

MOVEMENTS OF IMMATURE MOCKINGBIRDS BETWEEN SWAMP AND RESIDENTIAL AREAS OF PINELLAS COUNTY, FLORIDA*

By HERBERT W. KALE II AND WILLIAM L. JENNINGS

Juveniles of many species of birds gradually disperse away from their nest locality, after becoming independent from parental care, and congregate into loose roving bands of immatures of the same species. This dispersal is often initiated by the parent birds who actively drive the young away as in the case of the Song Sparrow (*Melospiza melodia*) studied by Nice (1943). In some species dispersal may be voluntary. Michener and Michener (1935) reported that Mockingbirds (*Mimus polyglottus*) did not drive the young out. The immature birds voluntarily left home quite soon after they were able to feed themselves and moved around singly or in groups, remaining only a short while in any one place. However, Woolfenden and Rohwer (personal communication) who were concurrently conducting studies of breeding birds in residential areas of St. Petersburg, Florida, frequently observed adult Mockingbirds driving young birds from their territories. Regardless of how the dispersal is initiated it is readily apparent that, as Laskey (1962) has already noted, "from August into October there is considerable activity and movement among Mockingbird populations."

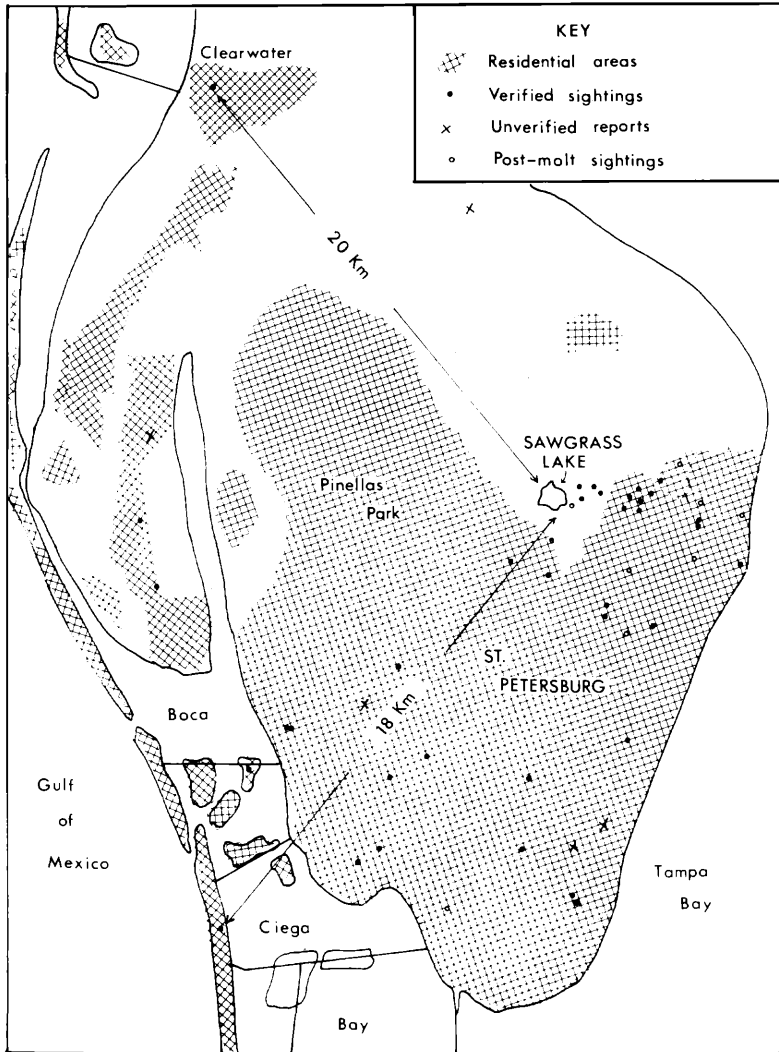
Numerous banding studies have revealed the breeding and wintering areas of birds and their tendency to return to these same areas each season (Mewaldt, 1964). However, post-fledgling movements of young birds with newly acquired independence have received relatively little study. Laskey (1962) reported a November recovery of a young Mockingbird 128 km (80 mi) from its May banding site in Nashville, Tennessee. Most of the young birds she studied remained in the Nashville area until October.

The present paper reports observations on the movements of a population of immature Mockingbirds into and away from a swamp located near St. Petersburg, Florida, a city comprised primarily of residential areas.

Beginning in mid-June and continuing throughout July and most of August, 1964, numerous immature Mockingbirds were observed feeding on Elder (*Sambucus simpsoni*) berries in Sawgrass Swamp (hereafter referred to as Sawgrass), a maple-willow swamp surrounding Sawgrass Lake located just north of St. Petersburg in Pinellas County, Florida (See Figure 1). Breeding studies conducted by Dr. Glen E. Woolfenden and Mr. Sievert A. Rohwer II (MS) revealed that Mockingbirds did not nest in the swamp but did breed in the residential areas of St. Petersburg and Pinellas Park, located southward and westward, respectively, of Sawgrass. The first ob-

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Fig. I. Map of the southern peninsula of Pinellas County showing dispersal of marked mockingbirds from Sawgrass Lake during July-August 1964.



servation of Mockingbirds (3 immature birds) in the swamp was noted by Woolfenden on 15 June when the Elders were heavy with ripening fruit. Thereafter, numerous Mockingbirds were seen during each visit to the area.

Immature birds of several other species also fed on the elder berries including (numbers represent birds netted and banded) Yellow-billed Cuckoo (*Coccyzus americanus*)-3; Yellow-shafted Flicker (*Colaptes auratus*)-3; Red-bellied Woodpecker (*Centurus carolinus*)-

3; Great Crested Flycatcher (*Myiarchus crinitus*)-5; Starling (*Sturnus vulgaris*)-13; Red-winged Blackbird (*Agelaius phoeniceus*)-14; Common Grackle (*Quiscalus quiscula*)-1; Cardinal (*Richmond-ena cardinalis*)-12; and Rufous-sided Towhee (*Pipilo erythrophthalmus*)-5. Considerably fewer numbers of these species were present compared to Mockingbirds.

Twelve to 20 small and medium-mesh Japanese mist nets, 12 m. in length, were placed close to the elder shrubs growing along the outer edges of the swamp in an area that had been cleared earlier during construction of a mosquito control canal. These were tended from dawn until 10:00 or 11:00 a. m., the first three days of each week. After 10:00 a. m. so few birds were caught in the nets that netting was discontinued for the day. After the first week in August, netting operations were discontinued because of the lack of concentrations of ripe berries. Mockingbirds were still numerous throughout the swamp feeding in isolated elders.

Each captured Mockingbird was processed as follows: Age was determined by examination of breast feathers. Birds were classified as immature if these feathers were speckled, or as an adult if un-speckled. Adults also possess a bright yellow iris whereas the iris color of immatures ranges from green to gray to dull yellow. A numbered, aluminum, Fish and Wildlife Service band was placed on one leg and a tag cut from red plastic adhesive tape was placed on the opposite leg. A blood sample was taken from the jugular vein for serological examination, the tail was then dipped in a permanent red dye (Ziehl-Neelsen carbolfuchsin acid-fast stain) and the bird released. All other species were only banded, bled and released.

During the processing of the first 20 or so Mockingbirds it was noted that a high percentage appeared to be infected with an avian pox virus, mostly on the head, legs and wings. Thereafter a record of visible infection was kept for each bird. Three infected specimens were sacrificed and sent to the U. S. Fish and Wildlife Service Disease Laboratory at the Patuxent Research Center for viral studies.

Newspaper articles about the project were published in the *St. Petersburg Times* on 31 July and 5 August 1964 requesting cooperation of the public in reporting sightings of marked Mockingbirds. Each sighting report was investigated, insofar as possible, and the observer interviewed to verify the observation.

RESULTS

Table 1 summarizes the results of the color marking program. The results of the serological phase of this study will be published at a future date. It was estimated that only a small percentage of the Mockingbirds that entered the swamp were netted. Nets were rarely more than 2.5 to 3.6 m. (8-10 feet) in height and for every Mockingbird in the net several were observed in nearby shrubs and trees, some of which were 15-18 m. (50-60 feet) high. A total of 189 Mockingbirds were marked and released. Only two of these were adult birds.

In addition to the three birds sacrificed for pox studies, seven Mockingbirds of the 199 captured died in the net or shortly after

removal of the blood sample. This represents a mortality of 3.6%. Such an operation mortality might be considered high except for the fact that over half of the birds were infected with avian pox (see below)—a disease that weakens its victims and makes them highly susceptible to secondary infections and physical stresses of one kind or another.

TABLE 1. SUMMARY OF RESULTS OF MOCKINGBIRD COLOR MARKING PROGRAM IN SAWGRASS SWAMP NEAR ST. PETERSBURG, FLORIDA, JULY-AUGUST 1964

Mockingbirds	Total Numbers
Netted	199
Color-marked	189
Recaptured ¹	18
Recovered ²	3
Sighting Reports (by public)	46
Verified (positive) observations	38
Unverified or doubtful observations	8
Post-molt observations ³	7

¹Individuals retrapped at least one week later. Birds retrapped within a three day period not included.

²Birds found dead (1) or killed by cats (2).

³Sighting made from mid-September through November. These observations are in addition to the 46 sighting reports by public.

Some of the marked birds remained in the area, but most of them were never caught again. A few individuals were recaptured two or three times during the same three-day netting period in which they were originally captured. However, only 18 (9.5%) were recaptured during a subsequent netting period one week later. None were ever recaptured beyond a one-week interval.

To date, three recoveries of marked birds have been reported. Two of these were killed by cats. One on 2 August, 1.9 km (1.2 mi) from Sawgrass and the other in the first week of August, 1 km (0.62 mi) away. The third recovery was of an individual found dead about 27 October over 3.1 km (1.9 mi) from Sawgrass.

After appearance of the newspaper articles a total of 46 reports were received between the end of July and the end of August. Forty of these were investigated and only three were discarded as obviously incorrect observations. Of the remainder, 31 were considered as verified sightings and 7 as probable observations. Thus a "return" of 20% of the 189 marked birds was obtained which was considerably better than anticipated. The possibility exists, of course, that an individual bird may have been involved in more than one observation. Figure 1 shows the distribution of these sightings throughout the St. Petersburg area. The most distant sighting was in a yard in Clearwater on 14 August approximately 20 km (12 air miles) northwest of Sawgrass. The most southerly report came from a yard in St. Petersburg Beach, a barrier island west of St. Petersburg and approximately 18 km (11 air miles) southwest of Sawgrass where two marked birds were seen on 27 July.

More than half of the reports came from within an 8 km (5 mi) radius east and southeast of the swamp. There is very little Mockingbird habitat north of Sawgrass, an area characterized by pine-palmetto flatwoods several miles in extent. Residential areas are located north and west of this forest, but only two sightings were reported from these areas and only one was verified (the Clearwater observation). Thus, the pine-palmetto habitat probably acted as a barrier to northward movement. No reports were received from the Pinellas Park residential area just west of the swamp. Only three sightings were reported farther west of Sawgrass, and these were over 12 km (8 mi) away. The majority of the birds appeared to move east, south and southwest of Sawgrass after leaving the swamp.

In almost every instance the lay observer stated that the marked birds did not remain long in their yard or neighborhood. Birds were seen for periods ranging from only a few minutes to an hour or so. Two reports indicated that there were two marked birds present and two reports involved seeing marked birds on two consecutive days. All other observers saw marked birds only once.

While banding the Mockingbirds we noted that most of them were undergoing a complete molt. Rectrices and remiges as well as body feathers were being replaced. According to Dwight (1900: 290-291) the first winter plumage (first basic of Humphrey and Parkes, 1959) is acquired by a partial postjuvenile (first prebasic) molt which does not involve the remiges or rectrices. Michener and Michener (1935) noted that some of the young Mockingbirds in their yard did undergo a complete molt, however, birds that were known to have been hatched late in the summer did not molt their flight feathers. The double marking system with bands and dye was used on our Mockingbirds because they were molting their tail feathers. We hoped that the plastic tape would remain on the bird beyond replacement of the dyed tail. As of 2 January 1965 observations of birds with red leg tags are still being reported. No sightings of birds with red tails have been reported since the first of September. A banded Mockingbird in fresh adult plumage and without a red tail or red leg tab was seen in Sawgrass on 26 September. Thus, some of the marked birds may have lost their leg tags, also.

Avian pox type lesions were found in 102 of the 199 Mockingbirds examined (51%). Infection varied from very mild, with one or two pox nodules on legs to very severe involving large nodules on the head, or caused malformation of bill shape, and additional open lesions on the wings, body or legs. One moderately infected bird was kept in captivity for approximately three weeks with no obvious adverse effects, while an individual with a severe infection died within three days of captivity. The diagnosis of avian pox virus was confirmed in the birds sent to Dr. Louis N. Locke of the Patuxent Wildlife Research Center. Pox activity among Mockingbirds was widespread in the Tampa Bay area in 1964. Numerous cases were noted in Bradenton, Manatee County (Mrs. T. Stewart, personal communication), in Tampa, Hillsborough County, and in St. Petersburg, Pinellas County.

DISCUSSION

Except for an area of a few blocks in the downtown business district, St. Petersburg provides an ideal breeding habitat for Mockingbirds. The city consists mainly of residential areas containing lawns, shrubs, and trees, interspersed with occasional shopping centers. It is bounded on the west by the Gulf of Mexico, and on the east by Tampa Bay, a body of water approximately 16 km (10 mi) wide and 40 km (25 mi) long. The majority of the immature Mockingbirds that flew into Sawgrass undoubtedly came from breeding territories in St. Petersburg. All but a few of the sighting reports were in these residential areas. It is of interest that no marked birds were sighted in Pinellas Park, the large residential area lying just to the west of Sawgrass and quite accessible to the marked birds.

According to Woolfenden and Rohwer (MS) the Mockingbird is the fourth most numerous breeding species in residential St. Petersburg (31 pairs/100 acres). It is exceeded in density by the House Sparrow (*Passer domesticus*) (224 pairs/100 acres), Mourning Dove (*Zenaidura macroura*) (92 pairs/100 acres) and Blue Jay (*Cyanocitta cristata*) (53 pairs/100 acres). Since the Mockingbird is considerably more territorial than these other species it is more evenly distributed throughout the city during most of the year. However, during the latter part of the breeding season, large numbers of immature Mockingbirds move from place to place singly, or in small groups. In early August flocks containing up to 15 or more birds may be observed in brush or weed patches scattered throughout the city. Smaller groups may be seen in yards and gardens.

During trapping operations it was noted that very few Mockingbirds were seen or heard in Sawgrass for the first half hour or so after daybreak. This suggests that perhaps the birds did not spend the night in the swamp. However, mosquito activity in the swamp may remain high during the day in the shaded areas under the dense canopy of trees. The infection rate observed for avian pox which is also transmitted by mosquitoes provides evidence that mosquitoes did feed on the birds, either in the shaded areas during the day, or at twilight, or at night when they dispersed into more open vegetation outside the swamp.

Any shift in bird populations during the summer months, when St. Louis encephalitis virus and other arboviruses are expected to multiply in vertebrate hosts is of interest to virus ecologists. Elder growth provides attractive food at this season and appears to be stimulated by clearing and soil disturbance in and near swampy areas. Construction of roads and canals in such environments produces a heavy growth of elders along their edges which, in turn, attracts young birds.

The late summer movements of large numbers of susceptible young birds into and out of a fresh water swamp environment, especially the one at Sawgrass, which has been a focus of intermittent activity for five arboviruses during the last four years, suggest a mechanism for transport and dissemination of these viruses into other, more urban environments. Experiments are presently being conducted to study the susceptibility to infection and the incubation and viremic periods for arboviruses in Mockingbirds.

SUMMARY

1. Approximately 200 Mockingbirds were captured in mist nets in a hardwood swamp north of St. Petersburg, Florida during the period 7 July-5 August 1964. A total of 187 immatures and 2 adults were banded, color-marked, and released.

2. Newspaper articles soliciting public cooperation resulted in 46 sighting reports during late July and August. Thirty-eight observations (a 20% "return") were considered verified observations and indicated that the Mockingbirds were moving from the swamp to residential areas throughout the city.

3. Movements of post-fledgling Mockingbirds into swamps and their subsequent dispersal to residential areas suggests a possible transport mechanism of arboviruses from swamp reservoirs to areas of human habitation during periods of high arbovirus activity.

4. Fifty-one percent (192) of all the Mockingbirds examined were infected with an avian pox virus which was widespread throughout the Tampa Bay area in 1964.

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*Encephalitis Research Center, Florida State Board of Health,
4001 Tampa Bay Blvd., Tampa, Fla. 33614*

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GENERAL NOTES

Analysis of Chimney Swift Returns at Kent, Ohio, in 1964 and 1965, with Notes on a Declining Nesting Population.—Studies of the Chimney Swift (*Chaetura pelagica*) on the campus of Kent State University were continued for the 21st and 22nd consecutive years. In the spring of 1964 the first migrants were observed over the campus on 17 April, and that night 6 were found roosting in the air-shafts of two university buildings. Each day others returned until a total of 38 was reached. These were distributed among the banding year-groups as follows: 1954 (1); 1955 (1); 1956 (1); 1957 (4); 1958 (5); 1959 (5); 1960 (2); 1961 (3); 1962 (8); 1963 (8). So far as sex has been determined, 11 were males and 15 were females. Twenty-four of the returns were taken from air-shafts where they had formerly nested, while 7 others were taken from air-shafts where they had roosted during the previous year. Only 6 swifts were recaptured from air-shafts where they had not previously been trapped.

A total of 25 swifts nested in the same shaft as in 1963, with 10 pairs being reunited as before. One returned to nest again where it had nested from 1960 through 1962, but failed to do so in 1963, although it was a resident bird in the same shaft in 1963. Four birds nested in a new location in 1964, and one was nesting during its first year on the campus. Only 3 returns taken before nesting was completed failed to nest on the campus. Four others returned late in the season. One swift was found dead on the campus, but all others were recaptured alive from the air-shafts on the rooftops of four buildings. One nesting bird disappeared before it could be trapped, and its mate was subsequently found dead on a nearby roof top. Two swifts nested in air-shafts where they had resided as non-breeding birds in 1963. None of the returns in 1964 became a visitor with a mated pair, although one of them was a temporary visitor with a pair in shaft S-1, where it was also a brief visitor in 1963, and one newly banded bird became an all-season visitor with the pair in shaft V-1. Of 7 non-nesting returns, 2 had formerly nested on the campus, 2 were formerly visitors with a mated pair, and one returned to the shaft from which it was banded in 1963. The last record of resident swifts on the campus was recorded 24 September, and the last migrant observed passing over the campus was seen on 9 October.

In the season of 1965 Chimney Swifts returned to the campus on 19 April. That night 7 swifts were found roosting in 6 air-shafts. Each subsequent night the number of birds increased gradually until cool, rainy weather set in which slowed down arrival of migrants and eventually sent some of the early arrivals off, presumably in search of a warm chimney. These soon came back, however, and other migrants continued to arrive. Eventually 34 returns were obtained in contrast to the average number of 44. These came from the following banding year-groups: 1954 (1); 1956 (1); 1957 (4); 1958 (5); 1959 (3); 1960 (2); 1961 (1); 1962 (6); 1963 (5); 1964 (6). Twelve of these were males and 12 were females. Sex for the other 10 has not yet been determined. Poor nesting success over the past two years may be one factor in the decline of the nesting population. Only 11 nests were produced in 1965 in contrast to the average number of 18.

Sixteen swifts were recaptured in air-shafts where they had formerly nested. One other was recaptured from an air-shaft where it had been a seasonal visitor in 1964; two others were recaptured from the air-shaft where they roosted briefly the previous year, and one was retaken from the shaft where it had been banded the year before. Fifteen swifts nested in the same shafts in 1965 as they did in