AN AUTOMATIC RADIO TRACKING SYSTEM FOR BIOTELEMETRY*

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One of the keys to understanding certain aspects of raptor behavior is knowledge of the location of the birds under investigation at all times. Past experiences with portable radio-tracking receivers showed that several persons could not continuously monitor the position of more than one animal. This report briefly describes an automatic radio-tracking system designed to provide quantitative data on animal behavior under natural conditions. A more complete technical description is given in Cochran *et al.* (1965).

The site of this system is the Cedar Creek Natural History Area located approximately 30 miles (48 km) north of Minneapolis, Minnesota. This area of 6000 acres (2420 ha) is owned and administered by the University of Minnesota in cooperation with the Minnesota Academy of Sciences. It has a variety of habitats which make it ideal for tracking several different species of raptors.

Rotating antennas on two towers, 0.5 miles (0.8 km) apart, receive radio signals from raptors carrying transmitters. The receiving and recording system has the capacity of continually recording the location and activity of 52 animals on 16 mm film. Locations may be obtained from the film record by using a microfilm reader, or they may be determined instantaneously in the laboratory by use of electro-mechanical counters. The mechanical accuracy of the system is ± 0.5 degrees. Movement of an animal causes slight displacement of the antenna of the transmitter. This is manifested by an uneven light in the indicator-tube, which can be detected on the film. In this way periods of activity and of rest can also be tabulated. Under ideal conditions, the system has a potential of obtaining 1,920 locations per animal per day. Animals which go beyond the range of the system can be found by mobile or portable receiving units which can be carried into the field or mounted on vehicles.

Information on location and activity may be transferred to machine punch cards and analyzed by several computer programs developed specifically for data from this system (Siniff and Tester, 1965). Results from the University of Minnesota's CDC 6600 computer give movement and location parameters, and activity patterns. Maps of movements may also be obtained with the use of an X-Y plotter.

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Great Horned Owls, Barred Owls, Saw-whet Owls, Red-tailed Hawks, Broad-winged Hawks, Red-shouldered Hawks, Cooper's Hawks, Goshawks and Kestrels have all been radio-tagged at Cedar Creek. Tail-mounted transmitters developed exclusively for use on raptors have been used on all but the Saw-whet Owl. Attachment involves taping a transmitter, weighing less than 2% of the bird's body weight, on a central rectrix. This technique seems to minimize behavioral responses of the bird to the transmitter package and, at the same time, to protect the package, avoid aerodynamic problems, and reduce the possibility of entanglement in vegetation. When the life of the transmitter, or molting period, or interference with feather growth precludes use of this design, a modified harness transmitter has been used. On very young, relatively sedentary brancher owls, a jess package fastened to the leg allows radio contact to be maintained with the bird until further development permits use of one of the other two more desirable packages.

Analyses of radio tracking data on these raptors is leading to a better understanding of such behavioral and ecological aspects as habitat use, home range size, territoriality, movement patterns, spacing, activity rhythms and predator-prey interaction. The advantages of this system over conventional radio tracking techniques involving hand held or vehicle mounted receivers include: increased qualitative and quantitative data returns, simultaneous monitoring of several animals while the animals are left undisturbed, and reduction of the time required to obtain these data.

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Literature Cited

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