legislature to wake up and appreciate the fact that we must, by all legitimate means, encourage the establishment of new industries within this realm?

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BIRD MIGRATION IN GREAT BRITAIN AND IRELAND.

THE great inquiry on the migration of birds as observed in Great Britain and Ireland instituted in 1880 by the British Association was brought to a conclusion at the Southport meeting last year, and it may be useful to describe shortly what it accomplished, and to direct attention to some of the results, which practically remain unknown except to a few ornithologists specially interested in the subject.

For eight years, 1880-1887, the committee appointed collected voluminous observations from the numerous light stations, some two hundred in number, around the British and Irish coasts. From the enormous amount of material thus amassed, a digest of the observations was prepared and presented to the Liverpool meeting, and was published in the report of the Association for 1896 (pp. 451-477), affording, in a highly condensed form, the general results of the inquiry in all its aspects, geographical, seasonal, meteorological, &c. This was followed by a series of histories wherein each and every movement (and the very varied conditions under which they are performed) of eight birds carefully selected so as to include every type of British migrant was exhaustively treated.

These histories appeared in the reports for the years 1900, 1901, 1902 and 1903.

Turning now to some of the special results of the inquiry, in the first place it was clearly proved that a considerable proportion of our native-bred song thrushes, blackbirds, skylarks, starlings, rooks, lapwings, and other species which are usually regarded as being wholly resident throughout the year are migratory; indeed, they are as essentially summer visitors to our isles as the swallow and the cuckoo. They leave us before the end of summer for southern Europe, and are the first harbingers of spring to appear on our shores, arriving during February and early March.

As regards the geographical aspect of the subject, perhaps the most interesting of the varied movements investigated, if not actually discovered, are those remarkable intermigrations which take place between the south-eastern coast of England and the opposite shores of the continent by a westerly autumn and easterly spring flight. Day after day in late September and during October, when the weather is suitable, vast numbers of skylarks, starlings, chaffinches, tree sparrows, rooks, and jackdaws rush across the southern waters of the North Sea, proceeding chiefly due west off the mouth of the Thames (the centre of the stream), south-west off the coast of Kent, north-west off Norfolk, and north-north-west off the Humber. Corresponding return migrations, in opposite directions, are witnessed in the spring. A noteworthy feature of these movements is that they are performed during the daytime; indeed, they are the main diurnal flights observed on the British coasts.

During the preparation of the digest and of the various reports, I was so much impressed with the singularity and importance of these movements that I decided to make some further investigations regarding them, and to this end I spent nearly five weeks on the Kentish Knock light vessel, situated thirty-two miles east of the Essex coast and out of sight of land, during the past autumn (see *Ibis*, pp. 112-142). I was previously uncertain as to whence came these hosts of migrants, now I am of opinion that they are emigrants

from western central Europe, which, having probably descended the Maas, Rhine, and Schelde, quit the Dutch coast at the mouths of those rivers *en route* for winter quarters. Some of these remain during the winter in England, others proceed to Ireland, and others, again, depart from our southern shores for more southern lands. There can be little doubt that many of those which remain in our islands winter in latitudes north of their summer homes!

Turning next to the meteorological aspect of bird-migration, it has been possible to make a careful comparison between the unique data obtained through the inquiry and the reports issued by the Meteorological Office, and thus to establish satisfactorily certain relations between migrational and meteorological phenomena. For instance, it has been found that each great arrival on our shores of migrants from north-west Europe in the autumn is correlated with a certain type of pressure distribution which establishes fine weather over the North Sea between Scandinavia and the British Isles. Such conditions, however, though they may prevail at the all important point of departure, and hence induce migration, do not always extend so far as Britain, and when this is the case the migrants pass into more or less unfavourable weather ere they reach our shores.

During a month's sojourn in the Eddystone Lighthouse (see *Ibis*, 1902, pp. 246-269) in the autumn of 1901, I paid special attention to the weather conditions under which the migrants set out to cross the Channel. I found that no movements were witnessed when the weather was in the least degree unfavourable for the passage, and that the wind is undoubtedly the main factor in migration meteorology. The direction of the wind was of no moment, for the birds flitted southwards in winds from all quarters. It was otherwise when its velocity came to be considered, and no movements were performed when this exceeded about 28 miles an hour. At 34 miles the few stragglers observed were in distress, and the only birds moving when it exceeded this and approached 40 miles were swallows and martins. My subsequent experiences at the Kentish Knock Lightship confirmed these conclusions.

The supposed influence of the *direction* of the wind on migratory movements has been much misunderstood, chiefly because the dependence of the wind upon atmospheric pressure does not appear to have been taken into consideration. We now know that certain types of pressure distribution are favourable for and conducive to migration, and the winds also resulting therefrom have erroneously come to be looked upon as the cause for such movements.

Finally, the investigation of certain movements, namely the emigrations, has presented exceptional difficulties, due chiefly to the fact that they are habitually performed under conditions which enshroud them in all but complete obscurity, indeed, often in complete obscurity. The reason for this is that, with few exceptions, emigration is undertaken during the hours of darkness, and thus entirely escapes notice at the place of embarkation. It was with the object of investigating this phase in the phenomenon of migration that led me to visit the Eddystone, where it was possible to observe these emigrants immediately after their departure from our shores. There I found that at least 90 per cent. of the various emigrants crossed the Channel during the night. Indeed, night movements are undoubtedly the rule when considerable expanses of sea have to be traversed. To this rule the chief exception has already been mentioned; but both at the lighthouse and at the lightship I found that day migration was confined to a few species only.

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