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MIGRATION OF THE COMMON COTURNIX IN NORTH AMERICA*

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The recent introduction to North America of some 172,000 Quail *(Coturnix coturnix)* from Japan is the most extensive attempt at introduction of an exotic game bird in recent years. This paper chronicles records of 143 banded recoveries of this species in North America taken prior to May 1, 1958 and recovered either more than 100 miles from point of release or 60 days subsequent to the release date. These birds were probably all descended from the same genetic stock of 140 breeders imported from Japan in 1953 by J. W. Steinbeck of Concord, California and propagated by various state game departments. Presumably all birds released were hatched in incubators and were artificially brooded.

Table 1. Common Coturnix releases and recoveries

Release Area	*Number Released*	*Band Returns**
Arkansas	1,633	10
California	5,066	1
Georgia	3,472	7
Illinois	1,700	3
Indiana	20,819	6
Missouri	23,745	6
Nebraska	23,740	20
Nevada	64	0
New Hampshire	2,000	0
North Carolina	1,196	1
Ohio	9,978	13
Oklahoma	61,277	53
Texas	9,600	5
Virginia	7,575	18
TOTAL	171,865	143

* Note: All band returns except nine resulted from releases made during 1957. The nine returns resulting from releases made during 1956 included four from Missouri, one from Illinois, one from Ohio and three from Virginia.

Geographic analysis: Because there appears to be some tendency for Common Coturnix released in North America to migrate in a converging

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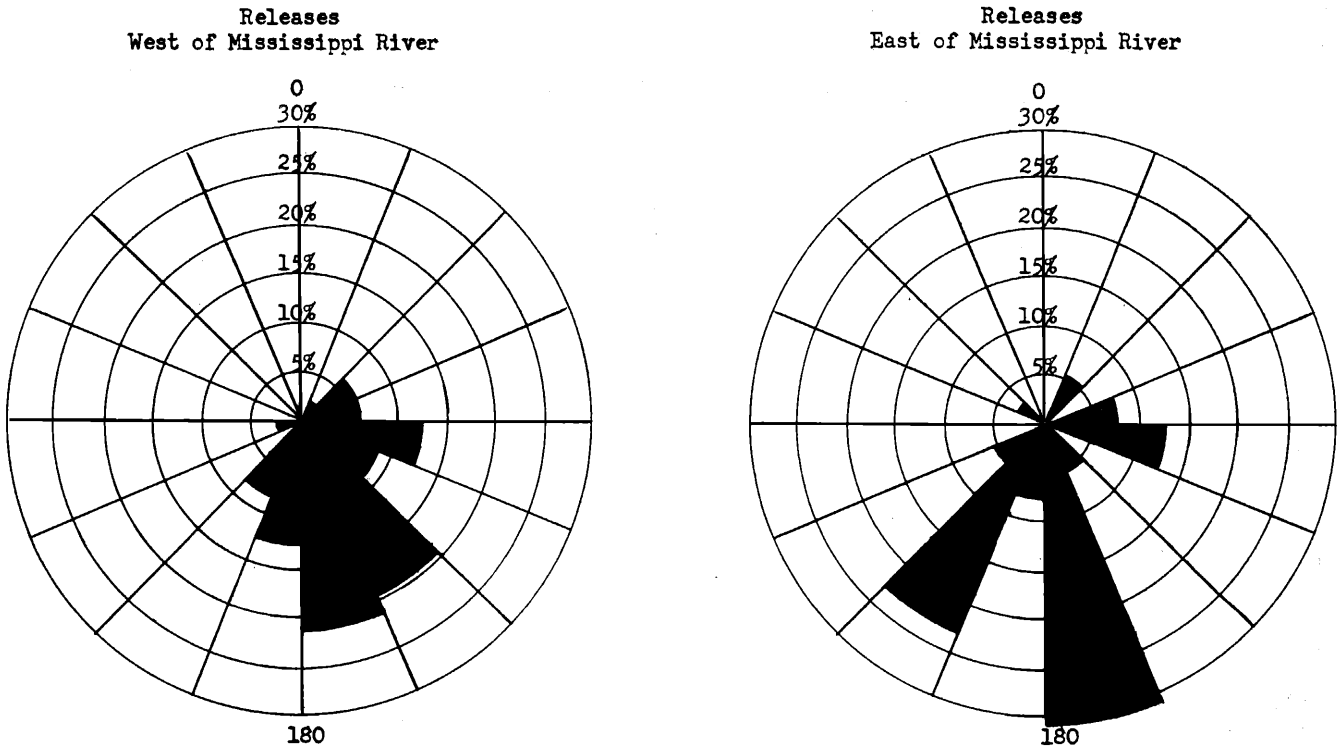


Figure 1. Directional movements of released Common Coturnix. Bands recovered more than 100 miles or 60 days from the point of release and shown in directional travel segments and expressed in per cent.

pattern toward the land areas adjacent to the Gulf of Mexico, the band return data have been separated into two sectors for geographic analysis. The Mississippi River was selected as the separation line between the east and west sectors. The apparent convergence might be the result of greater opportunity for western liberated birds to be recovered farther to the east than to the west or south of the point of release.

The number of birds released through May 1, 1958 was 171,865. Releases from the east sector totaled 44,804 and releases from the west sector totaled 127,061. The 14 states listed in table 1 and the State of Washington planned to release approximately 127,000 additional birds during 1958. At least three other states—Tennessee (Due and Ruhr, 1957), Louisiana and Kentucky—participated in the program but their data are not available.

The 143 returns that met the "60 day or 100 miles" requirements of this study represented .08 per cent of the birds released. Returns were further categorized in three groups on basis of travel distance, "0 to 10 miles," "10 to 100 miles" and "more than 100 miles." Individuals in the "0 to 10 miles" group were not plotted as to direction of travel; the other two groups were mapped and graphed.

The "more than 100 miles" group consisted of 60 per cent of all the returns. Recovery occurred at an average distance of 298 miles from the point of release. There was a definite trend toward a southward movement from the areas of release as well as a less pronounced movement eastward. When the east and west sectors in figure 1 are compared it is evident that some degree of convergence occurred during the general southward movement. The most pronounced direction of travel for birds in the western sector occurred between 135 and 180 degrees, whereas the direction of travel for birds in the eastern sector occurred between 157° 30′ and 225°. Southward movement was more pronounced in the east than in the west. A comparison of the returns of this long-distance group with the "10 to 100 miles" group indicated that directional stabilization occurred.

The "10 to 100 miles" group was plotted as to direction and distance of travel. This group consists of 21 per cent of all the returns. Recovery occurred at an average distance of 42 miles from the point of release. Movement to the south was not as pronounced in this group as it was in the "more than 100 miles" group. The average distance traveled was 71 miles for birds of this group in the east sector and 34 miles in the west sector. It is apparent that birds in this group in the east tended to move more continuously once they were out of the area of release than did the birds in the west.

The "0 to 10 miles" or sedentary group consists of 18 per cent of all the returns. Recovery occurred at an average distance of 1.3 miles from the point of release. This group was not plotted as to direction of travel as only four returns were taken out of the general release areas. No recoveries of sedentary birds were reported north or east of a line from Nebraska to Oklahoma and from Arkansas to Georgia (fig. 2).

Temporal analysis: While the numbers of records are insufficient to draw definitive conclusions, the records available suggest a migration pattern that fits rational expectations. The calendar date of release and

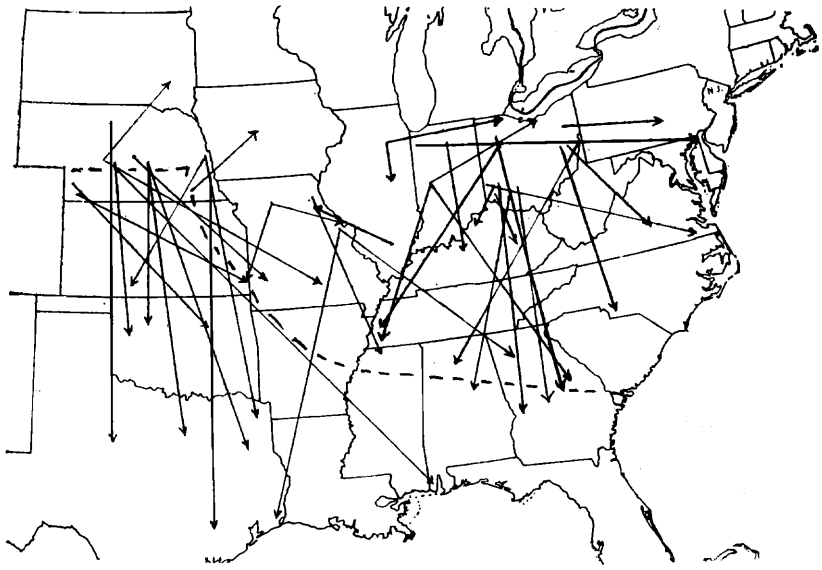
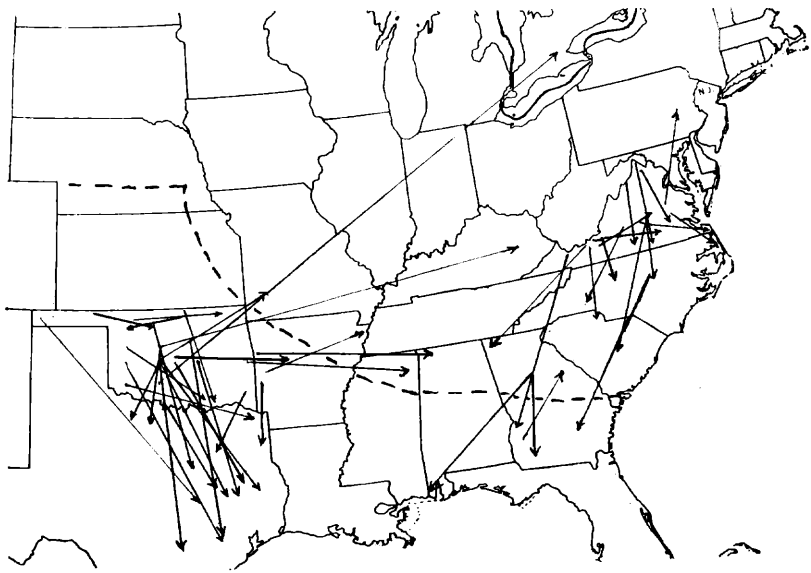


Figure 2a, b. Movements of released Common Coturnix. Broken line indicates the geographic limits of recoveries of sedentary birds.



the weather were the important factors determining recovery locations and numbers. Most of the birds perished from predation, starvation and exposure when introductions were attempted in the early spring before there was adequate cover. The Indiana to Maryland record cited below for a bird released in April may be regarded as the extraordinary alternative to such a fate. The records indicated that introductions made a little later in the spring either established themselves near the point of release or migrated north. An example of the latter is a bird released June 13, 1957 in Powhatan County, Virginia that was taken at Hamburg, Pennsylvania July 7, 1957; while another released as late as July 9, 1957 in Bourbon, Kentucky was recovered in Saginaw, Michigan about 107 days later (Stephens, ms.). Common Coturnix released in the summer in adequate habitat settled down to breeding. Undoubtedly the judicious selection of good season for making introductions was far more important for success than the number of birds released through the year. Subsequent recoveries revealed that July 17, 1957 was the optimum date for release in Nebraska. In late fall most hunter recoveries were taken south of their release points.

One bird released July 17, 1957 in Nance County, Nebraska was recovered alive March 11, 1958 in Hall County, Nebraska (Wetherbee, ms). As six other birds of this release group were taken during the winter in Oklahoma and Texas, and as there was an absence of winter records substantiated by specimens in Nebraska, the above unique recovery may be evidence of return migration in the spring.

Biological analysis: Our data indicate that the introduced Common Coturnix in North America does not generally emigrate southeast and perish at sea (Phillips, 1928). However, there is one record that should cause students to keep that idea in mind. A seven week-old male that was released in Morocco, Indiana, April 23, 1957 was recovered June 5, 1957 at Darlington, Maryland (see temporal analysis). It should be remembered, however, that the suggestion was first made on the basis of nineteenth century introductions of the European race (birds hatched in Europe), not of the Asian race (birds hatched in North American incubators). The slight southeast vector in our data, it is to be noted, occurs at a latitude of prevailing westerly winds and on a land mass having southeasterly river drainage in the western (most heavily sampled) sector. There is less of a southeast tendency in the eastern sector, perhaps commensurate with the drainage influence in the eastern sector. The relative orthodoxy of migratory behavior in these introduced birds, and the paucity of fluky data are the more surprising as Moreau (1951), after intensive study in Europe, concluded that the patterns of migration of the European subspecies are probably not standardized even in the Old World.

The relatively low (.08 per cent) ratio of recoveries to birds banded is probably only partly a function of poor release techniques: in Japan, Austin and Kuroda (1953) reported a recovery of eight per cent from 12,554 native Common Coturnix banded over a twelve-year period. Toschi (1956) recovered one per cent of half a million Common Coturnix banded, transported from points of capture and then released on hunting areas in Italy. It is not to be assumed that the bias in Toschi's data is any less than in our own for our data are further restricted to recoveries made more than one hundred miles or sixty

days from point of release. The percentage of band recoveries in North America is relatively excellent even though it may seem to be small in an absolute sense. Returns from all large scale releases of hatchery-produced Bobwhite *(Colinus virginianus)* (Buechner, 1950) are comparable to our returns of the Common Coturnix. For example, Hanson (1947), summarizing the data on Bobwhite restocking in Oklahoma for the period 1942-1946, reported 1.26 per cent of 57,062 released birds were recovered. The comparison is still more favorable when one considers that the Bobwhite is sedentary and is selectively hunted while the Common Coturnix is migratory, frequents large expanses of open grassland and is not selectively hunted.

A potentiality of a consolidation of the artificially sustained population is suggested by the recovery at the same site in Oklahoma, in late fall, of a Common Coturnix released in Nebraska in July and one released in Oklahoma in August.

Most birds recovered were shot by sportsmen. Other decimating agents, especially near the sites of release, included hawks, crows, strung wires and harvest machines. The summarization of recoveries as early as a year after release date is possible because of the almost complete population turnover each year. The accelerated life history of this species causes the Common Coturnix to have perhaps an even more rapid population turnover than does the Bobwhite and suggests the possibility of extreme fluctuations in population levels if the introduction is a success in this country. In Japan, Austin and Kuroda (1953) found that ninety per cent of the recoveries of native Common Coturnix were taken within the first year after banding. Catastrophic population crashes have been experienced in England and the subsequent comeback is slow (R. E. Moreau, personal communication).

It may be ten to twenty years before an adequate evaluation can be made of the ultimate biological success of the Common Coturnix in North America. This *Drosophila* of the avian laboratory has proved its worth as a laboratory pilot animal in genetic and physiological study. Therefore escaped birds will continue to be observed even should deliberate introduction stop. Most agencies plan a respite in making liberations after the 1959 season.

Summary: Records of 143 banded recoveries of artificially propagated Common Coturnix in North America suggest that that species probably will have an orthodox north-south migratory behavior on this continent if naturally breeding populations can be established. The rapid population turnover suggests extreme fluctuations in population levels, and the necessity of wide geographic range and close management if the introduction is to be a success in North America.

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SOME INSECT PARASITES ASSOCIATED WITH THE EASTERN BLUEBIRD IN MICHIGAN

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Birds are known to have many external and internal parasites which may effect their health and numbers. O. E. Plath (1919) mentions two species of blowflies *(Protocalliphora avium* and *P. splendida)* the larval stages of which are external blood-sucking parasites of nestling birds. He studied 63 nests of five species of birds in western United States and found 39 were infested, often causing the death of the nestlings.

Boyd (1951) states that blowfly larval parasites of birds are typically nocturnal and feed intermittently. Mud constructed nests and nests in holes are favorable abodes for parasitic *Protocalliphora*, for the life cycle may be passed within the nest itself. Death of fledglings from such infestations has been frequently reported.

Sabrosky and Bennett (1956) recognize 21 Nearctic species of *Protocalliphora*, 13 species of which were found in Algonquin Park, Ontario. *Protocalliphora metallica* and *P. sialia* are the only forms definitely known by Sabrosky (1959) to occur in Michigan, although based on general distributional records at least eight other species seem likely to be discovered in this state.

In the Midland area, from 1956 to 1959, I have banded 61 Eastern Bluebird *(Sialia sialis)* nestlings and adults from nests. Not until 1959 did I find any larva of *Protocalliphora* actually feeding on the birds. On these occasions the birds were examined at twilight, indicating the nocturnal habits of the parasitic fly larvae. Even then, only a few out of hundreds of larvae were feeding at any one time, the rest being an inch or 2 away in the bottom of the nest, often out of sight, and nearly or completely engorged with blood.

In 1959 I found eight bluebird nests in the Midland area, of which four were successful. A few "case histories" of successful nests will illustrate the magnitude of the parasitic insect population of *P. sialia* maintained by bluebirds: