesea mere, where some years ago, *Papilio machaon* used to be taken in abundance and *Zuzera arundinis* commonly, but through the drainage and cultivation of the fens, those insects are now becoming scarce, while *Chrysophanes virgurea* and *C. dispar* have completely died out. On the other hand, cultivation and drainage have changed the fen flora, producing an insect fauna entirely dissimilar to their predecessors.

2. Climatic influences on the variations of seasons no doubt have a very great deal to do with the relative scarcity or abundance of insects, not so much, I am inclined to think, as to the warmth or coolness of the previous summer, as to the duration and regularity of the winter temperature. In seasons when the ground is covered with snow (as in the past winter) and as a consequence the temperature