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## COMMENTS ON THE MIGRATION OF STARLINGS IN EASTERN UNITED STATES

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The origin of migration of birds is shrouded in mystery primarily because it began so long ago. However some clarification may be obtained from the study of the Starling (*Sturnus vulgaris*), which has developed migratory patterns since its introduction into the United States. Unfortunately since the exact source of the introduced birds is not known, it is impossible to know whether they belonged to a migratory or to a sedentary race. In any case the pattern of spread (Kessel 1953) does not suggest the prompt beginning of extended migration but rather spread by diffusion, probably by subadults principally. It has been clear for sometime (Kessel 1953) that some starlings are residents while others migrate. In Britain (Bullough 1942) characters to distinguish resident and migratory birds have been found, but in North America none of the characters reported by

Bullough are satisfactory although extensive examination has been made (Davis, unpublished). Unfortunately while thousands of starlings have been banded in the United States, few have been banded during the breeding season and few of these have been sexed and aged. To contribute to the understanding of the origin of migration, large numbers of birds should be banded in the breeding and summer season (April-September) and their age and sex recorded.

The purpose of the present paper is to review some banding results since Kessel (1953) examined the files of the Fish and Wildlife Service and to urge the study of starlings to clarify biological problems. Conventional methods of banding and analysis were used. The starlings were captured for banding in 3 ways. (1) Many persons banded a few starlings that were trapped, caught in nest boxes, or by some other means obtained. (2) Several persons caught a very large number in "walk-in" traps. In particular Rev. Detwiler and Mr. George Matlack in New Jersey captured as many as 2000 a month as the birds went to their roosts in marshes. (3) A few banders trapped some thousands in roosts in buildings in winter. Davis (see 1959) banded about 5000 at a roost in Baltimore. All types of recoveries and recaptures were used for analysis.

The results of recoveries of Starlings banded from 1955 to 1958 inclusive from Virginia north including Ohio and Ontario were made available through Mr. Allen Duval, of the U. S. Fish and Wildlife Service. The records for 1951 to 1954 were also available but were omitted because they are few in number and inconvenient to analyze due to the method of recording localities.

The individual records were not checked for errors because the task is herculean, and, more importantly, the conclusions are not numerical. A basic problem in recoveries is to know what the chance of recovery really is. For example, a starling has a much better chance of recovery in New Jersey than in New Brunswick, Canada. But until these values can be obtained no numerical comparison can be made. Thus the correction of a few errors that surely are present is not worthwhile since no rates of recovery are being calculated. The results here reported are strictly qualitative and are not presented in tabular form.

The results were organized in terms of the location of banding and of recovery and of seasons. For present purposes birds banded or recovered in March and September were omitted because there is a high probability of migration in these months. Certainly a few of the April and October birds were also migrants. Birds banded or recovered from October through February were called winter birds while birds banded or recovered from April through August were called summer birds.

From the detailed data we can see several results. (1) Many New England birds are residents as shown by the fact that birds banded in winter were recovered there in summer and birds banded in summer were recovered both winter and summer. Also some birds migrate north to Canada and south to Pennsylvania. (2) Some starlings in Delaware and Maryland are residents and others migrate north but not south. (3) Many starlings in eastern Canada are residents. (4) Birds banded in New Jersey in winter are highly migratory but some remain through

the summer. (5) Starlings captured in New York and Pennsylvania tend to be resident.

Some points attract attention. Though thousands of birds were banded in winter in the New Jersey-Maryland area, only three are recorded south (one near Richmond, Virginia and two near Charlotte, N. C.) (These 3 records were checked for errors in the files.). Indeed not one of the 5,000 birds banded in Baltimore has been recovered more than a few miles south of the city. Considering the dense human population in metropolitan Washington and Virginia it seems necessary to conclude that movement south is very rare.

The trivial number of recaptures in New Jersey of birds banded while in the north is noteworthy. Only two birds banded north (both from New Hampshire) were caught in the winter flocks, yet many birds go north. It seems likely that some peculiarity of sampling occurs here.

The number of resident starlings appear high in New York and Pennsylvania but this result may be due to the nature of sampling.

These results confirm previous work (Kessel 1953; Kalmbach 1932) that starlings are migratory but emphasize that many individuals are sedentary. A suggestion made in conversation by Rev. Detwiler deserves consideration. Analysis of the recoveries indicates that the starlings may have a circular migration, down through New Jersey in the fall and then up the Susquehanna valley in the spring. The results of banding in Maryland agree with this suggestion because the spring recoveries occur in Pennsylvania and Central New York, while the fall recoveries occur in New England.

The nature of the results here reported are definitely tentative because the sampling of the population is inadequate. It is important for a solution of the problem of migration in starlings that cooperators band starlings instead of wringing their necks. While it is valuable to band birds in roosts, special effort should be made to band residents in spring and summer. Starlings are notoriously trap-shy but can be captured easily in nets. The best arrangement is to take advantage of the starling's desire for an evening bath just before dinner. The arrangement of a net between a bird bath and bread scattered on the ground will capture many residents in the 3 hours before sunset. The bird bander has a splendid opportunity here to help unravel a profound mystery, the origin of migration. Banding large numbers of local birds will provide information necessary for analysis of this perplexing problem.

The sex and age must be noted. The characters are well-known (Bullough 1942; Kessel 1951; Davis 1959) but perhaps should be repeated. Sex is easily determined by the brown ring around the iris: present in female, absent in male. The ring may not be complete in some females. The chance of error is small since about one percent of the females lack the ring and about three percent of the males have a ring (Davis 1959). Age can be determined by the length of feathers on the lower throat. To obtain feathers hold the bird in the cup of the left hand with the thumb and index finger grasping the back of the neck. Then with the right hand jerk a dozen or so feathers from the lower throat just above the junction of throat and body. (The thumb of the

right hand should be far enough down the throat to just touch the upper end of the sternum.) The measurement is made of the length of only the iridescent part of the feather thus excluding the white tip (present in fall and winter) and the dull base. Since the iridescence fades into the dull base some difficulty occurs in deciding the exact point. However this point is critical in only a small number of cases. It was shown (Davis 1959) that starlings can be divided by the length of the iridescence into two age groups with only a small area of overlap of measurements. Naturally in a series of measurements some adults will have short feathers and some subadults will have long feathers. However boundaries can be set for an "indeterminate" class to include such cases. The data (Davis 1959) show that less than 20 percent of each age will fall in the indeterminate class. The following standards for the length of the iridescent part of the feather may be used.

|        | Adult            | Indeterminate | Subadult         |
|--------|------------------|---------------|------------------|
| Male   | More than 12 mm. | 10-12 mm.     | less than 10 mm. |
| Female | More than 7 mm.  | 6-7 mm.       | less than 6 mm.  |

For measurement a ruler may be marked by blotting out the part between 6-7 mm. with red and the part between 10-12 mm. with blue. Thus a female feather shorter than the red is a subadult and longer is an adult. Similarly a male feather shorter than the blue is a subadult and longer is an adult.

In considering the determination of age of starlings it is important to remember that this species has no spring molt. Thus a bird assumes its nuptial plumage in the fall and carries it till August, permitting distinction of birds in their first year (subadult) from older birds (adults).

#### SUMMARY

Examination of the records in the files of the Fish and Wildlife Service of recaptures of starlings confirms that some birds are resident and some migratory. While some qualitative results may be gleaned from the records, lack of information about age and sex prevents certain types of analyses. Banding and recording data on starlings may help to clarify the problem of the origin of migration, since it is clear that some starlings migrate while others do not.

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