tion in the next war it will be imperative to maintain a certain level of agricultural production.

A planned agriculture would allow of the comprehensive application of science, anything short of which may, as we have seen, have unexpectedly bad results. But the planning must not destroy the individual initiative that still remains one of the most potent factors of success in agriculture.

THE FULMAR IN THE BRITISH ISLES

By SETON GORDON, C.B.E.

THE results of the investigations into the distribution of the fulmar in the British Isles which the British Trust for Ornithology undertook during 1934-39 were published as a paper in the November issue of the *Journal of Animal Ecology*, 1941 (Cambridge University Press) entitled "The Breeding, Distribution, History and Population of the Fulmar (*Fulmarus glacialis*) in the British Isles", by James Fisher and George Waterston. The report was completed by Mr. Fisher as Mr. Waterston, now a prisoner of war in Germany, handed over his share of the work to Mr. Fisher in 1938. No one interested in the fulmar should fail to read this publication, which is one of the most interesting ornithological papers of recent years.

The spread of the fulmar, an attractive ocean bird with powerful flight that is deceptive because of its grace and apparent aimlessness, is one of the most remarkable features of British bird-life during recent decades. Until the year 1877, the fulmar bred only on the St. Kilda group of islands, which rise from the bed of the Atlantic more than one hundred miles west of the Scottish mainland. Since 1877 it has founded, up and down the coasts of Britain and Eire, no fewer than 208 colonies, in which there are estimated to be some 40,500 breeding pairs. Since the fulmar lays only one egg in the course of a season, this increase is the more remarkable.

St. Kilda has now been deserted by its human inhabitants, who were accustomed to snare the adult fulmars for oil (which they used for lighting) and food; and to take the young in the downy stage for food; and presumably, therefore, the great St. Kilda colony must now be increasing each year. But the spread of the fulmar was already taking place when the St. Kildans continued to take the fulmars for their needs, although Mr. Fisher's estimate of the number of young fulmars killed on St. Kilda in 1929 exceeds, by almost two thousand, Mr. Neil Ferguson's estimate given me of four thousand young birds taken that year.

It is not, I think, disputed that a considerable proportion of the newly founded colonies must have come from St. Kilda stock, but it seems to me probable that birds which overflowed southward from the great colonies on Iceland and the Faroe Islands have contributed to the increase. Surely, by the way, it is more likely that the Isle of Skye fulmars (p. 229) are an offshoot of the considerable colony on the Shiant Islands, twelve miles to the north, rather than arrivals from more southerly latitudes as suggested. Regarding the St. Kilda fulmars, Neil Ferguson, a St. Kilda man now living on the Scottish

mainland, is of opinion that their spread eastwards was due, partly at all events, to their habit of following in thousands the whales that were towed from St. Kilda waters to the whaling station in Harris. This is a possibility which must not be lost sight of in seeking for the reason of the spreading, for we are told (p. 258) that fulmars first bred on Foula in 1878 when a whale was being cut up there.

The fulmar is primarily a bird of the Arctic and my memory of it in Spitsbergen is of a mountain-nesting rather than a coast-nesting species. In Britain, too, the fulmar has now founded several inland colonies. One of them, on an isolated basaltic rock on the golf course at Bamburgh in Northumberland, has, I am told, been forsaken during the present season of 1942. At this colony during a January day of easterly storm I recall watching the fulmars flying high to a considerable distance inland from that inland cliff.

The enemies of the fulmar are indeed few, but Mr. Fisher is perhaps on doubtful ground when he makes the statement that in Spitsbergen "there is no proof that the Arctic fox ever tackles the fulmar". In "Spitsbergen Papers", vol. 1, p. 330, a short account is given of a fulmar colony on a cliff amid the inland ice of Spitsbergen and of the fox tracks in the vicinity, the inference being that the foxes were preying on the fulmars, and again on p. 333 "we were rewarded by the sight of an Arctic fox making its way at great speed towards Fulmar Cliff". No definite proof, perhaps, but I have little doubt that the Arctic fox preys upon young fulmars when it has the opportunity.

In Scotland great black-backed gulls take fulmar nestlings as food for their own young. In July 1937, on the island of Hoy, I disturbed, beside a freshwater loch, a large great black-backed colony. One of the young gulls when alarmed disgorged a complete young fulmar which it must have swallowed only a few minutes before. The neighbouring cliffs on which the fulmars were nesting had not been disturbed that day through human agency, and the inference therefore is that the parent gull must either have driven the parent fulmar from its young, or must have come upon the young one unattended. When young fulmars disappear (as they often do) from a colony, I suspect that it is the work of the great black-backed gull.

Mr. Fisher has found that the breeding colonies of fulmars arrive earlier at their rocks than the birds which are founding colonies but have not actually bred. But the small Bamburgh colony, even when that colony was in process of being founded, arrived at their inland rock so early as the end of December or beginning of January, whereas at their breeding colony in the north of Skye the birds have not been noted on the ledges before February. Perhaps the fact that the two colonies are on opposite coasts of Britain may account for this difference in the times of arrival, but it is nevertheless worth recording.

Mr. Fisher's paper is full of interesting information. Who, for example, was aware that fulmars have been on occasion shot with young peduncled barnacles growing upon the feathers of their under parts (p. 256)? Or, that a fisherman's minnow bait was taken by a fulmar on fresh water 400 miles from the sea (p. 257)? One would have liked to have been told more about that remarkable occurrence.

It is pointed out that the nesting site of the fulmar is rather different from the sites of other cliff-nesting birds, for it is usually a steep slope of 60° or more

(pp. 248-49) and not a true cliff. Neil Ferguson of St. Kilda in a letter to me apropos of this writes: "I am sure the sheep on St. Kilda are now disturbing a lot of fulmars. At the time of their laying we used, as long as we lived on the island, to fence the sheep off the easiest places where they would 'spoil the fulmars' as we used to say, and used to repair the fence each season before the laying time."

On p. 249 some unusual nesting sites of the fulmar are recorded. On North Ronaldshay the species was nesting on ruined buildings in 1934, and on inhabited dwellings in 1937; on Sanda, an isle of the Orkney group, it nests on the ground among Arctic terns.

Several instances are on record of a fulmar attacking a herring gull, but the species as a rule seems to be harmlessly disposed towards its neighbours. Yet there are a number of reports to the authors of the paper that it causes other sea birds to leave the sites which it occupies.

OBITUARIES

Prof. L. Roule

PROF. LOUIS ROULE, whose death has recently been reported, was the fifth occupant of the Chaire de Zoologie (Reptiles et Poissons) at the Muséum National d'Histoire Naturelle of Paris, a chair which, as its present occupier, Prof. Pellegrin, has remarked, seems to confer the gift of longevity on its holder. Louis Roule was born in Marseilles in 1861 and studied in the school of medicine in his native town.

Prof. Roule's early zoological work was on worms and tunicates, and his doctorate, gained in 1884, was awarded for a thesis on the Ascidians of the coast of Provence. He became professor at the University of Toulouse in 1892 at the age of thirty, his duties including the direction of the station of pisciculture and hydrobiology associated with the University. It is here that the origin of Roule's interest in fishes is to be found; that he never lost interest in the economic aspect of ichthyology is evidenced by the publication in 1914 of his "*Traité de pisciculture et de pêche*", and the devotion of one of the ten volumes of his "*Les Poissons et le Monde vivant des Eaux*" to the same subject.

Nevertheless, during his tenure of the Museum chair, to which Roule succeeded in 1910, it was largely with those fishes most remote from man's practical interests that his original works were concerned. He produced important reports on the fishes collected by the French Antarctic Expedition led by Commandant Charcot, on oceanic fishes and their larvæ collected by Prince Albert I of Monaco, and on larval and adult deep-sea eels collected by the Danish oceanographical expeditions led by Johannes Schmidt. The handsome volumes published at Monaco were enhanced by the artistic collaboration of Fernand Angel, who also illustrated the work on deep-sea eels (done in collaboration with Leon Pertin) and many of Roule's smaller publications.

The strange forms and peculiar conditions of life of the fishes that dwell poised far below the broad surface of the ocean and as far above its deep floor never fail to grip the imagination of any zoologist fortunate enough to handle them. Roule was fond of generalizations, and his conception of some of the most aberrant of the bathypelagic fishes as "*monstres normalisés*" was characteristic. One of the ten volumes of the popular work referred to above was

devoted to abyssal fishes, and another (which was translated into English) to the migrations of fishes, a subject in which he was particularly interested. The philosophical vein in all ten volumes, and particularly in the last, allows one to suppose that he offered this book, not merely as a by-product of his scientific life, but also as a summing up of his experiences, the rounding off of a satisfying career.

E. TREWAVAS.

Prof. J. H. Salter

WE regret to record the death of Prof. J. H. Salter on August 5 at the age of eighty-one. John Henry Salter was born in Westleton, Suffolk, on June 5, 1862. In 1869 his father died, and the family moved first to Woodbridge, and then to Scarborough. Dr. Salter attended Ackworth School and afterwards became an apprentice master at the school and studied at Flounders College. He graduated B.Sc. London, and taught at various schools during 1881-88. He then proceeded to Dalton Hall, Manchester, to read botany under Prof. Williamson and Mr. Hick at Owens College. In 1891 he demonstrated at University College, London, for a short time and was later appointed as the first professor of botany at Aberystwyth, under Principal T. F. Roberts. Obtaining a year's leave of absence in 1896, he went to Bonn and worked under Strasburger. He was replaced at Aberystwyth during this time by Keeble (later, Sir Frederick Keeble).

In later years Dr. Salter often spoke with pleasure of his time at Bonn, where he formed one of a group which included Harper, Swingle, Fairchild and Osterhout, as well as Schimper and V. H. Blackman. Harper, Swingle and Fairchild were studying the dividing nucleus and the spindle, Schimper was already interested in plant geography, and Dr. Salter was investigating the connexion between pyrenoids and starch grains. His drawings were beautifully executed in water colours, and were presented by him to the Botany Department of the University College of Wales, Aberystwyth, a week before his death. During the time that Dr. Salter worked under Strasburger, he learned from him the method of preparing herbarium sheets which he used and developed for the rest of his life. The plants were pressed between layers of cotton wool, each overlapping leaf was separated by a slip of drying paper, and the finished specimens showed all the care of the master hand. He specialized in *Salix* and *Mentha*, as well as collecting a large general herbarium, which he gave to the National Museum of Wales, Cardiff, a few months ago.

In 1897 he returned to Germany to work with Meyer at Marburg on the interrelationship between the algal and fungal components of lichens. He was convinced that the fungus obtained food from the alga, and his drawings, executed with meticulous care, form part of his recent gift to the University of Wales, Aberystwyth.

He married Adah S. Freeman of Birmingham in 1899. In 1908, he resigned from the chair at Aberystwyth, on account of a breakdown in his wife's health, and the family moved first to the Canary Islands, and then to the south of France. These countries gave wide scope for his interests and he added the record of several new species to the flora of the Canary Islands, as well as continuing his studies in conchology, ornithology and entomology.

The family returned to England in 1916 and, after