DISTRIBUTION AND POPULATION DENSITY OF BARN OWLS IN LEHIGH AND NORTHAMPTON COUNTIES, PENNSYLVANIA

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INTRODUCTION

The Barn Owl (*Tyto alba*) appears infrequently on the field lists of ornithologists in Lehigh and Northampton Counties, Pennsylvania (cf. Trainer and Miller, 1956; Barlieb, 1965). This suggests that Barn Owls are rare in these counties. This has not been proved. Most owls are nocturnal birds; they are easily overlooked, or often not looked for at all, even by competent observers. Thus it is not unreasonable to question the supposedly rare status of the Barn Owl in Lehigh and Northampton Counties.

The primary purpose of this investigation was to compare the past and current distribution of the Barn Owl in Lehigh and Northampton Counties. A second purpose was to determine the current population density of this species in the two counties. Some pertinent information concerning causative factors responsible for variations in this species' distribution and population density was collected. The field investigation lasted from February 8, 1965, to May 12, 1965.

Research methods included obtaining past Barn Owl records for Lehigh County from specimen permits in the files of Lehigh County Game Protector Kenneth Hess. Similar records were not available for Northampton County. Bird watchers, ornithologists, hunters, trappers, conservationists, and farmers also supplied information. Still more data were secured from responses to three requests for Barn Owl information which appeared in two local newspapers. All of this information was critically evaluated. Only those records which I was convinced were credible were used.

I checked 202 potential nest and/or roost sites in Lehigh County and 123 similar sites in Northampton County. All known past nest and roost sites also were checked.

I attempted to supplement my daytime checks of potential nest and/or roost sites by censusing Barn Owls at night. The night technique involved playing a tape recording of Barn Owl vocalizations, but since, in separate studies, I was unable to conclusively establish the validity of the tape recording playback technique for censusing Barn Owls at night, I suspended its use in the field on April 7, 1965.

I postulated that Barn Owls would vocally respond to tape recordings. The concept was based on the phenomenon described by Kellogg (1961:85) in which some birds vocally responded to playbacks of recordings of their vocalizations. Oech and Oech (1960) demonstrated the validity of this technique with some passerines. However, the technique does have some limitations. Dr. Kellogg (letter of April 5, 1965) stated, in part, that he had good tape playback responses with Screech Owls (*Otus asio*), and some success in calling Great Horned Owls (*Bubo virginianus*) and Barred Owls (*Strix varia*).

In the order Strigiformes, Holt (1959: 262-265) qualitatively demonstrated that human imitations of Screech Owl and Saw-whet Owl (*Aegolius acadica*) vocalizations elicited vocal responses from these species. I confirmed this phenomenon with Screech Owls by using tape recordings.

Payne (1962: 151-159) and Payne and Drury (1958: 316-323) demonstrated that Barn Owls have extremely acute hearing. It seemed likely that a Barn Owl in close proximity to a station at which a tape recording was being played would hear the recording. Prof. F. J. Trembley of Lehigh University stated that a captive owl with which he worked responded vocally to the sounds of another Barn Owl in a nearby building. At a nest site in New Jersey, however, Potter and Gillespie (1925) encountered few vocal responses by an adult female Barn Owl to the vocalizations of her seven nestlings. The adult bird did vocalize when she carried food to the nest site, and once she made a "harsh blood-curdling screech." The nestlings were extremely vocal, generally making a loud hissing sound.

The tape recordings of Barn Owls which I used were the hissing vocalizations of a nestling and the sounds of an adult. They were taped from Peterson Field Guide records.

To test the validity of my tape technique for censusing Barn Owls, I conducted two frequency of response experiments at the Philadelphia Zoo on March 20, 1965. My equipment consisted of one Wollensak T-1440 tape recorder connected to a type 12-T ATR power inverter. A 12-volt automobile battery supplied the electrical power. Playbacks of Barn Owl vocalizations were run at seven ips to insure reasonable fidelity, although Kellogg (1961:86) demonstrated that fidelity was unimportant in eliciting some species' vocal responses to tape recordings. The volume of the tape recorder was set at seven on the machine's control dial.

One captive Barn Owl, sex not determined, was used as the experimental subject. The bird was about ten years old. It was confined in an outdoor cage with a Great Horned Owl as a cage mate. This particular horned owl was considered by its keepers to be extremely aggressive, and it appeared to have the Barn Owl completely intimidated. The keepers stated that they had never heard their Barn Owl vocalize or seen it engage in the head lowering-and-swaying defense behavior characteristics of *Tyto alba*.

In my first experiment, with both the Barn Owl and Great Horned Owl in their cage, I played my Barn Owl vocalization tape 15 times. The tape recorder was placed about 20 feet from the birds. Each trial lasted about 30 seconds. About 180 seconds elapsed between each trial. The sky was cloudy, the air temperature in the open was -4.5 C., and a light snow was falling. The Barn Owl made absolutely no visible or audible response to the tape recordings. It perched in a corner of its cage and remained completely motionless. The horned owl responded to the tapes by walking along a limb of the tree on which it was perched, and by turning its face in the direction of the tape recorder. It made no vocalizations.

In the second experiment the Barn Owl was removed from its cage (it made no vocalizations while being captured) and placed in an isolated room away from the sounds of other animals in the zoo. The air temperature of the room was 22.0 C. A total of 10 playbacks of the tape was made. Three elicited no response, six brought a side-to-side head swaying response but no vocalization, and one elicited a weak hissing response. The keepers at the zoo stated that this side-to-side head swaying and the vocal response of the Barn Owl were the first they had encountered for this particular bird.

My conclusion, based upon the statements of the zoo keepers, my own observations of the zoo's Barn Owl, and my observations of other Barn Owls in previous years, was that this individual bird exhibited extremely atypical behavior. I do not consider the results of these two experiments to be reliable indicators of the validity of my tape recording technique for censusing Barn Owls. However, since I was unable to conclusively establish its validity, I did suspend its use in the field.

GEOGRAPHICAL DISTRIBUTION OF BARN OWLS

The Barn Owl is nearly cosmopolitan in distribution. One subspecies, *Tyto alba pratincola* (Bonaparte), is found in North America (AOU, 1957: 272-273).

In Pennsylvania, Warren (1890: 145) considered the Barn Owl as rare where formerly it was plentiful. On January 31, 1891, Reed (1897: 375) discovered 14 Barn Owls roosting in a tree at Glenolden, Delaware County. Numerous additional roost and nest records for southeastern Pennsylvania are cited in his paper. Stone (1894: 89) considered the bird as a resident in eastern Pennsylvania, but normally not north of the Carolinian fauna. Sutton (1928: 69) considered the state-wide distribution of the Barn Owl as fairly common but local as a summer resident in the southern and southeastern counties, and rare in the northern and mountain counties. It was found occasionally in winter. Twenty-five years ago Todd (1940: 278-279) studied the Barn Owl in western Pennsylvania. He discovered that it was extending its range into the Alleghanian fauna. A reasonably even distribution extended from the Ohio line eastward to Chestnut Ridge, with few breeding records. Poole (1964: 41) recorded the Pennsylvania status of *Tyto alba* as "a fairly

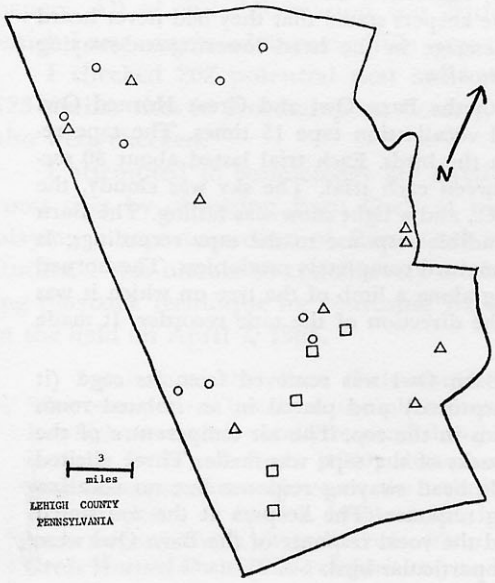

Fig. 1. — Distribution of past records of the Barn Owl in Lehigh County, Pennsylvania. Squares designate collected specimens, circles sight observations, and triangles nest sites.

common breeding permanent resident in the Carolinian and lower Transition Zone, definitely extending its breeding range northward. Apparently nests throughout the year. Some young individuals migrate southward in winter."

PAST LEHIGH COUNTY BARN OWL DISTRIBUTION

Past distribution records of the Barn Owl in Lehigh County are widely scattered. In many cases the information was sketchy; no doubt many records were missed because of the secretive nature of this species.

Warren (1890: 145) cited Kocher who considered the bird as an occasional visitor. Trainer and Miller (1956) reported the bird local at all seasons of the year. During this investigation, I collected 23 past Lehigh County records of Barn Owls. These records, which cover the 47-year period from 1917 through 1964, are distributed over the southern portion and northwestern corner of the county (Fig. 1).

CURRENT LEHIGH COUNTY BARN OWL DISTRIBUTION AND POPULATION DENSITY

During the course of my field investigation I located one migrant Barn Owl and learned of two additional records. No residents were found. The distribution of the migrant owls is plotted in Fig. 2. In terms of Lehigh County's

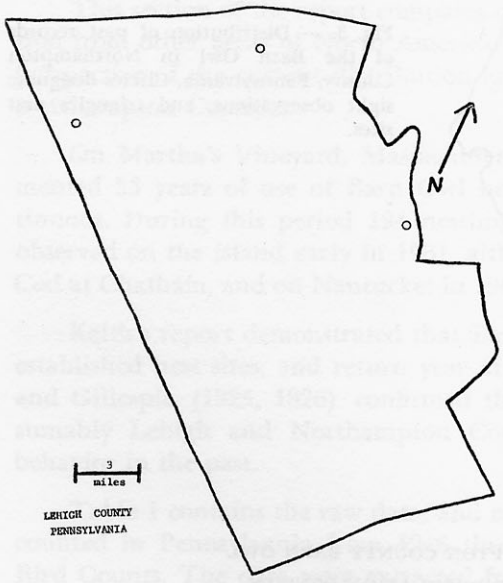

Fig. 2. — Distribution of current migrant Barn Owls in Lehigh County, Pennsylvania.

area, this is a migrant Barn Owl population density of 0.0088 Barn Owls per square mile. Measured by the standard of Heintzelman and Armentano (1964: 10), the Barn Owl is a rare migrant in Lehigh County.

Because ornithologists in Lehigh County failed to conduct systematic searches for Barn Owls in the past, it is difficult to compare my current data with the available past records and arrive at meaningful conclusions. However,

there may well be a decline in the number of migrant Barn Owls which pass through the county.

On the other hand, the total absence of the Barn Owl as a breeding species in all parts of Lehigh County is alarming. While it is possible that a few nesting birds may have moved into the county after completion of the field work, it is clear that the Barn Owl has undergone a drastic reduction in numbers as a breeding species in Lehigh County.

PAST NORTHAMPTON COUNTY BARN OWL DISTRIBUTION

Past records of the distribution of Barn Owls in Northampton County were as widely scattered and sketchy as those for Lehigh County. Warren (1890: 145) cited some Detwiller records, but these are rejected for the same reasons explained by Schaeffer (1949: 591). In the Bethlehem area, some records are available as the result of the work conducted by Trembley and Gaughran (1941) and Barlieb (1965). During this investigation, I collected 26 past Barn Owl records for Northampton County. They cover the 34-year period from 1930 through 1964. The distribution of the records is presented in Fig. 3. Most records were in the southern part of the county, with a few in the northeast and none in the northwest portion.

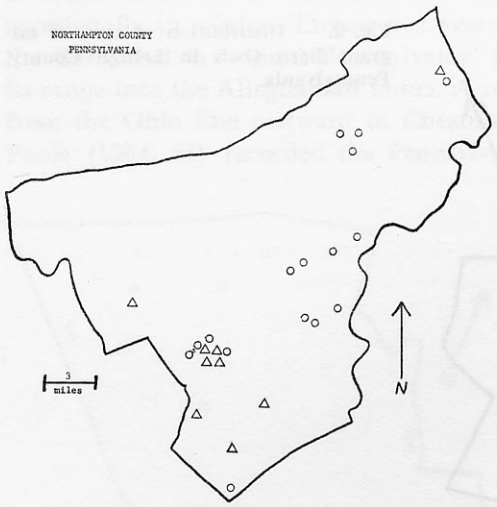

Fig. 3. — Distribution of past records of the Barn Owl in Northampton County, Pennsylvania. Circles designate sight observations, and triangles nest sites.

CURRENT NORTHAMPTON COUNTY BARN OWL DISTRIBUTION AND POPULATION DENSITY

Two Barn Owls, both migrants, were located in Northampton County during this investigation. Their distribution is plotted in Fig. 4.

In terms of the total area of Northampton County, the population density of migrant Barn Owls is 0.0053 birds per square mile. No breeding birds were found in the county. Measured by the standard of Heintzelman and Armentano (1964:10), the Barn Owl is a rare migrant in Northampton County.

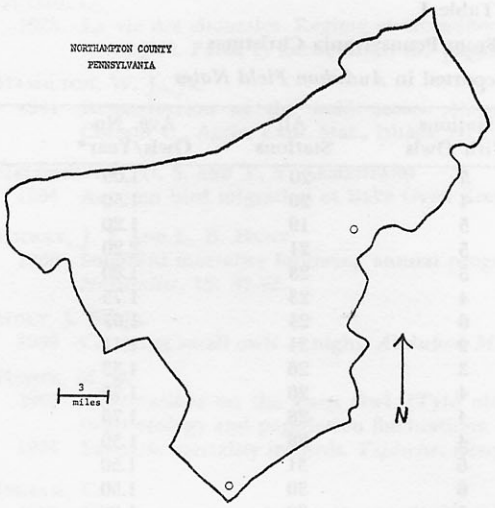

Fig. 4. — Distribution of current migrant Barn Owls in Northampton County, Pennsylvania.

LOCAL-NATIONAL DATA COMPARISON

This section of the report compares my local Barn Owl data with information from other areas of North America. This should give the reader a better perspective of the current distribution and population density in Lehigh and Northampton Counties.

On Martha's Vineyard, Massachusetts, A. R. Keith (1964: 22-31) documented 33 years of use of Barn Owl nest-roost sites, of which 29 were continuous. During this period 194 nestlings were raised. The species was last observed on the island early in 1961, although it nested in that year on Cape Cod at Chatham, and on Nantucket in 1963.

Keith's report demonstrated that Barn Owls become strongly attached to established nest sites, and return year after year to the same location. Potter and Gillespie (1925, 1926) confirmed this phenomenon in New Jersey. Presumably Lehigh and Northampton County Barn Owls also followed this behavior in the past.

Table 1 contains the raw data, and my calculated averages, for Barn Owls counted in Pennsylvania from 1946 through 1964 on the annual Christmas Bird Counts. The data were extracted from *Audubon Field Notes*. The nonrandomness which Preston (1958: 620-624) demonstrated for *Audubon Field Notes* data did not negate their usefulness in this investigation. Actually it may have enhanced the value of the data. It is widely known that unusual birds, e.g. Barn Owls, are located by cooperators prior to the official census day. Observers place particular emphasis on recording these birds on the actual census. This probably results in a more complete count of Barn Owls.

Table I

Barn Owl Raw Data From Pennsylvania Christmas Counts (1946-1964) as Reported in *Audubon Field Notes*

Year	No. Owls Counted	Stations With Owls	All Stations	Ave. No. Owls/Year*
1946	5	5	20	1.00
1947	6	4	20	1.50
1948	6	5	19	1.20
1949	11	5	21	2.20
1950	9	5	23	1.80
1951	7	4	23	1.75
1952	10	6	25	1.67
1953	10	9	31	1.11
1954	4	3	26	1.33
1955	7	4	26	1.75
1956	7	4	28	1.75
1957	6	4	28	1.50
1958	9	6	31	1.50
1959	9	6	30	1.50
1960	8	5	30	1.60
1961	10	7	32	1.43
1962	10	5	31	2.00
1963	3	2	34	1.50
1964	2	2	35	1.00

* Average No. Owls per Year = No. Barn Owls/No. Stations with Barn Owls.

The coefficient of correlation for numbers of Barn Owls observed in Pennsylvania per Christmas Bird Count-year, and the number of stations reporting Barn Owls per count-year is +.7973. Figure 5 is a scatter diagram

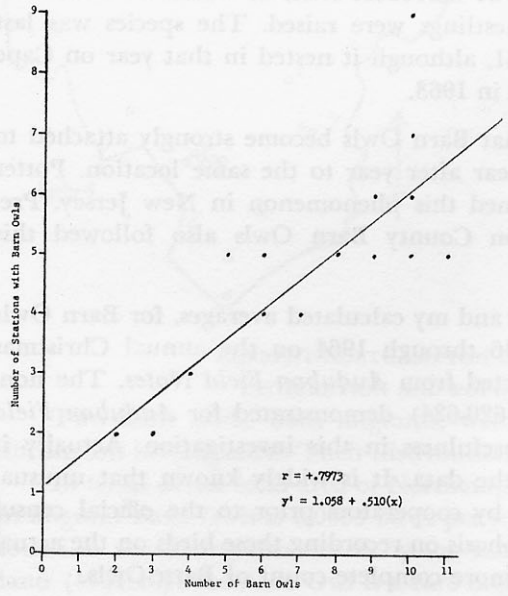

Fig. 5. — The relation between number of Barn Owls reported on Pennsylvania Christmas Bird Counts, and the number of stations reporting Barn Owls. The regression line was fitted by the method of least squares.

of the data. When all the stations reporting (with or without Barn Owls) on the Pennsylvania Christmas Counts are considered, there is a poor relationship of stations reporting. A select number of stations were responsible for producing the available Barn Owl records on the Christmas Counts. However, within those select stations there is a reasonably linear relationship between the numbers of Barn Owls counted and the number of select stations reporting Barn Owls.

To present graphically the yearly Pennsylvania Barn Owl data, I calculated the mean number of Barn Owls observed per count-year by those stations reporting Barn Owls (Table 1). Figure 6 suggests that Barn Owls may be cyclic. This hypothesis is discussed in greater detail in the next section of this paper.

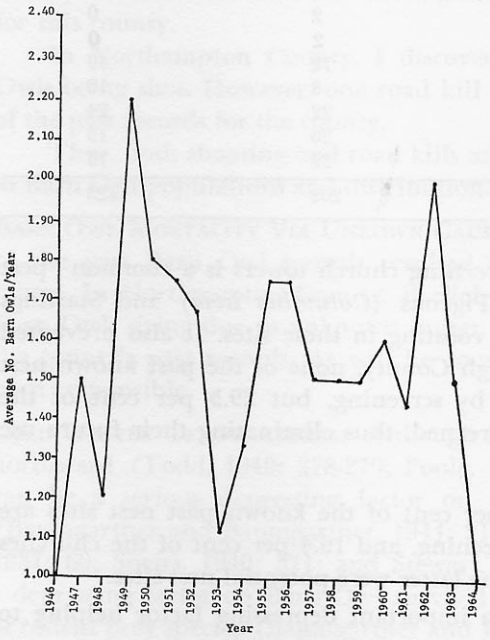

Fig. 6. — Fluctuations in the average number of Barn Owls observed on Pennsylvania Christmas Bird Counts from 1946 through 1964.

CAUSES OF BARN OWL DISTRIBUTION AND POPULATION CHANGES

Craighead and Craighead (1950: 219) considered predation either as a depressing, or a limiting factor on animal populations. In this paper, depressing factor refers to conditions which had measurable, but relatively minor, effects in holding down population levels of Barn Owls. Limiting factor refers to *the* condition which outweighed all others in the extent to which it impeded the increase rate of Barn Owls. At least 13 depressing and limiting factors possibly caused changes in Barn Owl distribution and population density in Lehigh and Northampton Counties.

Table 2 summarizes the various potential Barn Owl sites which I checked in Lehigh and Northampton Counties.

Table 2

Summary of Potential Barn Owl Nest-Roost Sites Checked in Lehigh and Northampton Counties

Type of Site	Number Checked In	
	Lehigh Co.	Northampton Co.
Quarry	26	6
Conifer Plantings	3	0
Deciduous Woods	6	0
Old Kiln	1	1
Old Houses	2	1
Old Mills	2	0
Old Schools	2	0
Barns	72	49
Churches (Open Towers)	8	16
Churches (Closed Towers)	22	24
Churches (Screened Towers)	26	13
Churches (No Towers)	32	13
TOTALS	202	123

SCREENING NEST AND ROOST SITES: Screening church towers is a common "pest control" technique used to prevent Pigeons (*Columbia livia*) and Starlings (*Sturnus vulgaris*) from nesting and roosting in these sites. It also prevented Barn Owls from using them. In Lehigh County, none of the past known nest sites was eliminated for future use by screening, but 29.5 per cent of the churches which were checked were screened, thus eliminating their future use by Barn Owls.

In Northampton County, 15.4 per cent of the known past nest sites are now eliminated for future use by screening, and 19.4 per cent of the churches which were checked were screened. The latter were potential nest sites.

In both counties, screening is an important depressing factor helping to restrict Barn Owl distribution and lower population densities.

CLOSED CHURCH TOWERS: Aside from screening, many church towers were closed. In Lehigh County, none of the past nest sites was eliminated because of this, but 25.0 per cent of the church towers checked as potential nest sites were closed.

In Northampton County, none of the past nest sites was closed, but 36.4 per cent of the potential church sites were closed, thus preventing Barn Owls from using them in the future.

In both counties, closed church towers are important depressing factors on Barn Owls.

DESTRUCTION OF PAST NEST AND ROOST SITES: In Lehigh County, 13.0 per cent of the past nest and/or roost sites were destroyed, and in Northampton County, 7.7 per cent of the past sites were destroyed. These percentages pertain only to sites which were completely demolished.

Thus, destruction of past nest and roost sites is a minor depressing factor in respect to Barn Owl distribution and population density.

MAN-CAUSED BARN OWL MORTALITY: Without question, man is an effective factor competing with the Barn Owl. He may directly influence Barn Owl populations by shooting birds or killing them along roads, or his influence may be indirect by such previously described factors as screening nest and roost sites.

In Lehigh County, 8.7 per cent of the past Barn Owl records for the county resulted from hunters shooting birds, but road kills were not recorded for this county.

In Northampton County, I discovered no records resulting from Barn Owls being shot. However, one road kill was reported, which is 3.85 per cent of the past records for the county.

Thus, both shooting and road kills are minor depressing factors in respect to Barn Owl populations and distribution.

BARN OWL MORTALITY VIA UNKOWN CAUSES: In Lehigh County, 13.0 per cent of the past Barn Owl records resulted from birds dying due to unknown causes. In Northampton County, Barlieb (1965: 35) discovered examples of Barn Owls dying due to unknown causes. This accounted for 3.85 per cent of the county's past records. As will be considered later, cannibalism may have been responsible.

COLD WINTER TEMPERATURES: Although the Barn Owl is extending its range northward (Todd, 1940: 278-279; Poole, 1964: 41), cold winter temperatures can be a serious depressing factor on their populations and distribution (Baumgartner and Baumgartner, 1944: 213-214; Bond, 1939: 54-61; Errington, 1931: 60; Speirs, 1940: 571; and Stewart, 1952a: 164-166). Snow also can be a depressing factor on Barn Owl survival by causing decreases in availability of rodent prey species (Baumgartner and Baumgartner, 1944: 213-214; Stewart, 1952a: 164-166). When this happens the owls starve, die of disease or predation, or leave the area.

RODENT PREY POPULATION CYCLES: A vast literature exists on predator-prey population cycles (L. B. Keith, 1963). For example, it is widely recognized (e. g. Hamilton, 1941) that Meadow Mouse (*Microtus pennsylvanicus*) populations are highly cyclic. It is also significant that *M. pennsylvanicus* formed a high percentage of the food of Barn Owls in widely separated locations, e. g. Michigan (Wallace, 1948; 1950), Ohio (Trautman, 1940: 275; Phillips, 1951: 239-241), Massachusetts (Boyd and Shriner, 1954: 200), and Pennsylvania (Trembley and Gaughran *in* Latham, 1950: 31; Meyer, 1939: 187), including Northampton County, Pennsylvania (Trembley and Gaughran, 1941: 6).

During two years on the Michigan State College campus, the percentage of prey species consisting of *Microtus* ranged from a low of 57.6 to a high of 95.1 (Wallace, 1948: 45). Wallace hypothesized that Michigan Barn Owls regulate their nesting activities to correspond with highs and lows in *Microtus* populations. Wallace's hypothesis seems plausible. A similar hypothesis was presented for Barn Owls in France (Guérin, 1928*). Recently, in the Netherlands, Honer (1963) presented important data supporting these hypotheses. Lack (1954: 35), citing Schneider (1928*), stated that "the Barn Owl often raises only one brood in the year, but when it raises two, the July brood may contain 8 eggs, the April brood only 4, correlated with the fact that a July brood is raised only in years when voles are especially abundant."

Unfortunately no direct data are available supporting the predator-prey cycle hypothesis for Lehigh and Northampton County Barn Owls. However, it is likely that this phenomenon existed, and that it was a limiting factor on the distribution and population density of *Tyto alba*.

Examination of Figure 6 suggests a five or six-year cycle in Pennsylvania Barn Owl population density. Peaks seem to occur in 1949, 1955-1956, and 1962. This fluctuation may reflect a correlation in local *Microtus* cycles. If this cycle is valid, the Barn Owls in the two counties covered in this investigation probably were at the bottom of their cycle in 1964 or 1965. The average number of Barn Owls recorded on the 1964 Christmas Bird Count was the lowest since 1946.

Raun (1960: 194-200) discovered that Barn Owls in Texas reduced predation pressure on other species when the Hispid Cotton Rat (*Sigmodon hispidus*) increased in population density between 1956 and 1959. The foraging habits of the owls changed with an increase in the rodent food supply in the study area.

BIOCIDES: Much is written concerning the relationships of biocides (pesticides) to wildlife. The problem was well documented by Carson (1962) and Rudd (1964). Despite this, very little is known concerning the effects of biocides upon Barn Owls.

In a few Strigiformes species, Wallace *et al* (1961: 32) presented data which suggested that Great Horned Owls accumulate DDT in their tissues. He demonstrated that DDT was present in heart and pectoral tissue of Screech Owls. However, two Saw-whet Owls which were analyzed were DDT negative.

It is possible that Barn Owls were indirectly affected by biocides via secondary poisoning as was demonstrated for other animals (Carson, 1962; Mehner and Wallace, 1959; Mendelssohn, 1962; Rudd and Genelly, 1956; Wallace, 1959, etc.) In Wisconsin, the density of breeding songbirds was inversely proportional to the density of elms sprayed on six study areas (Hickey and Hunt, 1960: 87-92). Definite data are urgently needed concerning the possible effects which biocides may have upon Barn Owls.

* The original references were unavailable for examination.

BARN OWL MIGRATION: The migratory status of the Barn Owl is mysterious. In Berks County, Pennsylvania, Poole (letter of February 24, 1965) discovered that some Barn Owls were migratory in winter, not returning until March, whereas other individuals were non-migratory and nested in October and January (Poole, 1930: 84).

Stewart's (1952b: 227-245) critical analysis of 336 Barn Owl banding recoveries (all recovered up to March 20, 1950) suggested that a vast displacement occurred among some segments of the eastern North American Barn Owl population. A line drawn through 35° North latitude separated the population into two groups. The southern group was relatively sedentary. Significant displacement involved birds in the northern group.

A marked displacement was exhibited by young and adult northern birds. Fisher (1893: 133) and Stone (1937: 624) previously suggested an autumn migration for Barn Owls. Stone (1937: 626) also suggested a possible spring migration. Stewart's (1952b) analysis of banding data supported both a northward and a southward movement of northern Barn Owls.

Stewart's Barn Owls returned northward to within 200 miles of their hatching places by the first of April. Some continued a northward movement within the 200 mile zone through April. The last of the northward movement was not complete until mid-April or early in May.

Stewart (1952b: 243) also discovered an impressive difference between the average life span of northern and southern Barn Owls. The life span of 70 southern birds was two years, two months, and 26 days. That of 150 northern birds was one year, one month, and four days. Dangers involved in migration could be factors partly responsible for the northern birds' shorter life span, and a depressing factor related to Lehigh and Northampton County owl populations.

In addition, Lack (1954: 264) citing Schifferli (1949*) demonstrated that Barn Owls in Switzerland moved farther in winter when their food supply was limited. "Ringed young moved on the average three times as far from their place of birth in the bad mouse year of 1947 as in normal years."

PREDATORS: Barn Owls are high in the food chain. They have relatively few predators aside from man. Wayne (1924: 342) and Luttringer (1930: 84) recorded the Great Horned Owl as a predator of the Barn Owl. However, I have no records in either Lehigh or Northampton County of horned owls killing Barn Owls, and it is unlikely that *Bubo* was a serious factor limiting Barn Owl populations. Nevertheless, it is possible that the edge effect described by Odum (1959: 278) could be responsible for placing some Barn Owls in an ecological position in which they would be available and vulnerable to horned owl predation.

CANNIBALISM: Ingram (1959: 218-226) recorded cannibalism among nestling Barn Owls. There is some evidence that it occurred in a nest in an old barn

* The original reference was not available for examination.

at St. Francis Retreat, Bethlehem, Pa., since Barlieb (1965: 35) found pellets and five Barn Owl skeletons at this site on December 20, 1952. The skulls of these owls were not available for examination; thus age determination by skull ossification was not possible. It appeared, however, that cannibalism occurred, and thus may be a minor depressing factor on local Barn Owl populations.

Ingram (1959: 222-224) presented some data suggesting that fratricide and cannibalism occurred among nestling Short-eared Owls (*Asio flammeus*) in England when rodent prey populations were at the bottom of their cycle, but that the parent birds provided enough rodent food to prevent owl fratricide and cannibalism when the rodents were at the top of the population cycle. It is possible that a similar phenomenon exists for Barn Owls.

DISEASE: Jennings (*in* Thomson, 1964: 197) pointed out that the role which disease may have upon wild bird populations is not yet clear. This was supported by the limited number of diseases contained in his summary. Very little is known about the diseases of Barn Owls. Jennings (*op. cit.*, p. 199) stated that fowl leucosis, the abnormal production of leucocytes leading to organ and tissue changes, was recorded in owls in England. Little more was known about it. Stabler (1941: 560) examined one Barn Owl and found that *Trichomoniasis gallinae* (=*columbae*) was not present. In the Netherlands, Honer (1963: 185) excluded *Mycobacterium avium* and *M. muris* as being of great significance in relation to causes of mass mortality in the Barn Owl. However, disease may be a depressing factor on Barn Owl populations.

PARASITES: No exhaustive effort was made to search the literature for data on Barn Owl parasites. Of the records available, Malcomson (1960: 193) recorded *Kurodaia subpachygaster,* a species of Mallophaga. Meng (1951: 180) recorded the Louse-fly *Lynchia fusca* associated with the Barn Owl.

In the European literature, some attention has been given to the possibility that *coccidia* are involved in Barn Owl disease. According to Honer (1963: 186-187; 1964: 192) the coccidian in question is *Isospora buteonis* Henry 1932. However, Honer (1963; 1964) demonstrates the untenability of the hypothesis that *coccidiosis* in the Barn Owl is serious.

Although parasites may not normally be more than a minor depressing factor on Barn Owl populations, when combined with other depressing factors, the effect on Barn Owl populations could be significant.

SUMMARY

The Barn Owl appeared infrequently on the field lists of ornithologists in Lehigh and Northampton Counties, Pennsylvania. The purpose of my investigation was to make an intensive search for Barn Owls in both counties. Additional information was collected from various sources. The field work lasted from February 8, 1965, to May 12, 1965.

All known past nest and roost sites were checked. In addition, 202 potential sites were checked in Lehigh County, and 123 similar sites were

checked in Northampton County. An attempt to develop a census technique by using tape recordings of Barn Owl vocalizations failed.

The Barn Owl is cosmopolitan in distribution. In North America it ranges from southern Canada south to the tip of South America. Its distribution in Pennsylvania was generally restricted to the Carolinian fauna, but it now appears to be expanding its range northward into the Alleghanian fauna.

In Lehigh County, 23 past Barn Owl records were collected. They cover the 47-year period from 1917 through 1964. These records were distributed over the southern and in the northwestern portions of the county. My field investigation produced three migrant Barn Owls, but no residents or breeders.

In Northampton County, 26 past Barn Owl records were collected. They covered the 34-year period from 1930 through 1964. These records were distributed mainly in the southern part of the county, with a few in the northeastern portion. Two migrant Barn Owls were located during my field investigation, but no breeding birds were found.

Data from other portions of the United States demonstrated that Barn Owls become strongly attached to established nest sites if these sites are not disturbed by man. Additional data suggested that Barn Owl populations in Pennsylvania are cyclic, and that our population may be at a low at the present time.

Various potential factors were suggested as possible causes responsible for the small number of Barn Owls encountered during my investigation. Among these is screening of nest and roost sites. In Lehigh County, no past nest or roost sites were screened, but 29.5 per cent of the church towers were screened. In Northampton County, screening eliminated 15.4 per cent of the past sites, and 19.4 per cent of the church towers.

Of the churches checked in Lehigh County, 25.0 per cent of the towers were closed, with 36.4 per cent closed in Northampton County. In Lehigh County, 13.0 per cent of the past nest and roost sites were destroyed, and in Northampton County 7.7 per cent were destroyed.

Shooting accounted for 8.7 per cent of the past Lehigh County Barn Owl records, but no past records resulted from shooting in Northampton County. Road kills formed 3.85 per cent of Northampton County's past records, but none in Lehigh County.

In Lehigh County, Barn Owl mortality via unknown causes accounted for 13.0 per cent of the past records, and for 3.85 per cent in Northampton County.

Cold winter temperatures were potential factors related to low Barn Owl populations in some portions of the United States. Its relation to the owls in this investigation is questionable.

There was strong evidence suggesting that rodent populations were cyclic and were major factors correlated with Barn Owl cycles.

The role of biocides in relation to Barn Owls was unknown, but migration among northern Barn Owls was a possible factor related to the local owl populations.

Predators were probably minor factors related to the Barn Owl populations, but cannibalism could have been more directly related to the owl's population level. Disease and parasites also were potentially minor factors in respect to local Barn Owl populations.

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