

The Relation of the Fauna and Flora of the British Isles to those of North America.

AT the Linnean Society on Mar. 5, Mr. H. E. Forrest opened a discussion on "The Relation of the Fauna and Flora of the British Isles to those of North America". Mr. Forrest first summarised the geological evidence on which his hypothesis is based. There were two phases of the Great Ice Age: (1) Ice-sheet period; (2) glacier period. During the first phase the ice came from north-west across the Irish Sea; during the second phase it came from the north-east.

(1) The ice-sheet originated in the mountainous northern region of the Atlantean continent, which connected Europe with North America. This gradually sank. Eventually an arm of the sea intruded between the Faroes and Scotland: this broke the continuity of the ice-sheet and brought it to a standstill.

(2) When the ice-sheet became stationary, its south-easterly thrust ceased. Then the local glaciers had free play. The Scottish Highlands and the Lake District produced glaciers on a big scale, and these sent forth streams of boulders which spread out west and south-west to Ireland, North Wales, and the plain of Cheshire and northern Shropshire. The glaciers lasted after the ice-sheet had finally melted and gradually retired as the climate ameliorated.

In the course of his investigations into the mammalian fauna of the British Isles, Mr. Forrest has found that out of sixty-four British species—recent and fossil—thirty-two are absent from Ireland. The usual explanation is that these reached Britain after Ireland became an island. But in the west of Ireland there are many plants and animals which do not occur in Britain. Several—such as *Saxifraga umbrosa*—occur only in Spain and western Ireland.

Among all classes of animals and plants, many species are common to eastern North America and western Europe. Five-sixths of American fungi are also British. About a hundred phanerogams, including many fresh-water plants, have similar distribution; whilst among invertebrates—especially insects and molluscs—examples are numerous.

That there was a land-bridge between Europe and America in the north is admitted. Evidence was offered that there was also a connexion in temperate latitudes; that in place of the North Atlantic there was an Atlantean continent—the northern half mountainous, the southern a plain with great fresh-water lakes. Mr. Forrest suggests that this continent was the home of all British-American species, and that some of them originated in it. *Saxifraga umbrosa* undoubtedly did so, and other species classed as Lusitanian by Dr. Scharff. He also suggests that the Salmonid fishes, including *Coregonus* and *Salvelinus*, and the crustaceans *Mysis* and *Limnocalanus*, originated in the Atlantean Lakes.

Dr. C. Tate Regan said that the examples given to support the hypothesis of an Atlantean continent are just as well explained by the supposition that the northern continents have occupied nearly the same areas since the Eocene, except for connexions between Asia and America across the Bering Sea, and possibly between Europe and America via Iceland. The only European species found in North America are northern types that range through Siberia, such as the pike. The Salmonids (char, whitefish) said by Mr. Forrest to have come from the Atlantic continent are not true fresh-water fishes. Char (*Salvelinus*) are marine fishes that run up rivers to breed and form colonies in lakes: those of the lakes of Ireland and Britain

may have entered them in glacial times when our seas were colder and the limit of char in the sea was farther south.

If in late Tertiary times the North Atlantic had been filled with a continent, one would expect nearly the same marine fauna on opposite sides of the Atlantic. It is only the northern species (cod, herring, etc.), found also in Iceland waters, that are common to America and Europe.

Dr. A. B. Rendle did not consider the existence of a North Atlantic continent necessary to explain the relations between the flora of the British Isles and North America. Existing land areas north of the Atlantic represented an adequate connexion between Europe and America in view of the more favourable conditions known to have prevailed formerly in Greenland. The presumed existence of the Atlantean continent suggested a greater similarity between the floras of eastern North America and south-west Europe and the Mediterranean than was borne out by facts. The Lusitanian element in the European flora finds a more satisfactory explanation as a European, not as an Atlantean outlier. Some of the species common to Europe and North America, such as *Pteris aquilina* and *Potamogeton natans*, adduced as evidence by Mr. Forrest, have a very wide distribution and have no bearing on the case. The distribution of *Eriocaulon septangulare* is remarkable, but it seems unnecessary to invoke an Atlantean continent to explain it.

Prof. J. W. Gregory was reminded by Mr. Forrest's North Atlantean ice-cap of the once assumed north polar ice-cap. If the glaciation of the British Isles was by ice from a North Atlantic continent, some of its rocks should be found in the British glacial drifts. In the absence of such material, the issue depends on the interesting cases of distribution to which Mr. Forrest had directed attention.

Mr. J. Ramsbottom said that Mr. Forrest's summary seemed to lay unwarranted stress on the distribution of fungi. The statement that five-sixths of American fungi were British was based on a list published by Mr. Carleton Rea and himself after a short visit to the eastern United States in 1926. The list included only larger fungi. If the whole continent were considered and all classes of fungi, the proportion would be entirely different. Parasitic fungi were largely specialised to their host plants and consequently could only be common to the two areas where the hosts were. The aquatic Saprolegniaceæ had many species in common but they were of world-wide distribution. The fact that the larger fungi of South Africa and other temperate regions have a large proportion of species in common suggests that fungi cannot be called in to give any support whatever to hypotheses of lost continents, and this is probably the same with all cryptogams having small spores.

Dr. O. Stapf observed that he could not adduce any evidence in favour of Mr. Forrest's views from the distribution of the so-called Lusitanian elements. The simultaneous occurrence of so many species in Europe and in North America is probably very largely connected with a more northern land connexion in Tertiary times, such as is very generally admitted. A certain percentage, however, may be due to simultaneous northward radiation to both hemispheres from an old common area in the south; for example, *Eriocaulon septangulare* and *Brasenia purpurea*, the latter now extinct in Europe. There is evidence of an extension of the Lusitanian element along the

coast-line which connected Ireland and Scotland with Norway across what is now the North Sea. Along the same line northern elements spread southwards and have left relict stations so far south as Ireland, where they mingle with Lusitanian species in Clare Island, the cliffs of which harbour *Silene acaulis* and *Saxifraga hypnoides* in intimate contact. This coast is the most westerly extension of land in this part of the Atlantic which we can safely postulate. In dealing with such problems it is necessary to consider species not only in relation to their special distribution but also to those of their nearer and wider allies.

Dr. B. P. Uvarov stated that in studying zoogeographical problems it is necessary to apply ecological methods. Orthopterous insects are particularly suitable for these studies, because of the very small number of British species. Three zoogeographical groups may be distinguished amongst British Orthoptera. The largest consists of species distributed across Siberia, northern and middle Europe. This group originated in the Angara continent of geologists. Amongst members of the Angara fauna there are some which occur in North America but they spread via north-east Siberia. The second element is the Lusitanian (Atlantic); their present distribution points to their having originated in dry rocky land at the latitude of the Mediterranean Sea and Canary Islands. The third group belongs to families and genera now widely spread in the subtropics and tropics, and they are obviously relics of an age when the British Isles together with the most of the northern hemisphere enjoyed a mild tropical climate.

Mr. A. J. Wilmott emphasised the point that, with the possible exception of *Saxifraga Geum*, no species of the Lusitanian element of the British flora

occurs in North America. These species must be relics in Ireland, since there has been no connexion southwards since the glaciation. Moreover, these species are not particularly cold-shy: they ascend to considerable elevations in Ireland. There are many species common to Europe and to North America, though the number is being steadily diminished by critical study. There are a number confined to Europe and eastern North America, and Prof. Fernald has found several restricted in America to the unglaciated parts of Newfoundland and the mouth of the St. Lawrence. We know that many species with limited distribution to-day formerly had a wider area of dispersal. There are species which are now known only in the eastern United States and Japan. It may therefore be possible that a species occurring only in Europe and the eastern States was originally connected across Asia and not across an Atlantis, and too definite an inference should not be drawn from present-day distribution alone. A proper analysis of the whole flora may give indications of the history of its development.

Dr. G. P. Bidder pointed out that the distribution of the fresh-water sponge *Heteromeyenia ryderi* given as western Ireland and eastern North America is from Hanitoch's list of Irish Fresh-water Sponges (1895), whereas the later account of Stephens shows that this is one of the commonest sponges of Ireland but restricted to non-calcareous districts and occurring in the island of Mull. Miss Stephens gives no opinion on the distribution of *H. repens*, which occurs in America over approximately the same area and has otherwise been recorded only from Galicia, though she holds that the distribution of *H. ryderi* supports Scharff's hypothesis of a land-bridge to America from Ireland.

Forestry in Kenya Colony.

IN the previous Annual Report of the Forest Department of Kenya Colony and Protectorate, reference was made to the great drought of 1928. The recently published report for the year ending Dec. 31, 1929, states that "the drought continued with ever-increasing intensity for the first quarter of the year", but long rains followed and recovery was rapid. One of the results of the drought was rather serious forest fires, occurring principally on the Aberdares and on the Mau. The other visitation with which the Colony was afflicted was a plague of locusts, which, says this report, "showed signs of having passed its peak and being rapidly on the decrease, and a greater spirit of optimism prevailed generally".

Steady progress is being made with the work of selecting new forests for reservation and with the survey of the reserved areas. It is pleasing to note that an earnest endeavour is being made to ascertain the degree of stocking in the various forests under exploitation by sawmills. Enumeration of growing stock is proceeding apace and two working plans are in operation. It had been proposed to form a special working plans party "but no staff was available during the year".

There are several forestry administrations under the Colonial Office to which similar remarks on the subject of inadequacy of staff are to be found in the annual reports. It is to be hoped, now that prospects in those forestry services are really attractive, that young men of the right type will come forward for training. For without sufficient and efficiently trained gazetted staffs real progress is impossible. Under Financial Results, the Conservator (Mr. H. M. Gardner) writes: "With only the comparatively small local market to

depend on, it is not possible for the Department to produce a large net revenue. It can be considered distinctly satisfactory if the Department can pay its way while the forests are being explored, developed, and brought into a more productive state. As the forests are improved and communications become better, production costs will diminish, and it should be possible to develop much wider markets and to obtain a very handsome profit from the Colony's forests." The Conservator's optimism is probably quite justified; but it should be remembered that this will only be possible provided financial support is available to develop the forest estate.

As a case in point, the opinion of the Government of India at the time a forest organisation was being introduced into that country, soon after the inauguration (in 1864) of the Indian Forest Service, may be quoted; for its application to several of the colonial forest services may not be out of place. The following extract is from a Circular (Revenue—Forests, No. 24, dated 23rd November 1867) issued by the Governor-General, Sir John Lawrence, in Council, and forwarded with a covering dispatch to the Secretary of State for India. "It appears expedient to the Governor-General in Council, to state that there are certain cases in which the administration of forests must, like the Irrigation Department, undertake works of public utility the outlay on which, within one year, may not always be covered by the revenue of the year. The rule that the forest expenditure shall always be covered by the revenue can, in its very nature, only apply to ordinary expenditure."

On the plantation work in Kenya being carried out the report is most informative: 4000 acres were