BIRD - BANDING

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BIRD DISTRIBUTION AND BIRD-BANDING[1]

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DESPITE the tendency of the so-called "experts" in ornithology to congregate in museums amidst vast collections of dead specimens, the study of birds is, and must always remain, primarily a matter of mental occupation with live birds. There can be no doubt but that the dead hold many secrets, the discovery and elucidation of which should be the principal aim of the museum investigators, but, aside from this, their duties are largely comparable to those of librarians, the only difference being in the sort of materials to be handled, arranged, and classified. Still, no one who has worked with museum material, and who has exercised his mind thereon, will find it possible to doubt for an instant that much of value, that many and diverse facts of real significance, are hidden latent in the rows of skins, waiting to be observed, grasped, and understood. The possibility of culling significant data from such sources depends largely on the acumen and imagination of the individual worker, but also on the quantity and kind of facts, theories, and generalizations supplied to him by the total sum of recorded knowledge of living birds. The splitting of ornithological workers into two camps, the field and the "closet" groups, is more apparent than real. The local field observer, limited in the area and in the number of species familiar to him, relies on the systematic and distributional data afforded him by the museum workers, who study all parts of the world and all the world's birds equally. Conversely, the latter group may observe peculiar structures in certain birds, the meanings of which remain obscure until the field observer supplies the needed notes on the habits that go with the possession of those structures. The two groups work hand in hand, although each occasionally grows impatient and weary of the other, since new material of significance to both requires time for its dicovery and studied appraisal.

[1]Presented before the meeting of the Northeastern Bird-Banding Association in Boston, Massachusetts, January 16, 1931. Published by permission of the Secretary of the Smithsonian Institution.

One of the fundamental fields of inquiry that museum ornithologists have to deal with is that of geographic distribution. The fact that each species of bird (as well as of all other groups of organisms) has a definite range, both geographically and ecologically, is one of the first things that impresses itself on the mind of the student. Furthermore, the fact that no two species have exactly the same distribution prevents the problem from being studied in a mechanical, empirical, statistical manner. Each species appears, at first sight, to be a law unto itself; the geographical or ecological factors that appear to be correlated with the actual range of one form may not apply at all to another, while the discernible factors in the second may be quite different again from those operating in a third. However, if ornithological science (when freed from sentiment) is to become an effective and orderly interpretation of bird life in all its aspects, we must assume that beneath all this seeming irregularity and luxuriant lack of harmony, there are underlying laws, processes, rules, etc., by which, either individually or collectively, the governing factors produce the great maze of diversities in the distribution of birds and the spatial relationships of allied races, species, genera, etc. Unless this type of assumption (which has been validated time and time again in all branches of science) is made, distribution will remain a hopelessly pluralistic and confusing mass of facts incapable of scientific analysis.

The thoughtful student of bird distribution, who has read and assimilated a greater or a lesser amount of the vast literature of the subject, will notice, upon reflection, that the entire subject, at least in its main features, is based on circumstantial evidence, and not too conclusive evidence at that. We observe that a certain species has a certain range, that certain genera or families are restricted to certain islands or continents; we learn that certain geological changes appear to have taken place in past ages (or, often, we willfully, although not consciously, convince ourselves that they have); then we assert that the present distributional facts are the effects of which the past geological (or climatological) changes were the causes. It cannot be denied that this inference is probably correct in many cases, but to say that it is so in all, is certainly more than one may claim with justification. Unfortunately we have no sure way of telling in which cases the inferences drawn are justifiable and in which they are not. The inevitable result is that all are open to suspicion alike. The tremendous bulk of the total of all these individually inconclusive cases is so great that we feel obliged to admit a good deal of truth in it

and to rely on the proposition that while many fragments of its content are not too definite and certain, yet, on the whole, the mass of data is not incapable of yielding trustworthy generalizations.

There is one point which, for some unknown reason, has been neglected very sadly hitherto. We have amassed quantities of data concerning the distributional pictures of individual species, but we have not yet begun to understand (hardly even to study) the mechanics of dispersal in any single case. It is quite inconceivable that any species suddenly came into existence simultaneously over a wide area; hence it follows that every species inhabiting a range of appreciable geographic size, must have spread out subsequently to its origin in one locality. Thus, every wide-ranging species is essentially an "introduced" species in most of its present range. Its success is reflected in the amount of space it has come to occupy in the course of time. Of the many loosely defined concepts prevalent in ornithology to-day, one of the most commonly used is that of "adaptability". We say that one species possesses this characteristic to a greater extent than another, and is consequently more abundant or more widely distributed than the other. It is a curious (and illogical) fact that we tend to forget completely this variation in adaptability in different species when studying their present distribution. We make the mistake of looking upon all species as affected similarly by similar conditions, although we are quick to take the opposite view when this error is pointed out to us.

It is undoubtedly true that all species are affected by external conditions, but it is misleading to consider their distribution as wholly a matter of temperature, humidity, past geological changes, etc. Probably the reason why we have been in the habit of doing so is that we did not have available for study any of the actual dispersal reactions of the species involved. The data of dispersal are badly needed in order to enable us to judge the validity of many of the ideas, expressed and inexpressed, in our present "science" of zoögeography.

Before passing to the discussion of these data and the manner in which bird-banding may be utilized to good advantage, we may be permitted to make one more comparison. The study of animal structure, the field of comparative anatomy, is quite similar to the present study of distribution. It is true that a study of the structure of an organ or a system of organs in a large number of species might lead the anatomist to form conclusions as to the similarities and differences found. But it is only when he begins to study the development of

these organs that he first becomes aware of real homologies, that he becomes able to distinguish between the fundamental similarities in basic structural elements and the more superficial similarities due to similar growth processes or purely physical forces. Embryology explains, clarifies, and puts new significance into comparative anatomy. So, too, will a study of the mechanics of dispersal put new meaning into the records of distribution. Distribution is dead, is static, is like a series of still pictures, while dispersal is alive, dynamic, and more like a continuous motion picture.

In the study of the mechanics of dispersal we must limit individual studies to single species, and then the matter of the identity of the individual birds observed becomes a matter of paramount importance. We must be prepared to find that a very large number of factors play a part in shaping the geographic "course of progress" of any species. In fact, if the present discordant and chaotic data of distribution convey any suggestion of underlying method, it is that of the interplay of a great many elements in different degrees and combinations. This is not very easy to conceive ordinarily, but it is true, all the same. We may gain a little insight into the nature of this complexity by comparing the distribution of birds to a symphony played by a great orchestra comprising a great many individual musicians. At any one moment, the individual sounds produced by each of the many instruments in the orchestra fuse and blend to form one auditory effect. This single effect is comparable to the range of one species of bird. Throughout the whole symphony no two instants are exactly alike in their sound summations, just as are the distributions of no two species wholly similar. Each of the instruments in the orchestra is like one factor (such as temperature, volcanic change, etc.,) in the environment in which birds are distributed. In the production of certain sounds all the instruments may be combined; in others, only certain ones and not certain others; in some, the resulting sound may be a simple summation of all the component sounds; in others, two of the component sounds may be mutually interfering and obliterate each other, just as interfering light waves cause momentary blackness or "twinkling" in some lights. In other words, just as there is a whole polyphony of sound in each resultant note of a symphony orchestra, so each present distributional fact represents a polyphony of causes and limiting factors. Undoubtedly many of these are irretrievably buried in the past, but many of them may be discernible to seeing eyes, given the proper favorable conditions. If, by studying the mode of

dispersal of a few of our common birds now actively extending their ranges, we could formulate expressions of the effects of individual factors, and of their interplay with each other, we should be in a position to examine the now static pictures of distribution with more penetrating discernment and understanding, and the harvest of new information would not only be very considerable, but would go far to show that many apparently contradictory distributional facts are really only modifications of one and the same thing.

We have a unique opportunity at the present time in that we have in our midst a successful introduced species, the European Starling, rapidly extending its range on this continent. With the growth of feeling against the introduction of foreign birds, we may never have another chance so pregnant with possibilities for the study of dispersal. The bird-banders of the Middle West have an unparalleled opportunity, and it is to be hoped fervently and sincerely that they will make the most of it. It is a little awkward for one not actively engaged in banding work to attempt to advise others what to do in their own field, and the few suggestions outlined below, are offered in the hope that they may be acted upon while the opportunity of studying the Starling is still here.

1. *Sex-ratio.* It is a matter of common knowledge among bird-students that, in most species, the individuals that establish the breeding territories in the spring are males and not females. Therefore, the matter of sex-ratio assumes a new importance as a factor in determining the dispersal rate of a species. If the males out-number the females, there will be a correspondingly quicker occupation of new area, even though it may not all be actually utilized for breeding purposes the first year. Also, it may well be that in the case of most species (in which the males are more numerous than the females) the male mortality rate is lower while the species is extending its range than after it has reached a stable equilibrium in its geographical adjustments. To determine the sex-ratio, all that is needed is for some properly accredited person to collect some dozen or twenty nests with young, and determine the sex of the nestlings by dissection. Once this was done for a species, it would not have to be repeated by every bander, so the loss of bird life would not be great, and, in the case of the Starling, probably not regretted by most bird-students. Other young birds should be banded and records kept of the exact location of the nests from which they came. Then, in the course of a few seasons, if sufficient numbers were banded, it should be possible to get some idea as to whether one sex was more aggressive

geographically than the other, and if so, which one, and the relation between the sex-ratio and the rate of spread would then be easy to outline.

2. *Single* versus *multpile broods.* Inasmuch as dispersal is undoubtedly related to the question of the supply of food and nesting-sites, the fecundity of a given species is a matter worthy of study. In the case of a multiple-brooded species, do relatively more of the young of the first or of the second brood survive? Do the young of the first brood return next year ahead of those of the second brood, thereby forcing the latter individuals farther afield for the establishment of their territories? If this be so (there is no evidence one way or the other), then multiple broodedness would have an influence on the dispersal rate that never could be sensed later on when the species is no longer extending its range. Also, this question is linked up with the matter of sex-ratio, as it is not impossible that the sex-ratio may change from the first to the second brood. It is a well-established fact that in domestic poultry the majority of the eggs laid in spring and early summer are male-producing in their potentialities, and that later on the percentage of males decreases and that of female-producing eggs increases. It may be, therefore, that first broods produce a higher percentage of males, and second broods, of females.

3. *The actual distance from the original nest-site to the territories, next year, of the young from that nest.* This undoubtedly varies in different species, and is probably correlated with many other factors, but it would be invaluable to have such comparative data for our common birds.

4. *The effects of early* versus *late breeding-seasons.* If, as seems likely, it is easier for a bird to become established in a region where it has been before than in one wholly new to it, then it may be that birds breeding early in the season might advance in their geographic dispersal more rapidly than late breeders, as the young of the year would have all of late summer in which to wander about before migrating south. In these post-nesting, pre-migrational wanderings (so enormously distorted in some of the herons) the birds may establish the contacts with the peripheral areas helpful in establishing breeding-areas there the next year. Or, on the other hand, late-breeding adults may wander about after arriving from the south and before commencing to nest. Both may be true. Either or neither may hold in specific cases. Only banding studies can supply the answers.

5. *The effects of inbreeding.* The work of Baldwin and his associates has demonstrated the amount of inbreeding going

on in one species, the House Wren. Inbreeding affects organisms in too many ways to go into here, but the point that may be made is that inbreeding would have less chance of occurring in a species actively expanding geograpically than in one spatially fixed and settled.

6. *The migration of groups within the species.* Do the young of the first brood migrate with or before or after those of the second brood? Do they return together or one before the other? What correlations are there between the order of arrival and the spatial relations of the breeding territories?

7. *Determination of the extent of the feeding ranges, breeding territories, etc.* Some work has been done along these lines, with good results, but more data are needed, and the studies should be correlated, not left as isolated fragments.

The number of things to be done may be endlessly extended, but it is hoped that enough have been suggested to form a starting point. Aside from the banding experiments themselves, bird-banders should keep records of temperature, humidity, etc., according to the nature of the problems investigated, just as a laboratory experimentalist would record the physical constants and variables in his experimental rooms and cages.

Lest it be thought that the Starling is the only bird available for a study of distribution in the making, for an investigation of the dynamics of dispersal, it may be mentioned that everywhere throughout this country clearings are being made, farms are being deserted to forest, swamps are being drained, etc., etc. All of these offer the chance for certain species to spread into the thereby newly formed suitable environments, so that we have in these cases the same thing on a smaller scale that is shown in the Starling on a greater plane.

All bird-students, whether they be museum workers or field observers, will benefit mutually by the results of studies of this sort. No one person will supply all the necessary data for even one species, but all will be in a position to contribute their notes more intelligently, once the mass of facts begins to assume a meaningful form. If the task seems full of difficulties, we must remember that the things that are easy to do have all been done long ago, and also that there is a keen mental joy in the overcoming of obstacles, in wresting the secrets from nature without disturbing it unduly in the process.