Immigration of Insects into the British Isles

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ABOUT a hundred years ago, it was gradually dawning on British entomologists that many of the butterflies in this country might be immigrants from abroad. Among the species first suspected of this habit were the Clouded Yellow (*Colias croceus*) and the Pale Clouded Yellow (*C. hyale*). It is curious that about the same time a more practical controversy was commencing in the United States as to whether one of their most serious pests, the cotton worm (*Alabama argillacea*) was a permanent resident of that country, or not. To-day we know that not only these early disputed species, but also many other Lepidoptera, dragonflies, and some members of other groups of insects, regularly migrate, and that in a number of cases these movements come to an end in the British Isles, thus giving the insects in question the status of 'immigrants'.

In the study of migration it is possible to start from two points of view. We may study a single insect throughout the whole range of its migration. An example of this is seen in an account that I gave of the migration of the Painted Lady butterfly (*V. cardui*) in NATURE of April 11, 1925 (p. 535). This is, in my opinion, the most fruitful method of investigation. The alternative is to study the migration phenomena of all insects as seen within a limited area. By this method it is easier for a single investigator to take field observations, and easier to obtain the co-operation of voluntary helpers, but it must always be remembered that the results are only a group of incomplete phenomena, the basic causes of which must often be sought elsewhere.

Most insect migrations in temperate zones consist of movements in the spring from sub-tropical or warmer zones towards the cooler parts of the temperate zone with—sometimes at least—a return southward in the autumn. Since the British Isles are in the cool temperate zone, it follows that they will figure chiefly as an end point for spring migrations and perhaps, more rarely, as a starting point for autumn movements.

Among the insects which come into Great Britain in this way in the spring are to be reckoned about twelve of our sixty-six butterflies, about half our Hawk moths (Sphingidæ), quite a large number of other moths, including even some Tineidæ less than an inch across the wings; at least a dozen of our dragonflies, and an occasional errant locust. It may also be necessary to add to the list certain Coleoptera, Aphidæ and Syrphidæ (hover flies), which are occasionally washed up in great numbers on our shores after a storm, but at the moment the evidence is too fragmentary to distinguish between wilful migration and accidental distribution by wind.

Some of these species do not breed at all in Great Britain, some breed only during the summer and die out each winter, while others breed regularly and continuously here, but are reinforced at intervals from abroad. Some immigrants arrive regularly each year, while others come only at intervals of several years, or in very varying numbers. Many only invade our southern shores and the counties along the coast; others, especially in years of great abundance, may spread as far as the north of Scotland and the Orkney and Shetland Isles. Some cross the English Channel conspicuously by day in large bands, whilst others appear to cross by night or individually and have never been recorded actually during the movement.

Turning in more detail to what is known of some of the species: five of our immigrant butterflies, the Monarch (*D. plexippus*), the Camberwell Beauty (*V. antiopa*), the Bath White (*P. daplidicæ*), the Long Tailed Blue (*L. boeticus*) and the Queen of Spain Fritillary (*A. lathonia*) do not breed in Great Britain; the Clouded Yellow (*C. croceus*), the Pale Clouded Yellow (*C. hyale*), the Painted Lady (*V. cardui*) and the Red Admiral (*V. atalanta*) breed regularly during the summer but seldom, if ever, survive a winter; while the three Cabbage White butterflies (*Pieris brassicæ, rapæ* and *napi*) are regular residents as well as irregular immigrants.

Most of these butterflies come to us from the more southerly parts of Europe in the spring or early summer, but there are some exceptions to this rule. The swarms of Cabbage White butterflies appear to originate in the Baltic area and fly about midsummer southward through Germany and westward across the North Sea and the Netherlands. The Camberwell Beauty arrives almost exclusively in the autumn along our eastern shore, even as far north as Inverness, and probably comes from Scandinavia. The Monarch butterfly is unique in coming to us in the autumn from the west across the Atlantic. In the United States at that time of the year enormous flocks are migrating southward, and our immigrants are probably wanderers blown out of their path and helped across by the prevailing westerly winds.

Finally, the Painted Lady comes to us from the south, but there is reason to believe, as already pointed out in my earlier article in NATURE, that our immigrants may come from as far afield as North Africa, if not farther.

Among the Hawk moths, the Death's Head (*A. atropos*), the Oleander Hawk (*D. nereii*), the

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Silver-Striped (*C. livornica*), the Striped Hawk (*H. celerio*), the Convolvulus Hawk (*H. convolvuli*), the Bedstraw Hawk (*C. galii*), the Spurge Hawk (*C. euphorbiæ*) and the Humming-Bird Hawk (*M. stellatarum*) are all immigrants which do not normally survive the winter in Great Britain, though most of them may breed during the summer of immigration. The status of the Privet Hawk and the Pine Hawk is not definitely settled. All the immigrants come from the south, but practically nothing is known of their origin except that some most certainly reach their maximum abundance in early spring in North Africa.

Information about the smaller moths is scattered and uncertain. Definite immigrants include the Silver Y moth (*Plusia gamma*), the Rush Veneer (*Nemophila noctuella*), the Satin moth (*L. salicis*), the Crimson Speckled (*D. pulchella*) and many others. The Diamond Back moth (*P. maculipennis*), a small but serious pest of crucifers, is believed to cross the North Sea, while one of the most widely distributed pests of cotton, the American Boll Worm (*Heliothis armigera*), is a rare immigrant in Great Britain, where it boasts of the popular name of the "Scarce bordered Straw".

The British dragonflies include a dozen immigrants, all belonging to the Anisopteridæ. Some of these are only very rare wanderers; others, such as *Sympetrum fonscolombii*, *S. flaveolum* and *S. sanguineum*, are more regular immigrants, while *Libellula depressa*, *L. quadrimaculata* and *Aeschna grandis* breed here regularly and are also immigrants at times. No member of the family Zygopteridæ has yet been considered an immigrant in Great Britain.

Apart from the details of which insects migrate, when they migrate and where they start from, there are a number of general problems connected with this subject, chief among which is the question of a return flight or emigration in the autumn towards the south in those species which arrive from the south in the spring. Until recently, there was little evidence in support of this, and zoologists were inclined to think that insect migration was therefore fundamentally different from that of birds. However, little by little, evidence is accumulating that makes it seem that a return flight, at least of some species, does take place. Particularly is this so in the case of the Red Admiral butterfly (*V. atalanta*) for which we have now quite a number of records of small autumn movements to the south on our shores; while in the case of *V. cardui* an ornithologist has reported their arrival on several occasions on the North Egyptian coast at dawn, flying in from across the Mediterranean along with the migrating quail. It is important to recognise, in collecting evidence on this point, that a migration need not be a gregarious action, and we know of one butterfly, the Monarch of North America, which carries out a movement in one direction gregariously and in the reverse direction individually.

Other problems requiring solution, which can only be settled by long continued collection of facts, are the reasons why one or other sex (more often the male) should frequently predominate in a flight; or if there is any periodicity connected with the movements; and how the insects keep to their fixed direction. On the last point there seems to be not the slightest clue; but it might be as well to point out that the evidence in hand lends no support to the oft-quoted theory that insects fly at a definite angle to the wind. Flights, on the whole, are as often with the wind as against it, and while there are one or two cases known of a change of wind resulting in a change of flight direction, there are very many more records of flight direction remaining constant in spite of frequent changes of wind.

In the past, the collection of records on the immigration of insects into Great Britain has been entirely haphazard. Scattered through the pages of a dozen entomological and natural history journals of the past century are records of sudden abundances, unexplained absences and occasionally of clouds of butterflies crossing the English Channel or arriving on the shores of Great Britain. But the absence of records for several years means little or nothing but a period of lack of interest. However, a little more than three years ago the South-Eastern Union of Scientific Societies formed an Insect Immigration Committee under the energetic secretaryship of Capt. T. Dannreuther. This Committee has organised a widespread system of district recorders, has issued a list of insects about which information is specially needed, and has sent out some thousands of standard record cards to voluntary observers in all parts of the country. The results have so far surpassed expectations, and have thrown new light on the movements of certain butterflies, particularly the Common Whites and Red Admiral. Now also the Committee has obtained, by permission of the Trinity Brethren, the co-operation of a number of keepers of light-ships and light-houses round the coast, and the records they are sending in are adding to our knowledge of many previously known migrants, and suggesting new and unexpected insects that will require watching in the future.

The study of insect migration in Great Britain is now better organised than it has ever been before, and far more completely than anywhere else in the world; but many additional helpers are needed, and years of work and co-operation from the Continent will be necessary before a definite answer can be given to any of the outstanding problems.

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