SCIENTIFIC BOOKS

OCEANIC BIRDS OF SOUTH AMERICA

Oceanic Birds of South America. A study of species of the related coasts and seas, including the American quadrant of Antarctica based upon the Brewster-Sanford collection in the American Museum of Natural History. By ROBERT CUSHMAN MURPHY. 8vo., Vol. 1, pp. xxiv + 640; Vol. 2, pp. 641–1245, 15 col. and 72 black and white pls., 80 text-figs., American Museum of Natural History, New York, 1936.

To most ornithologists the birds of the sea are much less familiar than those of the land; their life in open spaces often precludes a close approach, while their nesting places may be remote and difficult of access. Dr. Murphy's two splendid volumes on the oceanic birds of South America are therefore doubly welcome, for they bring together in compact form a vast amount of data, gathered from every available source, reviewed critically in the light of the author's rich experience, both in the field and in the study of museum specimens.

Birds that are closely associated with the sea fall roughly into four ecological groups: (1) the littoral birds that frequent beaches and rocky foreshores, such as oystercatchers, kelp geese, sheathbills; (2) inshore birds, confined to waters mostly within sight of land, such as many gulls and terns; (3) offshore birds that range "on soundings," or roughly to the edge of the continental shelf, such as cormorants, pelicans and some of the diving petrels; and (4) pelagic birds of the open sea, such as many petrels, shearwaters and albatrosses, tropic birds and migratory penguins. The last group is especially abundant in the southern oceans. Many of them spend much of their lives at sea, reducing to a minimum the time spent on land for nesting. Such a life is one of high specialization, for the bird must be able to cover wide spaces, to rest on the surface amid tossing waves, to find sustenance from the waters, to drink salt water, to ride high gales with ease and safety and to find its ancestral breeding ground on some remote islet with unfailing accuracy at proper times.

The first volume reviews the field work carried on over many years by various collectors, whereby the great series of South American seabirds in the American Museum of Natural History has been built up. Outstanding among these is Rollo H. Beck, whose energy and skill in securing and preparing such specimens is in large measure responsible for the acquisition of the material needed in comparative study. In earlier days many pelagic species were first made known from occasional specimens taken as chance offered at sea. These afforded little or no basis for a precise knowledge of variation, whether individual, sexual, seasonal or geographical. Even the breeding grounds of many were unknown until more recent years. Gradually, however, collections have been built up, enabling the close comparison of related forms from various breeding stations, so that in many cases differences previously unexplained take on a meaning. Nevertheless, "no single museum in the world possesses an even moderately good representation of birds from the antarctic and subantarctic islands as a whole." Some three hundred pages are devoted to an account of ocean currents, winds, and temperatures of both land and sea, considered especially in their effect on the bird life. It is shown that surface temperature of the water is a major control of distribution, primarily as it affects the food supply. The cooler waters about southern South America and Antarctica are relatively rich in diatoms, which in turn support vast multitudes of small crustaceans. These again afford sustenance directly to many seabirds, seals and whales, or indirectly through making possible an abundance of fish or cephalopods which may be utilized as food for still greater numbers of birds. Ocean currents of markedly different temperatures do not readily mix, and differ greatly in their potentiality for supporting minute forms of life. Consequently, there may be relatively sharp though invisible boundaries delimiting the distribution of these organisms, and as a result the ranges of the seabirds dependent upon them are similarly marked off.

A striking example of such an effect is the Humboldt Current, which carries cold water northward along the west coast of South America to tropical latitudes. Its temperature and chemical content are favorable for the growth of diatoms, crustaceans, fish and consequently higher forms of life. Its diversion westward off the coasts of Peru and Ecuador makes possible the presence of a penguin and a sea lion in the Galapagos group, southern types which otherwise could hardly live under tropical conditions. To the northeast, a smaller current of warm, tropical water, "El Niño," passing southwestward meets the Humboldt Current, and is of particular interest on account of the visible effects it sometimes causes when by unusual fluctuation it invades the cooler waters, killing myriads of fishes and causing death to seabirds. Winds, especially the steady-blowing trades in mid-latitudes or the strong westerlies of the southern ocean, are less a factor in accounting for avian distribution, although no doubt they are a necessity for the larger soaring birds. Tropical hurricanes play a minor part, though often accounting for waifs that may be carried far from their normal habitat. The author suggests the attractive view that oceanic birds tend to fight the wind only when they are carried to lee shores, hence they begin to tire only at such times; further, birds

caught in the calm "eye" of a hurricane are carried out of normal bounds not so much by the force of the wind as by their constant avoidance of the stronger air currents, so that they are constantly turned back toward the quieter center of a cyclonic storm and thus inevitably are carried along in its track.

An interesting feature is an imaginary journey in which the reader is taken completely around South America, visiting each of the isolated rocks and island groups as far east as Ascension and Gough Island, south to the Falklands and South Georgia and west to the Galapagos. Each of these is described and its seabirds are listed while the accompanying maps, inserted as text-figures, show very clearly the outlines and something of the topography of these important nesting areas.

The major part of the work is devoted to a detailed account of the many seabirds, 183 species and subspecies in all, that occur in the South American sector. These include members of sixteen families, representing five orders (the penguins, petrels and albatrosses, the pelicans and their allies, sundry shorebirds and ducks). The nomenclature of each species is reviewed, its plumages are described, and the known facts relative to its distribution and habits are given. A vast amount of data published and unpublished is critically sifted and set forth in detail. Many of these life histories are exceedingly interesting and afford for the first time a fairly complete picture of the birds' activities. The account of the wandering albatross is a good example. Published errors as to the wing spread are corrected; it is to be not 17 feet, as given by one authority, but instead not over 11.5 feet. The extraordinary habit of the parents in deserting their young before it can fly is shown to be quite normal, for the young bird lives for the last three months of its nestling life entirely without food, depending on the great accumulation of fat gained in the five preceding months while it was being actively fed. The young do not leave the nest until they are nearly a year old.

Two new forms are described: the Fuegian petrel, *Oceanites oceanicus chilensis,* which migrates northward into the Pacific Ocean in the non-breeding season, and a small race of cormorant, *Phalacrocorax olivaceus hornensis,* from Bertrand Island, Chile. With a sufficient series of skins, Dr. Murphy appears to have solved the puzzling status of the steamer ducks, and shows that instead of one species with volant and non-volant forms, there are in fact three: namely, a flightless form in the Falkland Islands, *Tachyeres brachypterus;* a different flightless bird, *T. pteneres,* inhabiting the continental region from Cape Horn and the Magellanic coasts to Chiloé; and finally a flying species, *T. patachonicus,* inhabiting the entire area covered by the ranges of the two first. Incidentally it may be pointed out that the flightless cormorant (Nannopterum) of the Galapagos group is represented by such small numbers that its existence is likely to become precarious, although a saving factor is that it forms only small breeding colonies easily overlooked by visitors.

Altogether this is an outstanding piece of work, carefully done, summarizing the present state of our knowledge of these seabirds and affording a firm basis for any further work in the future. A captious critic might feel that in parts there is even too much detail, and it might have been helpful in finding particular data if side headings had been more freely used. Sixteen colored plates by Jaques help the reader to visualize the settings among which the birds live, but the figures are perhaps too small to do more. Most of the species are further illustrated by a wealth of photographs taken in part by the author. An excellent bibliography and a full index complete this most attractive work.

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SPECIAL ARTICLES

THE DETERMINATION OF ACIDITY IN HEAVY WATER MIXTURES

WITH the increasing use of deuterium oxide as a research tool in biological chemistry, it becomes important to develop methods for the precise determination of acidity in that solvent and its intermediate mixtures with light water. Ultimately, the colorimetric method will probably receive the most general application by virtue of the ease and rapidity of the technique and the small amounts of material required. However, the quantitative interpretation of colorimetric measurements requires a knowledge of the influence of deuterium substitution upon the ion-product of the solvent as well as the dissociation constants of the acid-base systems employed as buffers and as indicators—data which can best be obtained by e.m.f. methods.

The e.m.f. measurements available at present indicate that[1] K_w is decreased 6.13 fold at 25° C.; *i.e.,* $C_{D^+}C_{OD^-} = 0.16 \times 10^{-14}$ and that the dependence upon deuterium content in mixtures of H_2O–D_2O is not linear. This means that if one wishes to construct a pD^+ scale analogous to a pH^+ scale, the characteristic points 0, 7 and 14, referring to molal hydrogen-ion activity, hypothetical neutrality and molal hydroxyl-ion activity, respectively, become 0, 7.4 and 14.8 for molal deuterium-ion activity, neutrality and molal deuteroxyl-ion activity, when pure D_2O is the solvent.

[1] Abel, Bratu and Redlich, *Zeits. f. physik. Chemie,* A173: 353, 1935.