point with pardonable pride to the organization of some important lines of research, to the consummation of some important projects, and to much good work in several lines of biologic research. Assured of its past, it may look forward with confidence to larger service and to a still greater measure of usefulness in the future.

In 1910, through the establishment of the Harriman fund, Dr. Merriam was enabled to relinquish all governmental work and to devote his undivided attention to scientific investigations of his own choosing, thus attaining a goal which many scientific men look forward to but rarely realize. In the Biological Survey, which he founded, and the affairs of which he so long and ably conducted, he has left a fitting monument. After his resignation I was appointed Chief of the Survey, June 1, 1910, which position I retained till December 1, 1916, when I resigned because of failing health, my successor being Mr. E. W. Nelson.

Washington, D. C., February 4, 1919.

THE EXISTENCE OF SEA BIRDS A RELATIVELY SAFE ONE

By JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

THE frequent reports of numbers of sea birds found along ocean beaches following storms are usually so worded as to lead the reader to infer that the life of oceanic birds is a markedly hazardous one. That quite the opposite is the case, under conditions undisturbed by the human factor, in comparison with most land birds is shown by a consideration of the breeding rates of the various species in question.

In no sea bird that frequents the North Pacific Ocean, insofar as I am aware, is more than one brood reared each year. Furthermore, with the majority of pelagic species, but one egg is hatched each year. Among these slow breeders are all of the albatrosses, all the petrels, the shearwaters, the fulmars, the auklets, the murres, most of the murrelets, and the puffins. With the Pigeon Guillemot and the kittiwakes, two eggs is the rule; while with most gulls, which, significantly, are much more littoral, three is the average number.

It is an accepted biological principle, I believe, that the rate of reproduction in any animal is somewhat in excess of sufficiency to meet the maximum probabilities of casualty in that species. Population may be supposed on an average to remain constant from year to year, even though we may observe fluctuations above or below the mean. Thus, in the case of the Fork-tailed Petrel, in which species but one egg is laid each year, the population of the species is raised not more than 50 per cent at the end of the breeding season—each two birds becomes three. But, by the beginning of the following nesting season, the population is (because of the average maintained norm) back to what it was a year previously. In other words, starting with 20 birds in April, there will be 30 (or less) by July; but by the April following, 10 of

these will have met their death, leaving again 20. Fifty per cent of the minimum annual population dies each year.

Compare this with the run of land birds. To cite the song sparrow, which we will figure as rearing two broods of four each, and starting with 20 birds in April, there will be 100 birds by July. Eighty of these will have succumbed to the various exigencies of terrestrial existence by the following April, when the normal complement of 20 will again obtain. Here there has been a death rate of 400 percent of the minimum annual population. In other words the life expectation in the petrel when it hatches is eight times that of the song sparrow when *it* hatches.

And what of the Brewer Blackbird and the Mudhen and the California Quail!

It is clear, then, that even with the faster breeding sea birds, such as the gulls with their three-egg sets, no such annual mortality is suffered as with the great majority of land birds. Why is it, then, that the deaths of sea birds become so impressive?

In the first place, as numerous naturalists have remarked before, the chances of a dead or dying land bird coming to the attention of the observer are relatively remote. Hosts of predatory animals of a variety of kinds are on the alert for any lagging bird. One that happens to drop onto open ground is quickly devoured, or carried away into concealment, or buried. But an oceanic water fowl which becomes decrepit or dies is rarely made way with. It floats on the surface of the water, for days and perhaps weeks, carried along by the currents and the winds. A storm setting on-shore is bound to sweep everything towards the beach from miles of surface; the narrow winrow of debris there left is the concentration from great areas of adjacent sea surface. The visitor to the seashore at such times naturally gets an idea of the mortality among the bird species represented which is exaggerated far above the real state of affairs.

I once experienced a five days' northwester while returning to California from Bering Sea in a small sailing vessel. Part of the time hove to, and part of the time running before the gale with double-reefed jib and fore-sail, abundant opportunity was given me to watch the behavior of the sea birds, some of which were always in sight during the daylight hours. I was impressed beyond all doubt, of the mastery of the albatrosses, petrels and fulmars over any ordinary stress of wind or wave.

The annual mortality of sea birds, beginning with the moment of hatching, probably pertains mostly to the early weeks of their lives before they have reached the full strength of their maturity, and to the period of advancing decrepitude in old age. Predacious enemies of sea birds, save of those that live close to shore within the domains of Duck Hawks, are rare. Accidents there must be, such as pertain to the processes of food capturing. But that wind or wave figure in any appreciable degree, per se, can hardly be considered for a moment. As above shown, life on the ocean wave, for those birds which are adapted to pelagic life, is by far the safest, as compared with the lives of the great majority of our terrestrial species.

In this connection I wish to file a complaint against the custom which prevails, of basing local records of birds upon the finding of dead, or living but helpless, examples cast up on ocean beaches. Such "remains" may have drifted scores, even hundreds of miles from where the birds met their death

or became incapacitated for normal existence. For instance the finding of the remains of Horned Puffins on the sea beach of San Mateo County, as has recently been reported, should not at all be construed as constituting valid proof of the normal occurrence of this species off the Californian coast. The floating bodies may have been carried on the southward-moving off-shore "Japan current" from off the coast of Oregon or even from Washington or Alaska. An element of chance clearly enters here which renders such "records" inconclusive. They certainly should not be considered as constituting the definite addition of a species to the existing native fauna of California, any more than with species imported by man.

It may be properly pointed out further that because of their slow breeding rate, in other words their lesser powers of recuperation when their numbers have been unusually reduced, any new danger is much more likely to lead to serious consequences with sea birds than with land birds. Such man-caused factors as disturbance of nesting grounds, and oil on the water, might quickly lead to extermination of the pelagic birds affected, because wholly new in the phylogenetic history of the species. Rate of reproduction is a very conservative character of species, not such as can be changed abruptly, as suddenly arising demands might make necessary to the continuance of the race.

California Museum of Vertebrate Zoology, Berkeley, March 15, 1920.

A RETURN TO THE DAKOTA LAKE REGION

By FLORENCE MERRIAM BAILEY

LAST DAYS IN NORTH DAKOTA

(Concluded from page 72)

THE last of August, having visited four lakes, I returned to the homelike farmhouse on North Sweetwater where I had explored sloughs and listened to the joyful songs of the Sora in June; and with the exception of the automobile trip to Island Lake, stayed there until the first Geese came from the north the last of September. During the five weeks of my absence, the nesting season had been completed except for birds that raise several broods, such as my small friend the House Wren down at Stony Point, who met me with her habitual vigorous scolding explained by a late brood of fuzzy-headed soft-gaped and short-tailed youngsters. As late as the first of September, the family were still met with, and talked volubly as I passed. Another mother with nearly grown young—a Holboell Grebe—was seen down by the lake shore the last of August, and I was much pleased to add her to my North Sweetwater list.

In June a few pairs of Bobolinks had been scattered over my beat, the black and white males singing from the fence posts and on the wing; but in August the twang of their call note, heard occasionally from a telephone wire, made me look for the yellowish breast of the sparrowy looking bird overhead. Along the margin of the lake, a Red-tailed Hawk, perhaps having exhausted