Telemetric observations of a Robin (*Turdus migratorius*).—Radio telemetry has proved to be a valuable tool in a variety of biological research projects (Slater, *Bio-telemetry*, New York, Macmillan, 1963). Southern (*Wilson Bull.*, 76: 129, 1964) used radios to track Bald Eagles (*Haliaeetus leucocephalus*), but the use of transmitters on small birds presents special problems in transmitter design. Because many species of birds are small (under 100 g), and because of the great potential of telemetry in ornithological studies, William W. Cochran of the Illinois Natural History Survey designed a lightweight transmitter (2 to 5 g) for use on small birds. The transmitter is essentially the same as that described by Cochran, Mech, and Bellrose (*Univ. Minnesota Tech. Rept.*, 8, undated) but incorporates the smallest readily available electronic components, and a one-meter fifth banjo string for an antenna. This paper presents some results from the initial field tests of the transmitter. Our receiver was a 28-mc Model D-11 (Cochran and Nelson, *Univ. Minnesota Tech. Rept.*, 2, 1963).

We tested low-weight transmitters and imitations thereof on Common Grackles (*Quiscalus quiscula*), a Robin (*Turdus migratorius*), House Sparrows (*Passer domesticus*), and Starlings (*Sturnus vulgaris*). One method of attaching the transmitter was to glue it to the back plumage of the bird with Duco cement. Grackles and Starlings would not tolerate transmitters thus attached, and removed their own back plumage to rid themselves of the radio. A House Sparrow, on the other hand, did not attempt to remove a glued transmitter, and carried it very well. A second method was to staple the transmitter to a plastic back tag (for description, see Labisky and Mann, *J. Wildl. Mgmt.*, 26: 393, 1962) which was then attached to the bird. No passerine bird can remove a back tag and transmitters affixed by this method are certain to stay in place. This is regrettable in one sense, because a low-weight transmitter is short-lived and, unless recaptured, the bird with a back tag is encumbered long after the transmitter dies. The weights of transmitters which various birds can carry without handicap deserve thorough study. We observed that a 30 g House Sparrow carrying a 4.7 g transmitter could fly well, climb, and maneuver sharply without obvious difficulty. Yet such a load seems extreme for so small a bird. The same transmitter (4.7 g) was carried with ease by a 100 g grackle. Back-tagged Starlings and grackles carrying imitation "radios" weighing up to 6.4 and 6.9 g were able to fly well.

Our best data on the performance of the low-weight transmitter were acquired from tracking a Robin for most of two days. The Robin was captured, with a mist net at 0730 hours on 20 July 1964, near the south edge of the University of Illinois campus. The bird, an adult male in postnuptial molt, weighed 76.6 g. A small 26-mc transmitter was fastened to the Robin by means of a plastic (Fiberthin) back tag. Including a 0.75 g battery, the transmitter weighed 3.7 g. The back tag weighed 2.0 g, so the bird's total load was 5.7 g. The bird was released where it was caught, 35 minutes after capture. It seemed reluctant to fly at first and ran into a shrub thicket, but it then took off and flew well, climbing at an angle of 20° to a perch near the top of a 40-foot silver maple (*Acer saccharinum*). At no time during the subsequent observations did the Robin's flight or other activities appear clumsy or to be hindered. It could gain altitude quickly, either from the ground or from elevated perches. The area in which the radio-tagged Robin lived (Figure 1) included parts of the University campus and a semi-wooded cemetery. The land was flat except for one high hill about 50 feet high. In this terrain the transmitter had a range of about 0.6 mile when the Robin was three feet or more above ground level. The bird's movements were audible through the receiver as changes in frequency

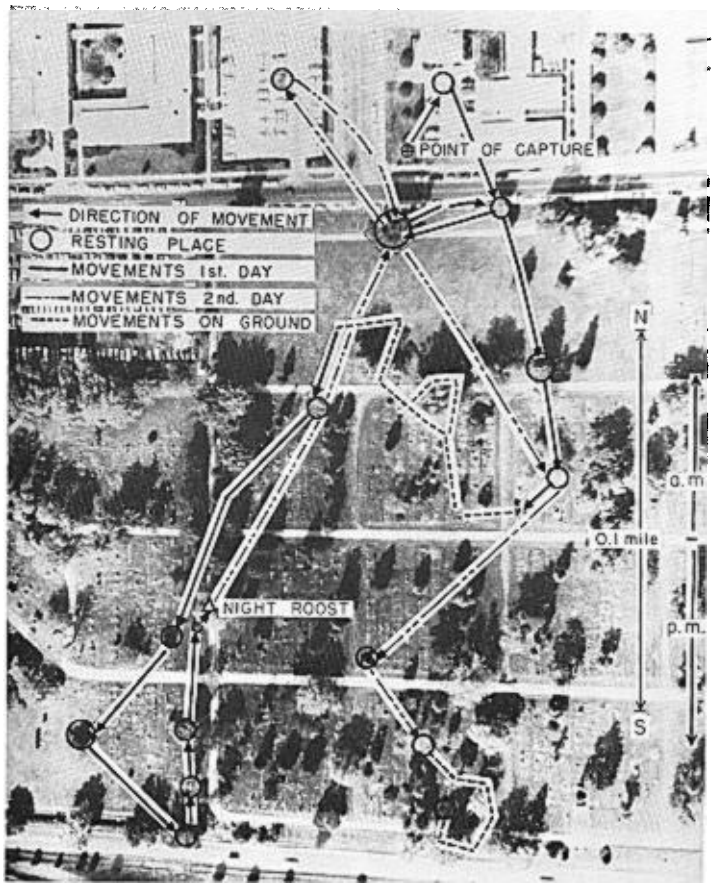

Figure 1. Movements of an adult male Robin tracked by radiotelemetry during two days in July. The bird spent mornings in the north half of the area, afternoons in the south half. The entire aerial photograph shows about 28 acres.

and signal strength. When the bird was in flight the receiver emitted a distinctive sound (phoneticized: *wicki-wicki-wicki*, etc.), so it was possible to know when the bird flew without seeing it. Most of the time, however, we stayed within 100 yards of the bird and could watch it. Like other Robins in the area, the tagged bird seemed unwary and tolerant of its observers. The long antenna did not appear to hamper the bird as it fed and moved about in dense foliage, though sometimes the antenna was bent double.

The first day we followed the bird for nine hours and five minutes, from 0805 (with one two hour interruption) until it settled for the night. Except for static interference from automobile ignitions and other (unknown) sources, we could have obtained a complete record of the bird's activity during the day. The second day we tracked the bird only a few minutes every one or two hours.

Its activity over the two days followed a definite pattern. In the morning it was

near the north edge of its area of activity and, through the day, moved slowly southward. By late afternoon it was near the south edge of the activity area and started moving back north; the night roost was not far from the south edge (Figure 1). In the morning the bird flew immediately to the north edge of the area and started the cycle again. Its travels on the first day fell within an area about 1,200 feet long (maximum north-south axis) by 300 feet wide (east-west axis), or about nine acres. In the course of the first day, the Robin flew about 2,100 feet or 0.4 mile (sum of all flights). It moved an additional 700 feet on the ground, where it spent 43 minutes (1132–1215) foraging or resting. The Robin spent most of the day fairly high (15 feet or higher) in medium-sized and large trees, particularly black

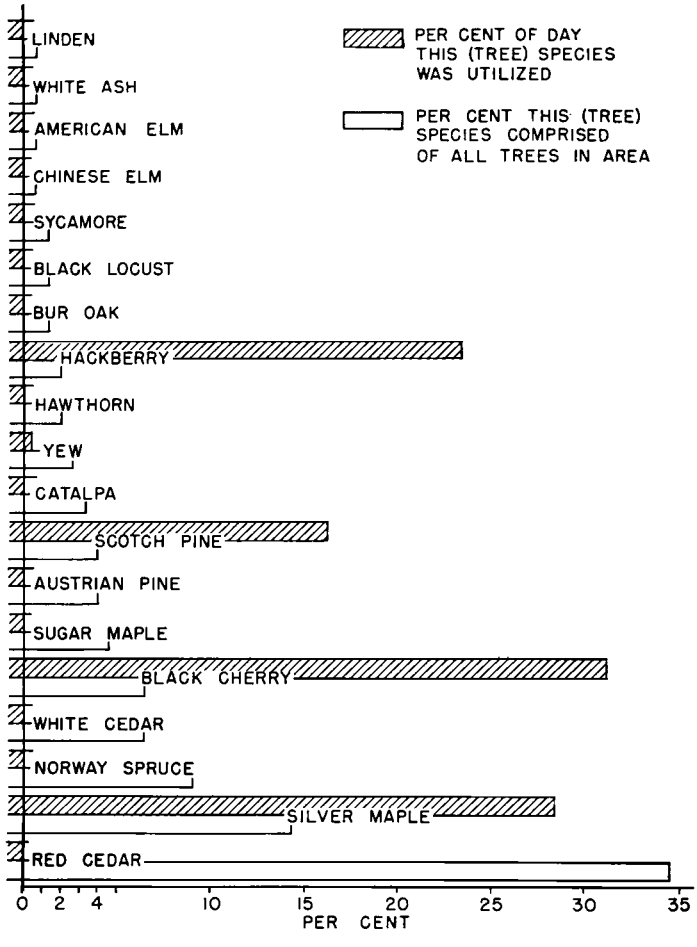

Figure 2. Species of trees used for resting and foraging by a Robin radio-tracked on 20–21 July 1964.

cherry (*Prunus serotina*), silver maple, and hackberry (*Celtis occidentalis*). The cherry and hackberry trees, loaded with fruit, were centers of activity for Starlings and Common Grackles, and other Robins. In the Robin's area of activity there were 156 trees of 19 species with diameters (four feet above ground) of six inches or more. Black cherry trees comprised only about 6 per cent of this total yet the Robin spent over 30 per cent of its day in trees of this species.

The bird definitely appeared to choose the species of trees in which it foraged and rested (Figure 2). Silver maples seemed to be particularly favored as resting sites, and the night roost was in a silver maple. The Robin also rested in the day in the cherry and hackberry trees where it fed. It spent most of its day (about 71 per cent) sleeping or resting with eyes closed, and no more than 26 per cent of the day foraging and feeding. Hackberries and cherries were so abundant that the bird usually required only one to three minutes to satiate itself, after which it rested for periods ranging from five minutes to more than an hour, usually 30 to 50 minutes. The Robin usually preened itself after resting or feeding, and probably spent more time preening than feeding while in the trees. After 1600 its tempo of feeding and preening definitely increased. It fed for the last time (that day) about 1750, and then flew into a large silver maple where it slept more than an hour. At 1900 it moved a few feet, into a cluster of leaves about 40 feet up in the maple, and settled for the night. Sunset came at 1920, but a heavy cloud layer in the west brought darkness early.

The Robin's behavior the second day was similar to that of the first; it frequented the same areas and even the same trees. Survival at this season appeared to be extremely easy for the bird, and its quiescent behavior would seem to have real value for a bird in molt.

The Robin was tracked intermittently for 32.5 hours before the transmitter's signal became so weak that we could no longer locate the bird. The signal showed definite attenuation after 28 hours, but the range was not noticeably altered before that time. The most serious difficulty we encountered in tracking the bird was related to the urban situation of the study area. Ignition noises from traffic were very annoying to the trackers, and certain vehicles all but drowned the transmitter's signal. Persons who need to use the telemetric technique in an urban situation should be particularly careful, in choosing their study area, to avoid sites of heavy traffic and other potential ignition interference.—RICHARD R. GRABER and STEVEN L. WUNDERLE, *Illinois Natural History Survey, Urbana, Illinois.*

Predator-induced parental neglect in a Ring-billed Gull colony.—While making studies of parental and chick behavior in a peninsular colony of the Ring-billed Gull (*Larus delawarensis*) at Rogers City, Michigan, in the summer of 1965, we noted that in one large nesting unit of about 1,000 nests the onset of hatching began about nine days after that in the other units. Hatching success was low in this unit and, of the chicks hatching, only a few survived beyond the second day. Suspecting nocturnal disturbances we checked the colony before daybreak on 8 June and discovered that a large raccoon was feeding among the nests while the adult gulls milled noisily overhead. On visiting the colony at 10:30 P.M. that evening, we found the disturbed unit completely deserted. All-night observations on the nights of 9–10 and 10–11 June revealed that the raccoon, apparently a single animal, was causing very little direct destruction, but was indirectly responsible for the extensive egg and chick mortality and probably the delayed hatching in the disturbed unit, by inciting "panic flights" which took the entire adult population of that unit