

Greatly desiring to add to the exhibition material of historic interest that might appropriately balance and complement the aesthetic appeal of the pictures, Mr. Robert Ridgway very graciously allowed us the temporary custody of a collection of treasures culled from his files and portfolios. The items included drawings, sketches, water color paintings, lithographic proofs, important letters from Professor Baird and Clarence King, memorandum books and field notes, all bearing on little known phases of the career of this modest savant, and testifying to the genius that will forever mark one of the most important and fruitful periods of activity in American science. Space here will not permit of the treatment this collection warrants; but that it constitutes a graphic and chronologic record of the early progress and growth of the mind that made possible the Ridgway Epoch of American ornithology bespeaks its superlative interest and importance.

The Cooper Club wishes again to express to the workers mentioned its warm thanks and keen appreciation for the pleasure and profit derived through their generous coöperation in making the Club's First Annual Meeting such a landmark in the history of ornithological development on the Pacific Coast.

Eagle Rock, California, July 11, 1926.

HOW THE BIRD CENSUS SOLVES SOME PROBLEMS IN DISTRIBUTION

By MAY THACHER COOKE

LIFE is never static but always shifting, and bird life is no exception. One of the problems confronting ornithologists is to learn the nature, extent, and rapidity of the changes taking place in the distribution of birds. Censuses of breeding birds have been found an excellent means to this end, in fact about the only one yet devised that will furnish definite statistics on which to base deductions regarding numerical changes in various species.

Persons working on problems of the distribution of birds feel the need of definite numerical statistics for former years. Memory of past abundance, usually impression rather than accurate count, is a poor basis for scientific work, particularly since recollection of numbers frequently magnifies the facts. Lack of the material desired should make ornithologists of today only more willing to collect it for the benefit of those who come after them; for the work must be done *now*, not left until some future time. Numerical data relating to birds continue to increase in value the farther we get from the conditions to which they relate.

To get the best results, bird-census studies should be conducted on a large scale. It is hardly possible for one person or a small group of persons to carry on investigations over a sufficiently large section of the country to obtain results from which entirely satisfactory generalizations can be made, and it is, therefore, almost imperative that such work should be done on a coöperative basis. Some persons feel that bird-census work is not worth while because the entire field can not be covered. While much of the information on this subject is often tantalizingly fragmentary, yet even such material has been found of value and much better than nothing at all.

The most definite figures for purposes of comparison, from which to learn what fluctuations in the numerical distribution and in the relative abundance of the species take place from year to year, or over longer periods, seem to be obtainable from bird

censuses taken during the breeding season. We may also, in time, discover whether or not these changes take place with any degree of regularity. Observations of various kinds show that many species are shifting their ranges, but the records are often fragmentary and rather indefinite. Statistics obtained from bird censuses are exact, and will in the course of time furnish the means of tracing these changes, as well as of learning how rapidly they take place. It becomes evident, therefore, that these censuses should deal with the same areas year after year, in order that the resulting figures may be comparable. These series of records dealing with the same tracts of land over a period of years will furnish the material by which can be determined not only what species are extending their ranges and in what direction, and what species are becoming more restricted in distribution, but also the exact time of the changes and the rapidity with which they take place. Also, in course of time, the numerical increase or decrease of the individual species will become known.

Unfortunately, after taking bird censuses for a year or two some persons become discouraged and give up the work. Their records, extending over even short periods, have some value, but it is seldom possible to gain any real insight into the bird life of a given tract with less than five years' records. Even with long series of records those resulting from the study of a single tract will show only strictly local conditions, but they may also give a hint of some more general movements. Slight fluctuations from year to year are to be expected, but if physical conditions remain the same, any very marked change is seldom of local origin. The greater the number of sets of records available, the more definitely can the extent and cause of such changes be determined. Series of records will show the fluctuations during different periods and whether there is any increase or decrease in the total bird life of the country.

An especially interesting and important problem in distribution along this line is to learn the changes that occur when water is turned on to arid land. The transformation of the land from desert to farmland will cause, in the bird life, considerable change about which exact information is greatly needed. Some desert-loving species will almost or entirely disappear; others will adapt themselves to the altered conditions; and some species not before found in the region will extend their ranges into this area as it becomes favorable to them. It is known, in a general way, that such changes will occur, but in order to learn their exact nature, what species will be affected, or the rate at which the changes will take place, exact records are needed such as can be obtained only by means of bird censuses. There is especial need of such a study in regions affected by reclamation projects. In order to get a comprehensive view of the bird life under arid conditions, the work should begin at least a year or two before the water is turned on; and in order to follow the successive changes, it should continue indefinitely as the land remains under irrigation.

Under desert conditions there are large areas on which the animal life is nearly uniform, but this uniformity will seldom hold after the land has come under cultivation. The nature of the crops grown will to some extent influence these changes in bird life and determine the species that will leave and those that will come into the area. It is very desirable, therefore, that the plots for censuses be chosen in various parts of the affected area and include the different types of crops raised, in order that the information gained from the study may be comprehensive.

If it is impossible to take censuses every year, counts made at intervals of two or three years will at least record the general trend of events. The information thus obtained, however, will not be so accurate as when the counts are made every year; for under such circumstances it would not be possible to determine the exact year when a new species came in or an old one disappeared.

Lists of the birds seen in a single day, made from year to year over a given area at the same period of bird life, make in themselves interesting studies. While they give a fairly accurate basis for conclusions regarding fluctuations in the species present, they are less satisfactory as to variations in numbers. For the latter purpose censuses of breeding birds are more useful, since, if taken according to the methods recommended by the Biological Survey, many of the variable factors such as weather, seasonal conditions, and movements of birds which so affect the "day" list are thereby eliminated and, likewise, the personal equation is greatly reduced.

Obviously, there is some chance of error in the results, especially in making, from scattered bird censuses, generalizations for the country as a whole. This error would probably be greater in the West than in the East, since more variable factors, including those of altitude and humidity, enter into the equation. Were it feasible to take censuses over large sections of the country, error would be reduced, and the larger the percentage of the entire country represented by censuses the less would be the error. In taking a census over a large area it is much better to consider it as an aggregate of several smaller tracts, unless one set of conditions holds over the entire area. In deserts, areas of several hundred acres may be found where practically the same conditions prevail, but this will seldom be the case on cultivated land.

The need of statistics regarding the approximate numbers of birds and their relative abundance is being felt by ornithologists all over the world. Dr. Walter E. Collinge of England, in an article entitled "The Need for a Bird Census" (*Scottish Naturalist*, Jan.-Feb., 1921, pp. 22-24), has called attention to this need as a guide to proper measures for bird protection. To provide such statistics he proposed a bird census of Great Britain to be taken along the lines advocated by the Biological Survey. For several years studies of this nature have been made in Australia by some of the ornithologists of that country, as described by J. Burton Cleland, "A Method of Taking a Bird Census" (*Emu*, XXII, July, 1922, pp. 18-23). Thus far their method has been somewhat different from that followed in the United States; but their object has been the same, that is, to learn the relative abundance of the species, and to collect numerical data from which to make comparisons in years to come.

The bird census, as begun under the Biological Survey, has now passed the experimental stage and has an established place in the study of distribution and migration. It has proved to be an excellent means of gathering definite information on the numerical distribution of birds throughout the country and on the fluctuations that take place in bird life. It is also a valuable aid to protection and conservation, since it provides exact information regarding the increase or decrease of the various species. Furnishing, as it does, data for solving many problems dealing with bird life, the bird-census work should by all means be continued for many years to come.

U. S. Biological Survey, Washington, D. C., March 2, 1926.