A POPULATION STUDY OF THE SPARROW HAWK IN EAST-CENTRAL ILLINOIS*

BY JAMES HARRIS ENDERSON

THE aim of this investigation was to obtain an understanding, both quantitative and qualitative, of the population movements of the Sparrow Hawk (*Falco sparverius*). A study similar to this one was carried on in Michigan and Wyoming by the Craigheads (1956). No organized study of the Sparrow Hawk has been made in Illinois. Fifty years ago this species was a "very common breeder" in the immediate area of this study, according to Hess (1910), and this holds true today. The Sparrow Hawk is a permanent resident in central Illinois.

A study area of 43 square miles was outlined during the winter 1958–59, five miles southeast of the University of Illinois campus (Fig. 1). This area is typical of the region, i.e., fertile cultivated land. The only areas with standing timber are those immediately adjacent to the river. Scattered trees occur in farm yards and along fences and roads.

I extend sincere thanks to my advisor, Dr. S. C. Kendeigh, for his many suggestions concerning all phases of this work. The efforts and interest of Dr. R. R. Graber and of my wife Dayle are also appreciated.

METHODS OF STUDY

It was not possible to census the entire area during each daily trip, but the area was covered many times in the course of the study. No attempt was made to search every likely location for Sparrow Hawks, but all conspicuous perches were scanned with the aid of binoculars. Fortunately, the birds seemed to prefer areas within a few yards of the roadways for hunting and perching. The order of coverage of the area was not systematic, except that when a bird was located I tried to find it on subsequent trips. No censuses were taken on days of low visibility or heavy precipitation.

It soon became apparent that some means of identifying individual birds would be necessary in order to trace their movements more accurately. Birds were seldom observed at the same location on successive trips.

Two types of traps were used to catch birds for marking. The first trap used was of the bow-net type, described in detail by Tordoff (1954). From February 10 to March 25, 16 Sparrow Hawks were caught with this type of trap. Because the success of this trap was relatively low, another type was then employed. It consisted of a small circular wire cage, the top of which was covered with many nylon nooses (Berger and Mueller, 1959). A live house mouse (*Mus musculus*) was placed in the trap as bait. When using

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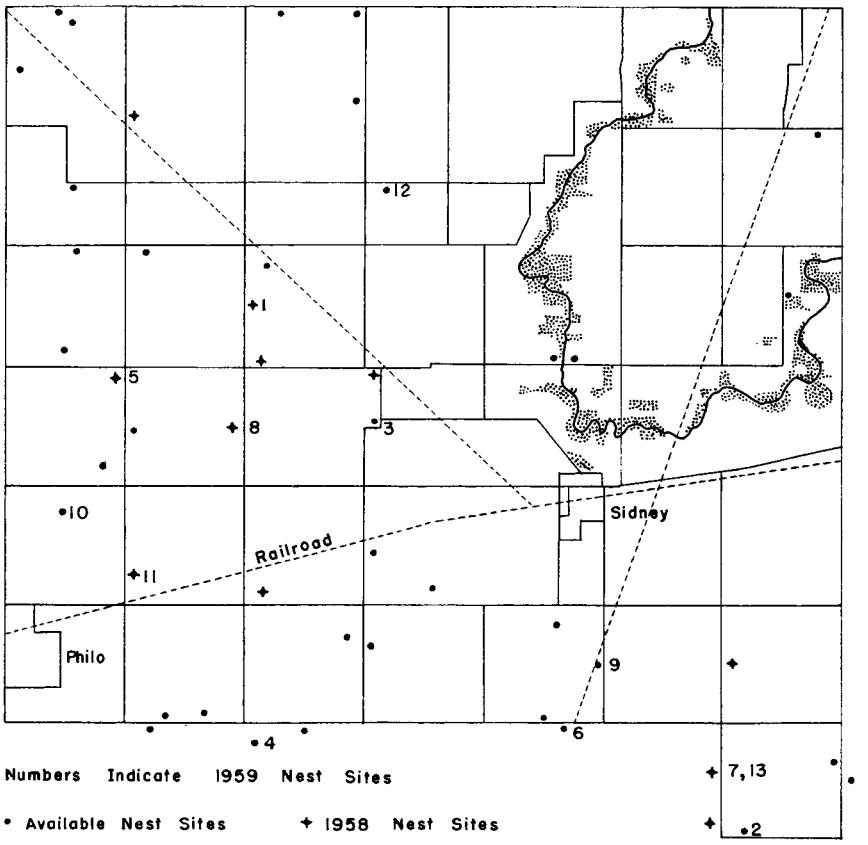

FIG. 1. The study area.

this trap, as many as eight Sparrow Hawks were caught and marked in a single day. During the period between April 3 and April 13, 23 birds were caught, bringing the total to 39. Between April 13 and July 6 an additional falcon was caught, and three were retrapped. Forty-two per cent of the Sparrow Hawks observed on the area, and 76 per cent of the breeding population, were caught.

All birds caught were banded with Fish and Wildlife Service bands. In addition, each bird was marked by means of a notch or "hole" in the primaries or secondaries of either or both wings. The location of this mark was varied to give individuals identity. The "hole" effect was most satisfactory. It was achieved by removing the barbs from the feather shafts in a circular area about one and one-half inches in diameter. With binoculars

such a mark was visible for at least a quarter of a mile while the bird was in flight. A similar procedure of removing barbs was used on the tail with less success. Finally, most birds were provided with a short leather strap on one leg. This strap facilitated recognition of a perching bird as a marked individual, so that unnecessary trapping efforts would not be made. Aside from an initial annoyance with strap and band, none of the marking methods is known to have interfered with the normal activities of the bird.

A total of slightly over 3000 miles was traveled by automobile on the area during 308 hours from December 1, 1958 to July, 1959. During this time, approximately 500 observations of Sparrow Hawks were recorded. Forty adult birds were trapped and marked (22 males, 18 females).

The Effect of Weather on Censusing

In December and January there was a correlation between weather conditions and the number of Sparrow Hawks observed. A less formal count was made of other raptors on the area, and the weather seemed to affect their observed numbers. This was not true during censusing of winter hawk populations in central Michigan (Craighead, 1956). Fig. 2 presents data correlating census results with weather conditions as measured on the campus seven miles from the study area. Wind velocities were recorded on the rooftop of the Water Survey Building. According to the State Climatologist these may average one-third lower than those in the open country.

Fig. 2 suggests a correlation between high wind velocity, low temperature, and low bird-per-mile count. On censuses taken between December 4 and 18, January 15 and February 11, and February 15 and 27, low bird-per-mile counts were obtained during periods of generally low temperatures and high wind velocities. Between March 13 and 18, high wind velocity seems to have resulted in a low census count despite moderate temperatures. However, on the census taken on December 3 and on the February 27 census, few or no birds were seen although temperatures and wind velocities appeared normal. In general the correlation does not continue into warm weather.

These census results are probably caused by two factors: (a) the buffeting effects of the wind causing the birds to seek shelter, and (b) the increased loss of body heat due to wind and low temperature. Several observations of Sparrow Hawks under these conditions support this theory. Apparently low temperature alone does not cause the birds to seek shelter. On different occasions Sparrow Hawks were seen perched near or on the ground avoiding wind, or on a branch close to the tree trunk. In these positions the birds would be inconspicuous to an observer.

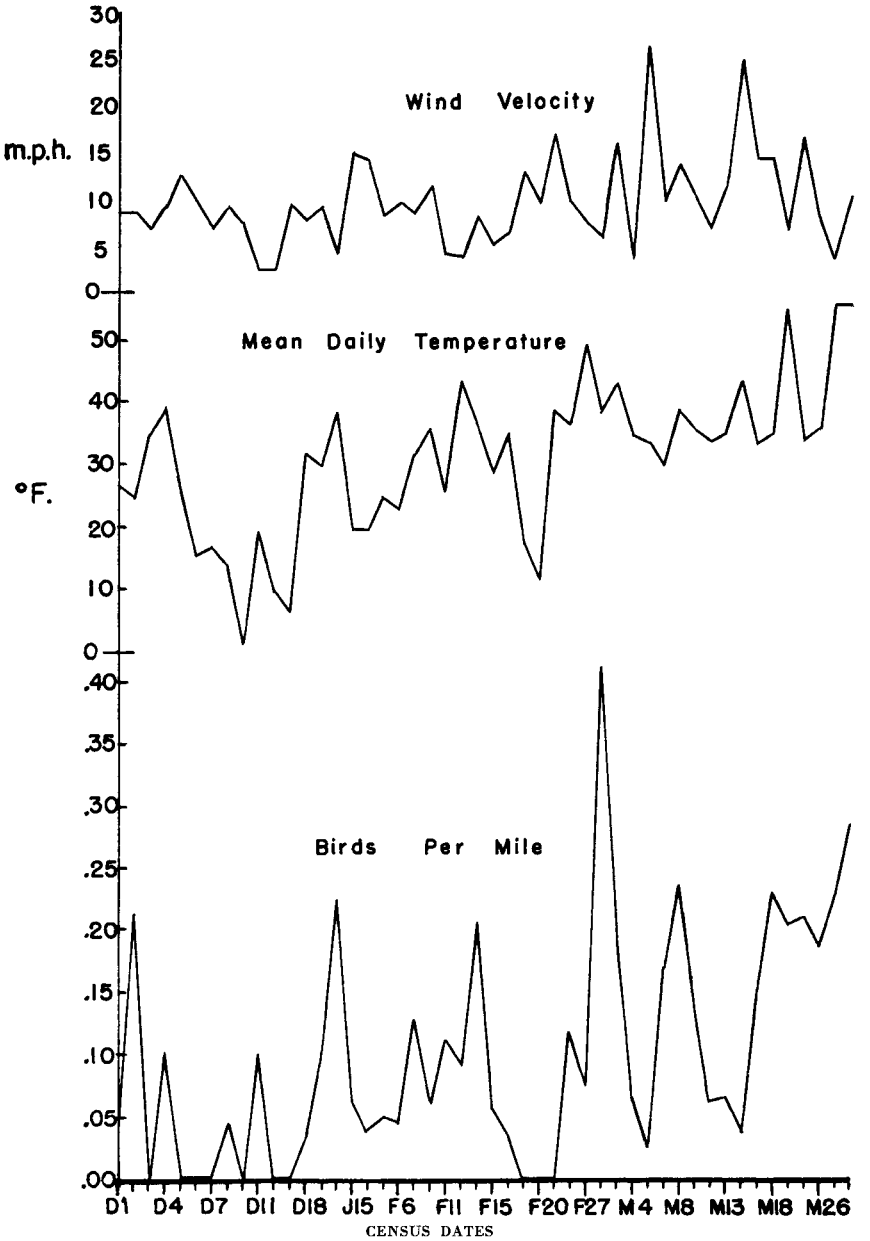

FIG. 2. The effects of wind velocity and temperature on censusing.

Records of Individual Birds

Before trapping and marking of birds began, a bird of the same sex seen on a subsequent trip within three-fourths of a mile of the site of the first observation was considered to be the same bird. This distance is less than one-half the winter range of Sparrow Hawks in Michigan (Craighead, 1956). The uncertainty as to individual identity was reduced somewhat by the relatively low winter population density on the area, with individual birds being well isolated. If a bird were not observed for a period of two to three weeks, it was considered to have left the study area.

The duration of occurrence of individuals on the study area (Fig. 3) is shown by drawing lines between the first and last dates of observation. These lines, when placed in chronological order of the first appearance, show the growth of the population in the spring. An "x" at the end of a line indicates a nesting failure. Bird 1 was caught accidentally in a padded steel trap set for large hawks, and because of a broken leg was not released on the area. Females 13 and 14 remained on the study area for over two weeks, but did not select a nesting site. Birds 25 and 29 remained near a group of trees for approximately two weeks but showed no nesting behavior. They were not considered a breeding pair. Birds 12, 16, 21, 33, 36, and 37 were marked birds which remained on the area for a short period only and were among those termed transients. Bird R near the top of Fig. 3 was a female that renested with Male 22 after destruction of the young of that male mated to Female 28.

Populations

Wintering.—The true wintering population may have consisted of only four birds (Fig. 4). Four birds on 43 square miles is in close agreement with data collected in Michigan, where 37 square miles supported five Sparrow Hawks during the winter (Craighead, 1956).

Transient.—There is evidence from banding returns that Sparrow Hawks from the northern plains area winter in the vicinity of Texas and that more northerly breeders migrate farther south than do more southerly breeders (Roest, 1957). These migrants effect an increase in the population in Central Illinois during the spring.

Beginning in early February, a total of 58 transients, i.e., birds not associated with nest sites, were observed. This undoubtedly does not represent the total number that passed through the area because observations were fragmentary. These transients reached their highest observed densities between February 25 and May 4 (Fig. 4). Peaks in their abundance on the area occurred on March 4, April 10, and April 12. Transients continued to be observed until the end of the observations in June. Transients observed

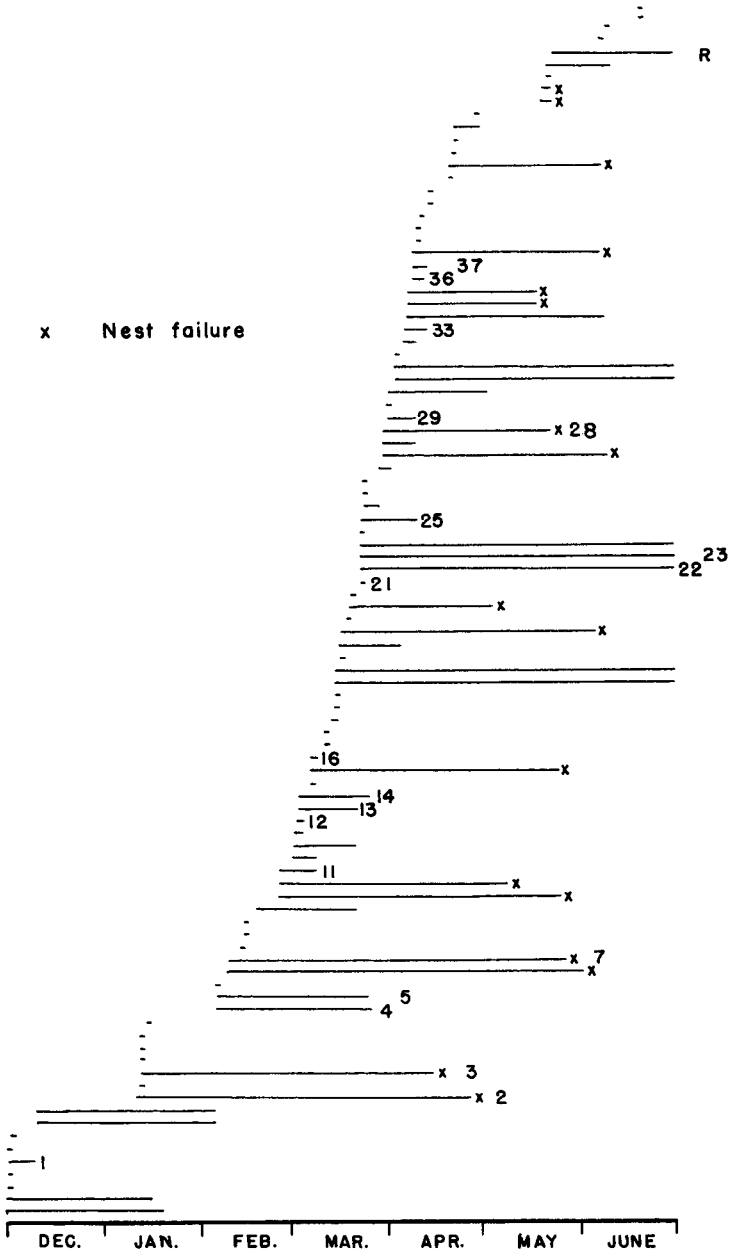

FIG. 3. Duration of occurrence of individuals on the study area.

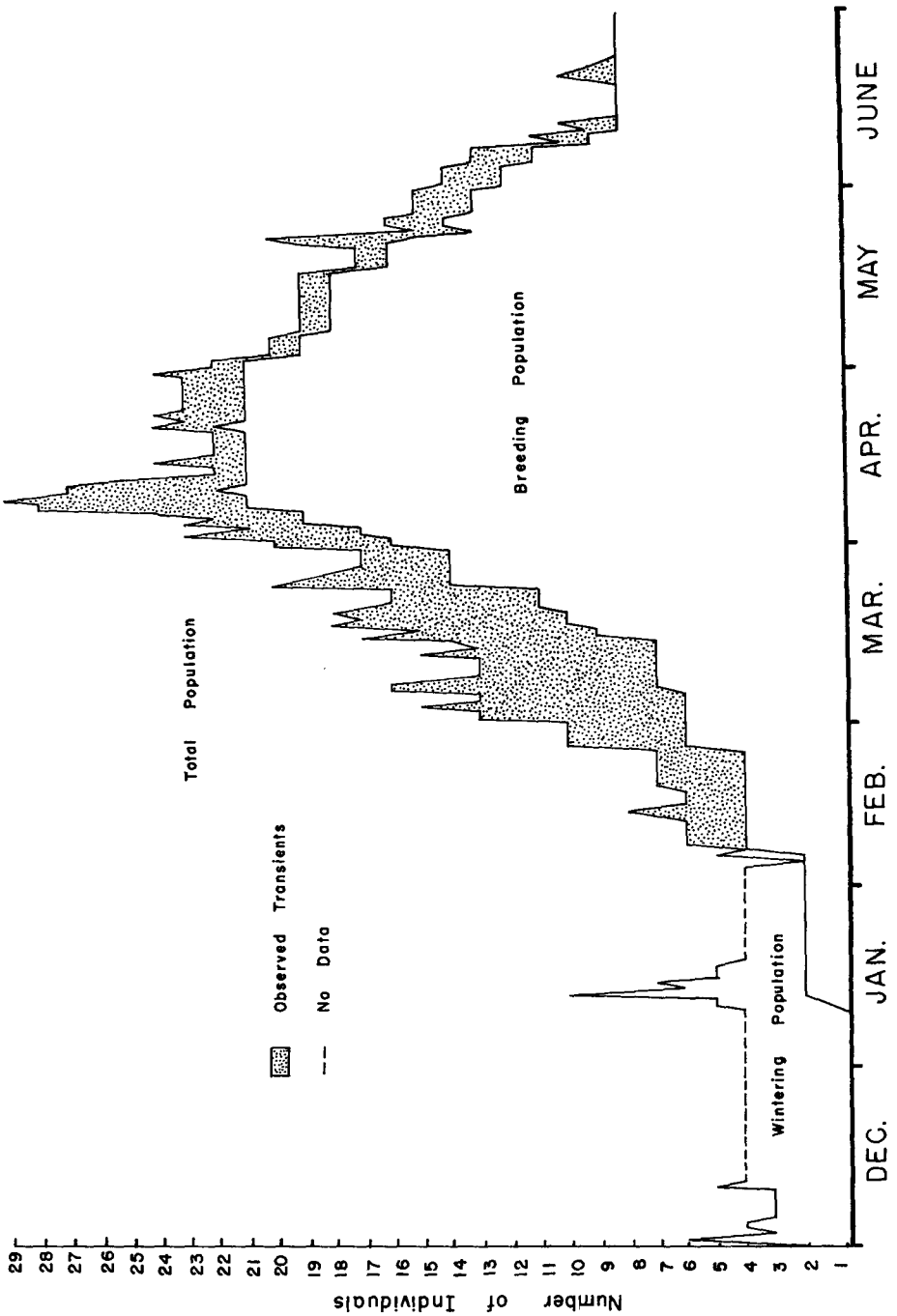

FIG. 4. Variations in the Sparrow Hawk population.

after the beginning of the nesting period may have been unsuccessful breeding birds from other areas, or part of a nonbreeding population.

Breeding.—The potential breeding population built up steadily, beginning with one bird on January 11, until a peak of 22 birds was reached on April 11 and on April 22. After April 22 there was a gradual decrease in the number of breeding birds until the end of the observation period. The majority (94 per cent) of the unsuccessful breeding pairs left the study area soon after the failure of their nests.

Twelve pairs of Sparrow Hawks were recognized as breeding birds, as demonstrated by their selection of nest cavities. An additional female renested with one of the original males, bringing the total number of breeding individuals to 25, or 0.58 breeding birds per square mile. This population is denser than that found in Michigan in 1948 when 0.22 breeding birds per square mile were recorded (Craighead, 1956).

Breeding individuals entered the area in greatest numbers (15) during the period when transients were appearing in greatest numbers, i.e., between March 15 and April 10. These dates encompass the period of arrival of breeding Sparrow Hawks at Corvallis, Oregon (Roest, 1957).

The members of a pair may arrive separately, or they may arrive together. The males of five pairs were observed first. The female was observed first for another pair, both appeared on the area simultaneously in three cases, and no observations were made in this respect for the remaining three pairs.

Range and Nest Data

An approximation of the diameter of the bird's range can be obtained by means of a line connecting extreme observation points. In Fig. 5, Ranges 3, 4, and 5 are those of nonbreeding birds which left the area before egg-laying. Ranges 3 and 4 are those of a nonbreeding pair. Ranges 2, 6, 7, and 23 are those of breeding birds.

The three nonbreeding bird ranges recorded in late winter have maximum observed diameters of 1.4, 2.0, and 1.3 miles; the average is 1.5 miles. This figure is less than the 2.2 miles average of winter ranges observed in Michigan (Craighead, 1956). This difference may be due to an error introduced when observing unmarked birds in the Michigan study, or it may be caused by the fact that the study area in Michigan, having 11 per cent tree cover and bushy areas is a less favorable habitat for hunting by Sparrow Hawks, causing them to range farther to meet food requirements.

Ranges 2, 6, 7, and 23 represent home ranges in the vicinity of nest sites. The average maximum diameter of these ranges is 1.4 miles. This agrees closely with the 1.5-mile average diameter for breeding ranges observed in Michigan and in Wyoming.

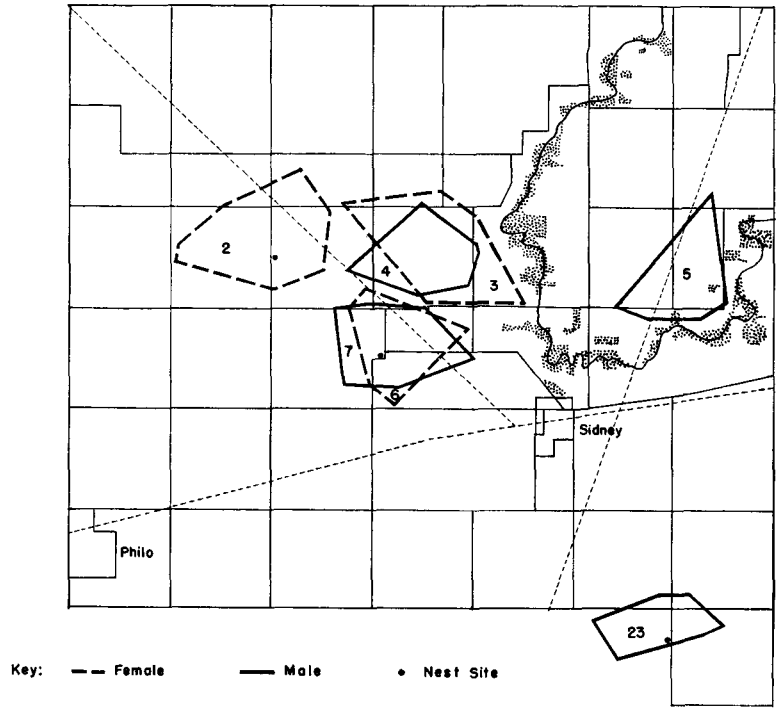

FIG. 5. Observed ranges of individual Sparrow Hawks.

The nest site does not necessarily lie in the center of these home ranges. Evidently certain areas for hunting are preferred to others by nesting birds.

Although observations of egg and brood dates were not thorough, practical approximations can be made. The first egg was laid on the study area on April 16. The first complete clutch of five was completed about April 22. The last clutch of five was completed about April 29. On May 20, the first bird on the study area hatched, and the last on the area hatched about May 28. The young of the renesting pair did not leave the nest until about July 20, although the other nestlings on the area had left the nest by June 19.

SUMMARY AND CONCLUSIONS

(1) Weather conditions under which observations of Sparrow Hawks were made affected the success of the censusing; fewer birds were observed during periods of high wind velocity and low temperatures.

(2) The dates of first occurrence of individuals on the 43-square-mile study area in the spring follow a sigmoid curve.

(3) Although the wintering population fluctuated in numbers, approximately four birds were present on the area during December and January.

(4) Transients, totaling 58, were observed on the area from early February to the last of June, being most numerous in March and April.

(5) The breeding bird population increased from January 11 to the middle of April, and then decreased.

(6) Twenty-five Sparrow Hawks were recognized as breeding birds, an average of 0.58 individuals or 0.29 pairs per square mile.

Literature Cited

Berger, D. D., and H. C. Mueller
1959 The bal-chatri: a trap for birds of prey. *Bird Banding*, 30:18–26.

Craighead, F. C., and J. J. Craighead
1956 Hawks, Owls, and Wildlife. The Stackpole Co., Harrisburg, xix/443.

Hess, I. E.
1910 One hundred breeding birds of a central Illinois ten-mile radius. *Auk*, 27: 19–32.

Roest, A. I.
1957 Notes on the American Sparrow Hawk. *Auk*, 74:1–19.

Tordoff, H. B.
1954 An automatic live trap for raptorial birds. *Journ. Wildl. Manag.*, 18:281–284.

18 South May St., Joliet, Illinois, August 15, 1959

NEW LIFE MEMBER

Mr. Frederick M. Helleiner, of Swastika, Ontario, Canada, is an elementary school teacher and boy scout adviser who is interested in the field distribution of birds. Most of his field work is done in the Timiskaming District of northern Ontario, but he has also compiled a list of the birds of the Peace River District of Alberta.

Mr. Helleiner has been an active member of the Wilson Ornithological Society since 1952, presented a paper at the Society's 1955 meeting in Stillwater, Oklahoma, and now becomes a Life Member. In addition, he is a member of the A. O. U., a director of the Federation of Ontario Naturalists, President of the Kirkland Lake Nature Club, and a member of the Ottawa Field Naturalists' Club, the Toronto Field Naturalists' Club, and the Saskatchewan Natural History Society.