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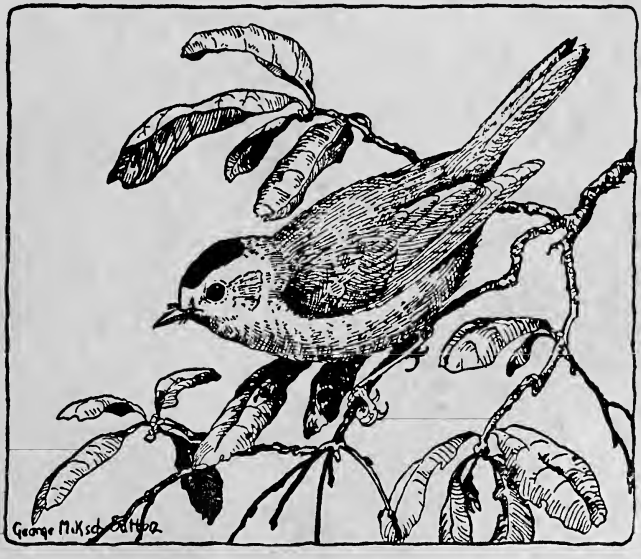

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THE WILSON BULLETIN

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BREEDING BEHAVIOR OF THE BLACK-THROATED GREEN WARBLER[1]

BY FRANK A. PITELKA

A nest of the Black-throated Green Warbler *(Dendroica virens)* was kept under observation for a five-week period (June 26-July 30) during the summer of 1938 near the University of Michigan Biological Station, Cheboygan County, Michigan. Original nest observations extended from the beginning of nest building to the time the young were five days out of the nest and totalled 55 hours; these are supplemented with data on a second nest and with general observations on occurrence.

Observations were made from a canvas blind built on the platform of a 16-foot tower of cedar poles. The blind was placed three feet to the side of the nest, which was 23 feet from the ground. With the aid of a foot stool, the observer could reach the nest for purposes of examining contents and removing young for weighing.

The majority of the Compsothlypidae remain relatively untouched subjects for life-history students. The Black-throated Green Warbler, while not the best known species of warbler or perhaps even of the genus *Dendroica,* has received its share of attention, this largely in general studies of birds or in somewhat casual observation. Individual treatment has been accorded it chiefly by Stanwood (1910, 1914) and particularly by the Nices (1932). Nichols (1919) has most justifiably called attention to the opportunities offered by the genus *Dendroica.*

Acknowledgments are gratefully made to Dr. Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minnesota, for suggestions on nest observation and for critical reading of the manuscript, to Dr. Theodora Nelson, Hunter College of the City of New York, for helpful advice during the course of the study, and to Mrs. Margaret M. Nice for valuable suggestions and corrections of the manuscript.

Niche Relationships

During the breeding season the Black-throated Green Warbler is one of the more frequent Compsothlypids in the conifer regions of northern lower Michigan, though it is by no means to be included

[1] Contribution from the University of Michigan Biological Station.

among the common birds. Locally it occurs in spruces of mature bog communities and in upland developmental forests of mixed pine and deciduous growth. Less frequently it breeds in mature deciduous forest (Blanchard and Nelson, MS). While the niche requirements of the nesting site confine it, with few exceptions, to coniferous trees, the species forages generally in the higher levels of the prevailing vegetation—high shrubs and both deciduous and coniferous trees. It appears to be far more tolerant than such characteristic coniferous forest species as the Pine Warbler *(Dendroica pinus)* and Blue-headed Vireo *(Vireo solitarius),* and will occupy areas that afford only a few evergreens for nesting sites (Bagg and Eliot, 1937:588).

Vegetation of this breeding habitat of *Dendroica virens* in northern Michigan may be characterized by the following chief components: coniferous trees *(Pinus resinosa* and *P. strobus,* the former being the predominant species for the community) and deciduous trees *(Populus grandidentata, P. tremuloides, Betula papyrifera,* and *Quercus borealis);* scattered high shrubs (chiefly *Amelanchier canadensis)* and ground vegetation of shrubby ericads *(Vaccinium pennsylvanicum, Gaylussacia baccata,* and *Arctostaphylos uva-ursi)* and bracken-fern *(Pteris aquilina).*

The avifauna of this pine-aspen community included the Red-eyed Vireo (*Vireo olivaceus*), Hermit Thrush (*Hylocichla guttata*), Crow *(Corvus brachyrhynchos),* Cedar Waxwing *(Bombycilla cedrorum),* Chipping Sparrow *(Spizella passerina),* Nashville Warbler *(Vermivora ruficapilla),* and Pine Warbler *(Dendroica pinus).*

Nesting Sites and Nest Building

Structure and location of nests are detailed in Table 1. Nests apparently vary according to availability of material and probably according to the skill or past experience of the female (Herrick, 1935: 222). Nest A, at which my observations were made, was poorly built (i.e., walls loose and comparatively flexible, foundation thin), and insecurely placed; nest B (obtained in Emmet County, July 4, 1938) was well built and securely placed. The late date at which nest A was started (June 26th) would suggest that it was either a second attempt at nesting or the first attempt of a yearling female.

Nichols (1919:226) maintains that nests of different species of *Dendroica* are remarkably distinct; according to his observations, the nests of Black-throated Green Warblers (in a limited area of New Brunswick) are characterized on the outside by spruce twigs and birch-bark whorls, on the inside by hair, and an occasional feather. Undoubtedly a good many nests of the Black-throated Green Warbler do not possess those characteristics or, if present, such materials may be few (see examples in Table 1). Judging by the literature (e.g., Stanwood, 1910:290–292, also 1914:187; Sutton, 1928:215) as well as my

TABLE 1

STRUCTURE OF NESTS

	Nest A	Nest B
Location	Horizontal branch of Norway Pine *(Pinus resinosa)*	Same
Height from ground	23 feet (7 meters)	12 feet (3.66 meters)
Distance from trunk	5.5 feet (1.68 meters)	5 feet (1.52 meters)
Material		
Lining	Mostly hairs; some grasses, a small black feather and wool-like plant fibers	Rootlets, blades of grass short pine twigs
Bulk	Grasses, rootlets, thin and short pine twigs	Rootlets, blades of grass short pine twigs
Trimming	Mostly birch bark; more of the wool-like plant fibers, some cottony material (from seeds?), and a piece of partially decayed leaf blade	A considerable quantity of hypnaceous mosses and bits of birch bark
Measurements*		
Inside Diameter	4.5 cm.	5.0 cm.
Outside Diameter	7.8	7.5
Inside Depth	3.0	3.0
Outside Depth		
Maximum	5.5	6.5
Minimum	3.0	3.0
Approximate Dry Weight.	4.9 grams	7.8 grams

* Nest measurements as given by Knight (1908:527) are slightly greater in diameter and inside depth, indicating a bulkier structure. His figure of 1½ in. (3.8 cm.) for inside diameter (p. 527) is doubtlessly an error.

own observations on the present species and other passerines, the materials of nest construction are relatively variable. To a large degree this variation may be explained by the simple principle of availability (McAtee, 1932:135), modified, of course, by niche and territorial limitations. Thus differences between nests A and B in materials used can easily be explained from an examination of the surrounding territory, the first being built in a dry, upland pine-aspen-birch forest, the second in a grassy pine grove bordering a *Thuja* bog where ground mosses abounded.

Nest-building lasted four days; both sexes participated at least during the first day when they were observed working the initial material together and individually. The female apparently completed the bulk of the structure. Stanwood (1910:292) likewise recorded a 4-day nest building period, the male taking part only on the first day; in a second case nest building occupied 8 days, performed entirely by the female. The interval between completion of nest and laying of the first egg was but one day in my own observations, nine days and one

day, respectively, in the two nests observed by Stanwood (1910:293). The figure of nine days seems doubtful since this makes a 13-day interval between beginning of nest-building and appearance of the first egg. Nice (1937:94) finds that in the Song Sparrow *(Melospiza melodia)* this interval is 3 to 7 days, usually 4 to 5, with exceptional records of 9 and 13 days connected with subnormally reactive females. For the White-crowned Sparrow (*Zonotrichia leucophrys*), Blanchard (MS, 1938) reports that the interval between beginning of nest building and appearance of first egg is 8 to 12 days (8 known cases), the *nest-building itself occupying 7 to 9 days* in this species.

Egg Laying and Incubation

Three eggs were laid (July 1, 3, 4). A Cowbird's (*Molothrus ater*) egg was found with the first warbler's egg. Although the nest was examined on July 2, no additional egg was found, but it is possible that one was removed by the Cowbird (see Nice, 1937:157). However, when the third egg of the warbler was found, the Cowbird's egg was gone from the nest and was later found broken on the ground near the trunk of the home tree. No explanation can be given for its removal.

Not only do different species react differently to Cowbird parasitism (Friedmann, 1929:193), but individuals of the same species may vary likewise. One of the three known pairs of Black-throated Green Warblers near the Biological Station was observed feeding a Cowbird several days out of the nest. Knight (1908:530), on the other hand, cites a case of desertion when a Cowbird's egg was added to the first egg of a Black-throated Green Warbler. Friedmann (1929:245) regards this species as one "very seldom bothered by the Cowbird."

Incubation was done entirely by the female and apparently began with the laying of the last egg. Hatching took place the early morning of July 16, making the incubation period 12 days. Forbush (1929:265) states that the male takes part in incubation, but in the present study, the male was seen at the nest during this period only once when the female, disturbed at the observer's approach, called excitedly and attracted the male, who made an examination and adjustment of the nest contents and then left. Inattentiveness of the male during this period was also noted in two nests by the Nices (1932:166).

No extended observations were made of attentiveness of the female with regard to incubation except for one afternoon, on the second day of incubation, during which time (130 min.) the female was attentive for periods of 32 and 65 minutes (81 per cent), inattentive for 12 and 13 minutes (19 per cent). These figures are similar to those of the Nices (1932:95). During incubation the female was noted to leave the nest when the singing of the male was particularly near, giving a soft *chip* as she left. This has also been noted by the Nices (1932:97) and

suggests that, while the male may not take part in incubation, he may be attentive in the sense that he remains rather close to the nest during the female's absences. (See also Nice, 1937:126). During incubation more or less frequent shifts of position were made. One late afternoon the female was discovered asleep on the nest. When disturbed during early incubation the female left the nest in silence, a fact observed also by Knight (1908:529). However, as hatching time approached, the female became increasingly fearless, and if disturbance continued for more or less prolonged periods, she called excitedly, but the state of alarm was broken intermittently by feeding periods, evidencing a "waning of reactions" in the behavior pattern of the bird as described by Howard (1929:58).

Nestling Stage

At hatching, down feathers were distributed chiefly over the dorsal tracts of the otherwise naked young (coronal and occipital regions of the capital tract, pelvic region of the spinal tract, also the femoral, crural, alar, and caudal tracts); they were longest on the crown (5 mm.). Feather sheaths of the alar tract (remiges) emerged on the fourth day after hatching; those of the major body tracts appeared on the fifth day, at which time the eye slits also began to open. Sheaths began breaking on the seventh day. Weights of nestlings, taken at approximately 5 P.M. each day, are diagramed in the accompanying graph (Figure 1). (The death of one nestling indicated on the weight diagram was caused by exposure following accidental fall from nest.)

Parental Care

Feeding. Both sexes fed the young, the female more often. Brooding of young, like the incubating, was done by the female. Details of feeding activity are presented in Table 2. As indicated, data were extracted from the full day's observation on July 21 for equivalent periods spent at the nest on July 19. From a comparison of these data, it is evident that feeding was more frequent at 5 days of age than at 3 days. As shown by the Nices (1932:102, 166), increased feeding frequency is the general trend during the nestling stage. Distribution of feeding visits by numbers per hour (Figure 2) with two 5-day old young in the nest indicates increased activity in both male and female during early morning, noon, and early evening. In a complete day's observation made by Nice and Nice (1932:97) at a nest with young of the same age, the female fed alone and with less apparent regularity (Figure 2). The total number of feedings for both observations chances to be the same (46). The Nices, however, regard feeding frequency in the case of both females observed as slow (that is, normal, given the

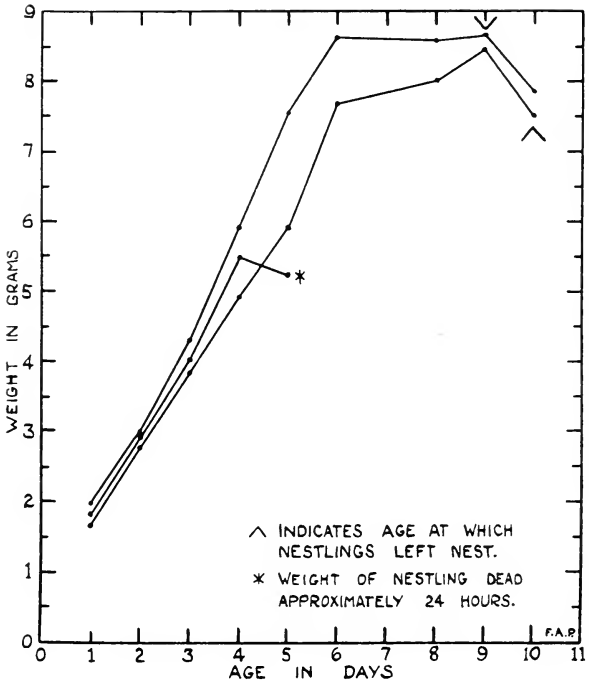


Figure 1. Daily weight increases of Black-throated Green Warbler nestlings.

assistance of the male), following an inherent rhythm adjusted to this assistance (1932:166).

The female's feeding of the young appeared to be independent of that of the male (see also Nice and Nice, 1932:96). However, the appearance of the latter with food at the nest, more often in the absence of the female than in her presence, is probably to be accounted for by the use of the song during the male's approach (see "Songs and Call-Notes") in response to which the female would leave before he appeared. If the male arrived rather soon after the female had fed the young, the female would leave the nest, remaining nearby to return after the male had completed feeding. On one occasion, the female returned to the nest while the male was still feeding and assisted him in re-inserting food in the mouths of the young.

At almost every one of his visits the male, although feeding less frequently, brought more food than the female, a point noted also by Smith (1934:33) during observations on the Black and White Warbler *(Mniotilta varia)*. The males of Black-throated Blue and Myrtle Warblers *(Dendroica caerulescens* and *D. coronata)* have been reported

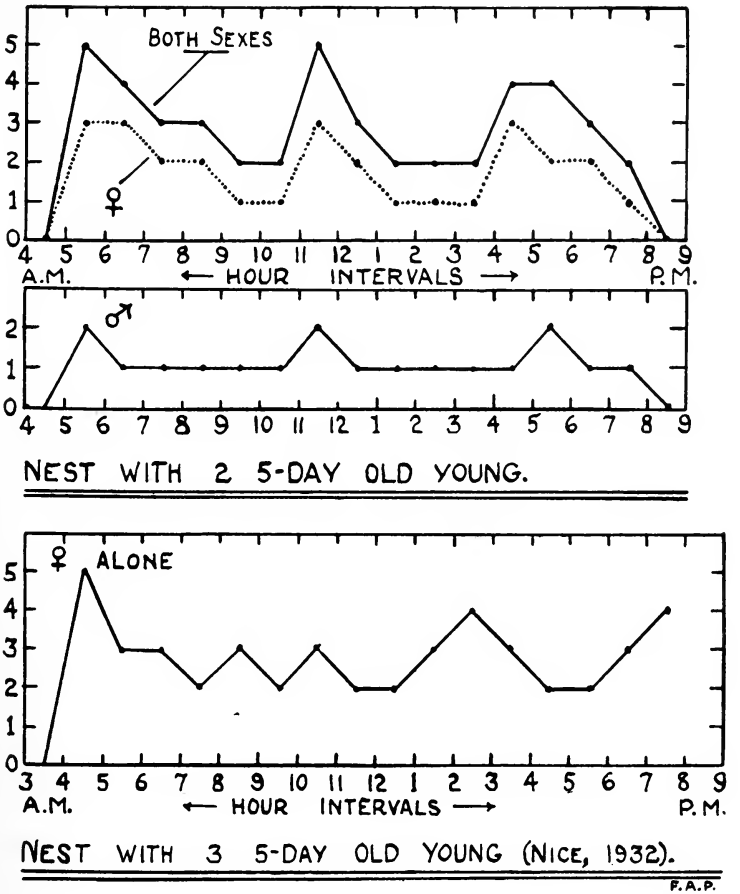
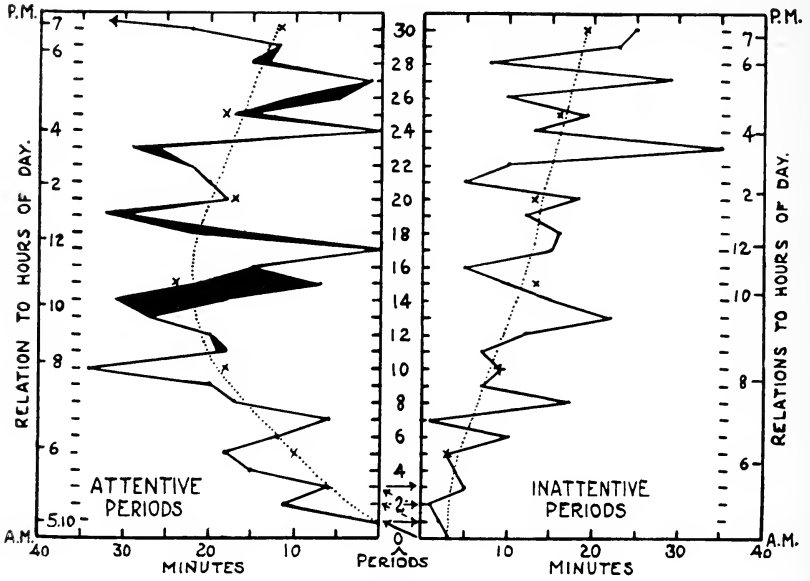


Figure 2. Feeding frequency of adult Black-throated Green Warblers at two nests with 5-day old nestlings (complete day's observation in both cases).

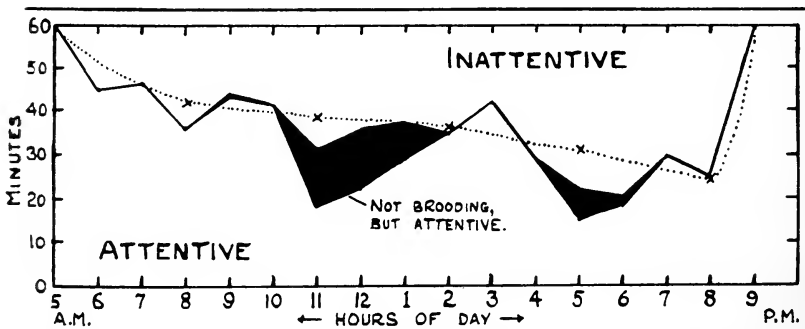
to bring more food per visit than females (Nice, 1930a:60, 1930b:343). In the present study, each of the male's mouthfuls usually consisted of two or three green lepidopterous larvae of one species, measuring about one inch in length. The female brought small Diptera, various small larvae, etc., the bulk of which always amounted to but a fraction of the male's food.

Sanitation. Both sexes removed and swallowed fecal sacs with approximately equal frequency, and on occasions when these were extraordinarily large, they were carried away and probably dropped. Reading and Hays (1933:403) recorded a feeding pair of which only the female removed fecal sacs.

Attentiveness. Observations on the attentiveness of the female



A. Complete day's record of attentive-inattentive periods of female. Sequence-relationship shown by arrows in 0, 1, 2, 3. Dotted lines indicate trends based on averages of every five periods (indicated by small crosses). Darkened outer segments of attentive periods show time during which female was attentive but not brooding.



B. Analysis of attentiveness by fractioning of successive hours. Dotted line indicates trend based on average of every four periods.

Figure 3. Activity of female Black-throated Green Warbler at nest with two 5-day old young.

during the nestling stage are summarized in Table 3 in a manner similar to the feeding data of Table 2. In addition to data from a full day's observation, the table provides a comparison of equivalent periods at 3- and 5-day ages of nestlings. It is evident that attentive periods are shorter, the total attentiveness is less on the fifth than on

the third day. While inattentive periods approximate the same on both days, the total inattentiveness is increased. A plotting of the full day's record of attentive-inattentive periods of the female (Figure 3A) show that attentive periods were longest during the middle portion of the day, while inattentive periods increased in length as the day progressed. Time spent in attentiveness but not brooding (i.e., female perching at nest) is indicated by the darkened portions of attentive periods in Figure 3A. An hour-by-hour analysis of attentiveness (Figure 3B) indicates that attentiveness decreased during the day and shows more clearly the time of day when brooding subsided (darkened portions) though the female was attentive.

In accordance with the above comparison, the Nices (1932:102, 162) show brooding periods to decrease in length during nestling life.

TABLE 2
FEEDING ACTIVITY

Age of Nestlings	3 days (July 19, 1938)	5 days (July 21, 1938)	
Period of Observation	5 hrs., 10 min. (8:35-11:30 A.M.; 1:15-3.30 P.M.)	Same as 3 days	15 hrs., 40 min. (4:20 A.M.-8:00 P.M.)
Number of Nestlings	3	2	2
TOTAL FEEDING VISITS:	9	12	46
Average No. per hour	1.7	2.4	3.1
Extremes	1 to 3	2 to 3	2 to 6
Intervals	7	10	45
Average length	34.7 min.	23.2 min.	19.1 min.
Extremes	5 to 55 min.	1 to 50 min.	0 to 50 min.
No. of Nestlings Fed per Visit:			
Known Instances	6	....	....
Average	2.5	....	....
Extremes	1 to 3	....	....
MALE:			
Total feeding visits	4	5	18
Average No. per hour	0.8	1	1.2
Extremes	0 to 1	....	1 to 2
Intervals	2	3	17
Average	75 min.	50.3 min.	49 min.
Extremes	61 to 89 min.	37 to 62 min.	31 to 90 min.
FEMALE:			
Total feeding visits	5	7	28
Average No. per hour	1	1.4	1.9
Extremes	0 to 2	1 to 2	1 to 3
Intervals	3	5	27
Average	47 min.	44 min.	31.9 min.
Extremes	41 to 52 min.	32 to 57 min.	2 to 64 min.

Brooding ceased on the seventh day after hatching (sixth and seventh days, respectively, recorded in two nests studied by the Nices).

Bigglestone (1914:58) has justifiably called attention to the number of factors, chiefly climatic, affecting the attentive-inattentive periods of at least dendroicine warblers. But the Nices (1932:164) —in spite of a number of variations—find two female Black-throated Green Warblers more alike than different in the matter of attentiveness as well as other respects when compared with nine other species of the Compsothlypidae. As Bigglestone suggests, there is a certain adaptability of behavior under varying conditions. Nevertheless, by studying a *number* of pairs and comparing with closely related species, these variations in behavior may be more accurately evaluated and the inherent, characteristic rhythm more closely determined (Nice and Nice, 1932:166).

TABLE 3

ATTENTIVENESS OF FEMALE DURING NESTLING STAGE

Age of nestlings	3 days (July 19, 1938) [1]	5 days (July 21, 1938) [1]	
Period of observation	4 hrs., 4 min. (9:05-11:30 A.M.; 1:15-3:30 P.M.)	Same as 3 days	14 hrs., 23 min. (5:07 A.M.-7:30 P.M.)
Attentiveness	71% [2]	64%	57% [3]
Periods	4	6	30
Average length	36.3 min.	23.2 min.	16.4 min.
Extremes	33 to 39 min.	18 to 31	0 to 34 min.
Inattentiveness	29%	36%	31%
Periods	6	7	31
Average length	13.3 min.	13.4	12.0 min.
Extremes	7 to 30 min.	5 to 22 min.	1 to 29 min.

[1] Days of observation were clear, mild, and "average" in both cases.

[2] In a complete day's observation, percentages of attentiveness are calculated on basis of time from beginning of first inattentive period to ending of last inattentive period.

[3] This percentage expresses total attentiveness, but only 52% constituted actual brooding since portions of eight attentive periods (see Figure 3) averaging 5.6 min. (extreme 1 to 14 min.) were spent simply near the nest.

Reaction of Adults to Intrusions. Display on the part of the excited adults was not noted until the second day after hatching when the female left the nest upon the observer's approach but remained a few feet from it, fluttering her wings and bending forward slightly. Such a reaction was also observed after the first nestling left the nest, at which time display was more intense. On the same date, the male appeared on the scene and behaved similarly, dragging the outspread tail along, fluttering wings and lowering the head.

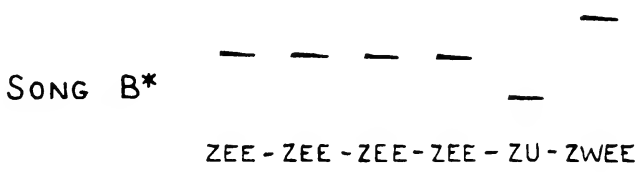
On the eighth day after the hatching, a red squirrel *(Sciurus hudsonicus)* was observed to approach the blind, coming to within seven feet of the nest. At this time, the female simply left the vicinity of the nest at once and gave no alarm notes. Later the same day, when a young Black and White Warbler approached the nest to a distance of five feet, the female pounced upon it and struck with considerable force. When the intruder returned a second time the female flew at it and drove it away. The indifference to red squirrels and at the same time the offensive reaction toward small passerine intruders *(Vireo olivaceus* and *Penthestes atricapillus)* has also been noted by the Nices (1932:160).

Fledgling Stage. Young left the nest 9 and 10 days after hatching. Forbush (1929:266) records length of nest life as 8–10 days, the Nices (1932:171) as 8 and 9 days. After the young left the nest, the male was not observed to take any part in feeding and, save for the single instance of display mentioned above, was not seen near the young. However, both adults of a second pair were observed feeding a Cowbird several days out of the nest, and the Nices (1932:167) report males feeding young out of the nest in nine cases. Following the departure of the second or last nestling, the female continued to bring food to the empty nest. Similar behavior was noted by the Nices (1932:99) in the case of a male, likewise by Mousley (1924:283) in both members of a pair of Magnolia Warblers *(D. magnolia)* and by Common (1933:413) in a female Ruby-throated Hummingbird *(Archilochus colubris)*. Five days after leaving the nest, a single juvenile fed by the female was still in the vicinity of the nest. Nice (1936) reports a molting female Black-throated Green Warbler feeding two fully grown young in winter plumage on September 7 in Massachusetts. Probably the length of fledging dependency is somewhat shorter than this would imply and is similar to that of other dendroicine warblers or closely related passerines. In the Magnolia Warbler (Nice, 1928: 253), this period is at least 22 days; in the Ovenbird *(Seiurus aurocapillus)* (Hann, 1937:212) it is recorded as 30 days, in the Prothonotary Warbler *(Protonotaria citrea)* as at least 19 days (Walkinshaw, 1939), and in the Song Sparrow as 28 to 30 days (Nice, 1937:133). Four weeks is the approximate figure for small passerine birds.

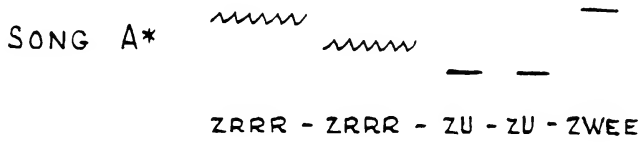
Songs and Call-notes

The Black-throated Green Warbler has two songs, both of which may be given with certain modifications. Comparable interpretations are recorded by Hoffman (1904:113), Thayer (cf. Chapman,

1907:160), and the Nices (1932:168). The first and most common song may be shown as follows:



The *zee's* preceding the *zu-zwee* may be reduced to two or increased to six in number. The second and less frequent song may be shown as follows:



The second or last or both notes may be omitted, resulting in the following modifications: *zrr-zrr-zu-zu* or *zrr-zu-zu-zwee* or *zrr-zu-zu.*

There was an interesting use of the song by the male as an apparent warning to the female brooding the young of his approach to the nest with food. Odum (1931:316) observed the male of a Hooded Warbler *(Wilsonia citrina)* singing during approach to the nest over all of the first seven days of nestling life, suggesting a similar behavior. The present observations were made during the fifth day after hatching (July 21). As a rule, for about three to five minutes before arriving at the nest with food and for the same period after leaving the male sang. During the approach to the nest, song B was given; after leaving either song A or B was given.

The singular thing about the approach song was that the closer to the nest the male came, the softer became the song. When the singer was but a few feet from the blind, the song became a whisper and unless one was aware of the male's presence, it sounded as if coming from the distance. Mousley (1934:215) has suggested ventriloquial properties in the voice of the Crested Flycatcher *(Myiarchus crinitus).* Aretas Saunders (1929:81) believes that apparent ventriloquism may be due to a psychological condition of the hearer, but in this case the

* In accordance with the Nices' designations.

approach song can be described as ventriloquistic in the sense that it seemed to come from a distance when the singer was close (as Saunders suggests). Usually the female left the nest before the male reached the nest tree. Once the female left the nest in response to a single performance of the song, remaining perched near the nest while the male came with food a minute or so later. On a few occasions the female remained on the nest until the male was within a few feet of her and had given a few soft *chip's* in addition to the whisper song. During the late afternoon when singing subsided, the male approached silently and when only a few feet from the nest, gave the whisper song; whereupon the female left the nest. During the singing periods, song B was given on an average of 5 to 6 times a minute, song A only 3 times a minute. The last (emphatic) note of song B was usually dropped in the whisper song.

The apparent ventriloquistic quality of the song seems adaptive in that there is less possibility of attracting enemies when the male is close to the nest, but nevertheless the song may serve to coordinate behavior of the sexes in that it warns the female of the male's approach with food. In almost all of the cases where the female remained on the nest in spite of the male's approach, the former had fed the young shortly before. The song, while superficially alike in late spring migration and nestling stage, can hardly have the same relation to behavior of the adults throughout these various phases of the breeding cycle (Herrick, 1935:17). Undoubtedly this relation changes as the breeding cycle advances, and during the nestling stage song may well serve a coordinative function in the feeding activities of the adults.

The usual alarm note of the female was a soft *tzip* distinctly less metallic than the *chip* of the male. During the excitement of the first two days after the young left the nest, the female gave a decidedly sharper, louder *chip* upon the observer's approach. Once the female gave a series of soft *chips* directed at a nestling which did not open its bill when she attempted to feed it. The female's call to the young while approaching them was a soft and rapidly repeated *sh-sh-sh-sh-sh* of variable length. On the seventh day after hatching, the nestlings began to utter a rapidly repeated *chi-chi-chi-chi* upon a parent's arrival at the nest or during the observer's handling of them. At time of leaving the nest, young were noted to give two calls, a simple *chip* and a *chi-churr*. Stanwood (1914:188) and Thayer (in Chapman, 1907:160) describe additional call-notes.

Further Studies

In the present paper, certain details of breeding behavior may be contributory to our knowledge of the life history of the Black-throated Green Warbler, but in large part, these observations serve to confirm facts presented by the Nices in a longer, earlier study (1932). Mousley's

(1924) studies of five species of Compsothlypidae (including the genera *Compsothlypis, Dendroica,* and *Setophaga,* but not *D. virens*) present general conclusions on the breeding behavior of North American warblers. The majority of these (numbers 2 to 11) are applicable to the Black-throated Green Warbler, judging from my own experience as well as that presented in the literature. However, as is apparent from data presented here and also from the Nices' detailed table (1932:165), his conclusions regarding feeding rate and length of attentive periods need revision and amplification. Available data indicate that the species of Compsothlypidae vary in a number of phases of breeding behavior—feeding frequency, attentiveness, relationships of sexes, etc. In view of known similarities and close phylogenetic relationships, the detailed study of these variations should prove all the more interesting.

Summary

1. In northern Michigan, the Black-throated Green Warbler is found chiefly in developmental communities in which conifers are available in pure growths or mixed with deciduous growth.
2. Phases of the breeding cycle have the following time lengths: nest building, 4 days; incubation, 12 days; nestling life, 8 to 10 days; dependent period of fledglings, approximately four weeks.
3. Nests are placed at various heights in conifers. A rather extreme variation is noted in strength of nest structure. Materials used in nest structure apparently vary largely according to availability.
4. Both sexes (but chiefly the female) participate in nest building and care of young. In the present study the male was not observed to take part either in incubation or in feeding of fledglings.
5. Observations at 3- and 5-day stages of nestling life indicate an increasing feeding rate over the nestling period and a decreasing amount of brooding, which apparently ceased on the seventh day. Details of feeding frequency and attentiveness are given in tabular form.
6. The female fed more often, though the male brought more food at each visit. While the sexes appeared to be independent of each other in time of feeding, a coordinative behavior was detected in the use of song as an approach warning so that the male usually brought food during an inattentive period of the female.
7. Two songs are characteristic: *zee-zee-zee-zee-zu-zwee* and *zrrr-zrrr-zu-zu-zwee;* these are varied with a number of modifications. Call notes of both adults and young are also described.
8. The song, as given with relation to the male's approach with food for the young, is softened increasingly with approach towards nest to a whisper song having a ventriloquistic quality.

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SPRING ROOSTS OF THE ROBIN

BY JOSEPH C. HOWELL

MANY accounts of the late summer, fall, and winter roosting of the Robin (*Turdus migratorius*) have been published, but few, if any, good descriptions of spring roosting appear in print. Brewster (1890: 364), in his fine account of the summer roosting of the Robin in Massachusetts, found that the roosts were never used before June 11, and usually not until the twentieth of that month. Forbush (1929: 414) infers that the roosts are not used prior to June and that the young do not use the roost until July. This paper is a report of a small roost which was located on the Cornell University campus at Ithaca, New York during the spring, summer, and fall of 1937.

The Robins roosted in a small grove of conifers, occupying a steep northerly slope of 4¼ acres in area. At the eastern end of the roost was a dense, one-acre patch of red pines and white pines. The trees grew very close together, with interlocking branches and were about thirty years old. This was the part of the grove to which most of the birds resorted. The western part of the area was much more open, having a few clumps of white pines and scattered spruces and firs. In outline, the area was rectangular, about 150 feet across and 1200 feet in length. It extended from the southeast to the northwest. Open fields lay to the north and east of the area. To the south and west was a gravel road, and beyond the road were scattered buildings, the nearest being 75 feet from the roost. The northwestern approach was dominated by a heavy growth of large trees and was little used by the birds in coming to the roost.

While the birds were undoubtedly using this roost earlier in the season, their presence there was first noted on April 28, when the sun set at 6:55 P.M. At 7:30 P.M. it was cloudy and a low breeze was blowing. Many birds were in full song, but more of them were only calling. During roosting time, song could have little territorial significance. Perhaps the singing males were unmated birds. There were at least 200 Robins in the conifers. Many flew over my head and into the cover as I stood at the southern exposure of the roost. The roosting birds shifted their position almost continuously, noisily flapping as they moved in the dusk. A true chorus of songs was given and at no time were less than three or four birds singing.

Four Robins were flushed as they roosted in a white pine that held a Robin's nest containing two eggs. This pair had evidently ceased defending its nest-tree from intrusion by other Robins early in the evening, when roosting began. This lull in the defense of the nest with the coming of dusk is probably due to the fact that the female is concerned with incubation and the male rarely roosts in the nest-tree.

By 7:40 P.M. the chorus was over, and only a few chirps and an occasional snatch of song were heard. The birds roosted five to twenty

in a tree, and they flew out in hordes when I walked beneath the pines. The roost was absolutely silent at 7:45 P.M.

On April 29, at 7:24 P.M., the weather was clear and the temperature was about 55° F. The Robin chorus was in full swing. The birds came to the roost singly or in pairs. Many more were calling than singing.

A minute-by-minute count of the Robins entering the roost was made as I stood on the gravel road to the south of the middle of the roost. It was certainly far from a complete count, for the light was poor, the extremes of the roost were 600 feet away from me, and I could count only the birds that came in from the south and west and not those from the north and east. The times given in the following table represent the end of a minute interval.

TABLE 1.

RELATION OF TIME TO THE NUMBER OF ROBINS ENTERING THE ROOST

Period No.	Time	No. of Robins	Period No.	Time	No. of Robins
1	7:27	12	10	7:41	22
2	7:30	17	11	7:42	10
3	7:31	26	12	7:43	4
4	7:34	15	13	7:44	3
5	7:35	30	14	7:45	1
6	7:36	27	15	7:47	2
7	7:37	20	16	7:48	1
8	7:38	23	17	7:49	0
9	7:39	20			
					233

The earlier birds that came to the roost called frequently and often alighted on a lawn, housetop, telephone wire or tree before entering the roost. As they approached the roost they were almost always within 100 feet of the ground and often flew over my head only a few feet out of reach. Between 7:30 and 7:40, when it was almost dark, the birds usually flew straight into the roost with no stops along the way. By 7:48 I could not see what I wrote in my notebook. The last Robin to enter the roost came in at 7:49. It fluttered heavily into a pine, apparently not being well able to see where it was going.

The singing, which was so prominent at 7:24, was carried on by only a few scattered birds at 7:40. At 7:45 only one bird sang and only three called. No songs and only occasional outbreaks of chirping were heard after this. After 7:50 all was quiet.

On April 28 it was cloudy and silence came to the roost five minutes earlier than it did on the following day, when it was clear.

An attempt was made on April 29, and at subsequent dates, to trap Robins as they came to the roost in the deep dusk. It was my hope that they would not be able to see me. However, it turned out that no Robins came to roost after darkness had arrived, and in the last faint

glow of twilight they were always able to see me or a net set for them to fly into.

On April 30 the roost was visited at 7:30 P.M., when the weather was clear and the temperature was 55° F. Fifty Robins were frightened from a brushy spruce that was only 35 feet high. The birds roosted both against the trunk and near the tips of horizontal branches. The birds flushed from the trees flew out heavily, often rising more or less straight into the air, but sometimes going to a nearby tree. Those ascending vertically seemed to get their bearings soon and flew down to a new roosting place, where they had little trouble in finding a perch. When the beam of a weak flashlight was played on the birds they "froze," with their eyes open and their necks outstretched. They appeared to be confused by the light and were nervous and ready for action.

On May 3 three adult Robins were collected as they roosted. Two of these proved to be females. The condition of the ovary indicated that one of the females would have laid an egg in a day or two. The yolk of the largest egg was fully matured. In the ovary of the other female the largest yolk was 5 mm. in diameter, which is a little over a third of the diameter of a mature yolk. The presence of these females in the roost at this stage in the nesting cycle shows that the nest is not protected at night by the parents until the first egg is laid. Recently completed nests, in which an egg had not yet been laid, were visited on a few occasions, and in no case was a parent Robin flushed from the nest or close to it.

Nests containing eggs were often visited at night. One of the parents was always on the nest, but the other parent did not roost near the nest. In the few occasions where the sex of the incubating bird could be determined, it was a female. The nesting male birds in the region surrounding the roost left the immediate vicinity of their nests at dusk and flew to the roost. This observation was borne out by collecting seven Robins in the roost, all of which were male birds, between May 6 and July 10, 1937. At this season almost all of the female Robins spent the night on the nest.

On the evening of May 6 the roost was visited after the birds had settled down for the evening, and a number of them were flushed. They were quiet until disturbed, but as they fluttered off they usually chirped a few times.

Young Robins began using the roost as soon as they were able to fly sufficiently well to reach the roost. They were usually about three weeks old when they ceased spending the night in the vicinity of the nest in which they were raised.

No other Robin roost was known to be located near this one. Robins were seen flying to the roost from points half a mile away. As some of these birds were flying rather high when observed, it is probable that

birds within a mile radius of the roost used it each evening. At night the only Robins not using the roost were female birds that were incubating eggs or brooding young.

For purposes of comparison some of the observations of Emlen (1934: 341–343) are given here. His studies were made during spring and summer from 1927 to 1931[1] at Cresheim Creek, Philadelphia, where thousands of Robins were roosting with even larger numbers of Grackles and Starlings. The first spring arrivals visited this place at night, and from then on they continued to return night after night in seemingly numberless multitudes. The roosting site was a thirty-year plantation of hemlock and pine on a hillside. While the blackbirds roosted high in the trees, the Robins seemed to prefer the lower branches, where they were left unmolested. A common place to find them was on a broad, dense horizontal branch of hemlock from 7 to 10 feet from the ground. Frequently a bird would be encountered conspicuously roosting only a few feet up and well within reach of prowling terrestrial predators. When roosting at low elevations, the birds were often only 18 inches in from the tip of a branch, but when the site selected was near the top of a tree they were usually huddled close against the trunk.

Dr. Emlen banded several hundred Robins at the roost. They were captured by spotting them at night with a flashlight. Some of the Robins banded in April were recovered as far north as Newfoundland in the summer. Thus the roost served as a resting place for migrating Robins en route to a more northern nesting ground.

As the spring advanced this roost diminished in size, but served as headquarters and nightly rendezvous for a large number of Robins throughout the entire summer.

Summary

During the spring of 1937 a company of from 200 to 300 Robins roosted in a small grove of conifers on the Cornell University campus, at Ithaca, New York. Activities at this roost were studied from April 28 to July 10. The following facts were ascertained:

On April 29 (the sun set at 6:56 P.M., E.S.T.) Robins were entering the roost at the rate of about fifteen a minute at 7:30 P.M. About twenty a minute entered the roost between 7:31 and 7:41, following which time not more than ten birds entered the roost during any one-minute period. The last bird entered the roost at 7:49.

Robins came to roost from all directions, although few birds flew in from the northwest, where there was a heavy growth of large trees. The birds came from distances of more than half of a mile.

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[1] Dr. Emlen made spring visits to the Cresheim roost on the following dates: 1927, April 12, 13, 19, 25, 28, May 7; 1928, March 18, 25, April 7, 8, 14, 15, 19, May 4, 12; 1929, April 6, 12; 1930, March 23, May 4; 1931, March 27, April 4.

A chorus of song was given by the roosting male birds. This chorus played no part in territorial behavior.

A tree in which a Robin's nest containing two eggs was located was used as a roosting site by four Robins.

Female Robins continued to use the roost until a day or two before they laid their first egg.

Male Robins spent their nights in the roost throughout the nesting period, leaving their mates to guard and care for the nest.

Young Robins began using the roost as soon as they were able to fly to it.

A roost studied at Cresheim Creek, near Philadelphia, by Dr. John T. Emlen, was used by resident Robins and also by transients en route to a more northern breeding area. This fact was determined through the recovery of banded birds from as far north as Newfoundland.

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VARIATION OF THE EXTERNAL EAR-OPENING IN THE STRIGIDAE

BY LEON KELSO

IN WILLUGHBY'S ORNITHOLOGIA and other early works the few known species of owls were classed according to presence or absence of ear-tufts. When more species became known and the structure of owls was studied in greater detail it was realized that a classification based on ear-tufts alone was not entirely satisfactory. Our present-day classifications based on structure of the external ear may likewise need revision after the anatomy of some tropical species has been investigated.

The subdivision of the family Strigidae has long been a source of disagreement and the present paper does not attempt to settle the matter. The study of the classification of owls has always been handicapped by a lack of preserved specimens and skeletons of the tropical species. Until these are available a final phylogenetic arrangement must wait. The aim of this paper is to show the general variation tendencies in the external ear-opening or ear-conch.

As a Subfamily Character

Savigny (1809) and Cuvier (1817) seem to have been the earliest to use the ear-conch in subdividing the Strigidae. Macgillivray (1836, 1840) published the first illustrated studies of the ears of owls. Kaup (1859) made use of ear characters in his revision, as did Sharpe (1875). Collett (1881), whose work was translated by Shufeldt (1900), made a detailed study of the ear-openings and crania of ten species of boreal Europe. Pycraft (1898:259-263) described the ears of 18 species of owls, placing less emphasis on the ligamentous bridge than did Collett. Later (1903:44, 45) he described the ear of *Phodilus*. Ridgway (1914: 618–622) made extensive use of external ear characters in his key and diagnoses of owl genera represented in North and Middle America. He warned however that a classification based on ear structure alone would probably be far from satisfactory. Peters (1938) measured the ear-conches of a number of species.

The inner details cannot be studied in all species at present because they are not evident in skins and whole preserved specimens are not available. There is a shrinkage of 1 to 3 mm. in diameter of ear-openings in dried skins.

On the basis of the above studies Sharpe and some subsequent writers have separated the Strigidae into two subfamilies: Striginae, characterized by having the ear-conch at least half height of skull in vertical diameter, or larger than eye, its margin produced into a dermal flap of varying width, with a ligamentous or muscular bridge across the opening; and Buboninae, characterized by openings less than half height of skull, without flap and bridge.

The dermal flap is an outward extension of the skin along the bases of the feathers surrounding the opening. The bridge is an outward extension of a ridge or shelf below or behind which the auditory passage enters the skull.

The ten boreal species studied by Dr. Collett do indicate that the proposed subfamilies are quite distinct. The Strigidae are not primarily a boreal family however, and their taxonomy cannot be finally determined on the basis of the northernmost species. Just as the genus *Phodilus* tends to bridge the gap between Tytonidae and Strigidae, so some tropical species tend to merge the proposed subfamilies.

The writer would call attention to the following points:

1. There is a distinct though narrow dermal flap on the posterior margin of the ear-conch in living or preserved specimens of such bubonine species as *Otus asio, O. choliba, O. leucotis, O. vermiculatus, Bubo bubo, B. lacteus,* and *B. coromandus,* and species of *Ciccaba.*

2. The ligamentous bridge is apparent in *Otus asio, O. choliba,* and *Bubo bubo* as a shelf above the entrance of the auditory passage into the skull. According to Hodgson (1837:372), there is a very distinct bridge in *Bubo cavearea* [= *B. bengalensis*].

3. *Pulsatrix melanonota* and *P. koeniswaldiana* (subgenus *Novipulsatrix*) are intermediate between the proposed subfamilies, their ear-openings having the small size of the bubonine group but the oval shape, dermal flap (particularly on the posterior margin), and interior transverse ligament of the strigine group. They are intermediate in iris color, ear, and plumage characters between the admittedly strigine *Strix rufipes* and the bubonine *Pulsatrix perspicillata.* The skeleton of the latter species has both bubonine and strigine characters but is closer to *Bubo.*

On the basis of ear characters, facial feathering, and bare toes, *Novipulsatrix* could well be considered generically distinct,—as much so as *Mimizuku, Nesasio, Lophostrix, Jubula, Rhabdoglaux, Berneyornis, Rhinoptynx, Gymnasio,* and *Ketupa.* It has the recommendation of not being monotypic.

4. The genus *Ciccaba* shows affinity to both *Bubo* and *Strix* although usually classed as bubonine. The right ear openings of *Ciccaba virgata* (about 22 mm.), *C. borelliana* (21 mm.), *C. nigrolineata* (20 mm.), *C. albitarsis* (23 mm.), *C. hylophila* (24 mm.), in dry skins, are over half the height of the skull in greatest diameter, a strigine character. The smaller left ear opening is another strigine character. While skins of all of them do not show the transverse ligament and dermal flap, freshly killed or preserved specimens might show traces of such. The skeletal characters of *Ciccaba* place it closer to *Strix* than to *Bubo. Ciccaba albitarsis* is a step toward *Strix fulvescens* in size and character of ear openings and in its Temperate Zone habitat.

5. *Strix indranee* and *S. leptogrammica* (Subgenus *Bulaca*) of the

Indian Region are intermediate between *Bubo* and *Strix* in build, relative length of primaries, shape of facial disk, and color of the iris. While there is a dermal flap present, the vertical axis of the ear-conch scarcely equals half the height of the skull.

6. In the living *Otus asio naevius,* and in *Bubo bubo* (Macgillivray, 1836:344b) the vertical axis of the right ear-conch is fully half the height of the skull, 12-15 and 26-31 mm. respectively. Furthermore, in *Bubo bubo* the hollow of the conch proper, or cavernum, extends upward between the skin and the skull to the crown (Pycraft, 1898:260). The same is true in *Surnia ulula.*

It is thus evident that some species of four different genera have a combination of the supposedly diagnostic ear-opening characters of both of the proposed subfamilies.

As Correlated with the Environment

Among closely related species of owls the size of the ear-opening shows a parallel variation similar to that of wing length and foot feathering. In closely related groups the northern species have relatively larger ear-openings with more conspicuous dermal flaps than the southern.

As shown in the following table, large-eared species (those with ear-conch at least half height of skull in vertical axis) comprise a higher percentage of the owls in the Temperate and Boreal Zones than in the Tropical Zones. The Tytonidae (Barn Owls) and *Phodilus* (Bay Owls), which are mainly tropical and have uniformly small conches, are not included. Only non-migratory continental Strigidae are considered.

TABLE 1

Regional Ratios of Large-eared to Small-eared Strigidae

Region	No. of species	Species with large ear-conch	Species with small ear-conch
Transition, Canadian, Hudsonian, Temperate, and Boreal Zones of the Americas	22	12 (54.5%)	10 (45.5%)
Subtropical and Tropical Zones of the Americas	51	8 (15.6%)	43 (84.4%)
Boreal Europe and Asia	10	6 (60.0%)	4 (40.0%)
Tropical Africa	23	2 (8.7%)	21 (91.3%)
Tropical India	30	6 (20.0%)	24 (80.0%)

The resident owls of New Zealand, Australia, and the Philippines are all small eared.

The following evidence of southward reduction in ear size may be noted. In *Otus asio naevius* the ear-conches are 8-12 mm. in vertical

axis, while those of the southern *O. a. asio* are 6-8 mm. *Otus choliba, O. vermiculatus,* and *Ciccaba albogularis* of tropical America are as large as *O. a. naevius* in body size but the ear-conches are smaller, 6-9 mm. *Lophostrix cristatus* and *Strix woodfordi,* tropical species twice the size of *naevius,* have ear-openings just as small, 10-12 mm. Tropical *Pulsatrix perspicillata saturata* is as large and stout as boreal *Bubo v. virginianus* but the ear-conches are only slightly larger than in *Otus,* 10-14 mm., instead of 16-20 mm. as in *Bubo v. virginianus. Bubo nipalensis* and *B. orientalis* of the Indian tropics have ear-openings as small in relative size as those of *P. p. saturata.* In *Ninox, Athene,* and *Glaucidium* they are even smaller.

This tendency is contrary to Allen's (1877) rule of variation in mammals, according to which, in related forms the external ear is relatively larger southward, instead of northward.

Closely correlated with the larger ear-openings and dermal flaps of northern owls is the occurrence of a more broadly rounded facial rim which extends farther above the eye, wings with fewer emarginate primaries, more extensively feathered feet, and (in *Strix uralensis, Scotiaptex, and Cryptoglaux*) an unsymmetrical skull.

The asionine genera (*Asio, Rhinoptynx,* and *Pseudoscops*) have ear-conches with vertical axis greater than the height of the skull, narrow and slit-like, with dermal flaps continuous around the margin. In northern species of *Asio* the auditory canal enters below the bridge in the right ear, above the bridge in the left ear. This group may prove separable when preserved material of the tropical species is examined. The aegoline genera (*Cryptoglaux* and *Gisella*) having ear-conches about equaling the height of the skull or greater, oval in shape, with continuous dermal flap, and unsymmetrical skulls, may also be separable as a subfamily when their tropical species have been studied anatomically.

It seems likely that in the asionine, aegoline, and strigine groups, the large ear-openings, like the dense feathering of their feet, developed independently through parallel evolution.

A few remarks on the relative importance of external ear structure and foot feathering as taxonomic characters may be in order here. It has been proposed that, for owls, foot feathering be considered a character of subspecific significance only. Many tropical species have bare toes. There are three facts to remember when considering this view.

(1) Among species, foot feathering shows less correlation with climate than does size of ear-opening. The species with bare toes comprise 74.51, 65.22, and 36.67 per cent of the owl species in continental tropical America, Africa, and India respectively, while small-eared species comprise 84.4, 91.3, and 80.0 per cent in those regions.

(2) In *Asio otus, Cryptoglaux funerea, Otus asio,* and *Tyto alba*

the final extent of foot feathering is established at or before time of hatching, while the dermal flaps, and final shape of the ear-opening are then scarcely evident.

(3) Several characters of tropical genera—shorter, more rounded wings; more primaries emarginated; stouter bill and feet; shorter, less compact feathering—are strongly correlated with tropical climate throughout the Strigidae, and indeed, the whole class Aves. Dismiss these along with size and coloration, and nothing is left to support many long-recognized tropical genera.

Summary and Conclusions

1. The ear-conches of some species of *Pulsatrix* and *Ciccaba* are intermediate in structure between those of *Bubo* and *Strix*. The ear-conches of some species of *Otus, Bubo,* and *Strix* are likewise intermediate in character. The proposed subfamilies Buboninae and Striginae, as defined on the basis of these ear characters, are therefore not perfectly distinct.

2. In the Strigidae there is some correlation between size of ear-opening and climate. Among closely related genera or in genera of wide distribution, the species confined to tropical climates usually have relatively smaller ear-conches. In cold climates species having large ear-openings with large dermal flaps are more numerous, while in tropical climates species having small ear-openings with scarcely any dermal flap greatly predominate. This is contrary to the tendency in mammals (Allen's Law), according to which the external ear is relatively larger in southern forms.

3. Those species of Strigidae having larger ear-openings usually have a more complete facial disk and rim, and more extensively feathered feet. In a few cases (*Strix uralensis, Scotiaptex,* and *Cryptoglaux*) the large ear is associated with an unsymmetrical skull.

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1370 TAYLOR STREET, N.W., WASHINGTON, D.C.

FIELD BOOK OF ANIMALS IN WINTER. By Ann H. Morgan. G. P. Putnam's Sons, New York, 1939: 4 x 6¾ in., xv + 527 pp., 283 illus., including 4 color pls. $3.50.

All of the four colored plates and more than 60 pages of the text of this excellent little manual are devoted to the winter birds of the northeastern states. The engravers have handled Roger Peterson's paintings so well that in spite of their extreme reduction in size most of the 81 species shown on the plates are very successfully represented. The text includes very brief discussions of such topics as winter food, migration, and winter flocks but most of it is devoted to details of identification points, habits, and distribution of the several species.

Unfortunately the author follows the modern but confusing custom of not capitalizing the English proper names of birds. This, combined with the occasional use of such purely literary synonyms as "white-vested nuthatches," will surely be confusing to beginners. When a new edition is needed the author should ask some ornithologist to go over the bird nomenclature, both scientific and common, and remove its many small but annoying inconsistencies. At least the misspelling of *Arquatella* should be corrected and if most birds are to be listed under trinomial scientific names the reader should not be told that all "horned larks" are called simply *Otocoris alpestris* and breed "in the Arctic zone of Canada and Newfoundland."

We regret that the author has repeated the old legend that because of past importations of Texas Bob-white "most of the present northern quail are small as compared with birds captured sixty years ago, and they are probably more easily killed off by hard winters." There seems to be no real proof of this and Milton Trautman and others have presented strong evidence against it.

Few bird students are so specialized in their interests that they will not be led irresistibly, to their own great benefit, into reading the other sections of this attractive book which recount the characteristics and habits of the surprisingly large vertebrate and invertebrate fauna to be found in winter in our northeastern states.—J. Van Tyne.

A NEW TUFTED FLYCATCHER[1] FROM HIDALGO

BY GEORGE MIKSCH SUTTON AND THOMAS D. BURLEIGH

IN identifying the birds collected by the John B. Semple 1939 expedition to eastern Mexico, we find that our series of eight *Mitrephanes phaeocercus* from Jacala, Hidalgo, belong to an undescribed race that presumably represents the species at the northeasternmost edge of its range. We propose to call this form

Mitrephanes phaeocercus hidalgensis, subsp. nov.

TYPE.—Adult male in fresh plumage, Louis Agassiz Fuertes Memorial Bird Collection at Cornell University, No. 6558; La Placita (elevation about 6000 feet), along main highway six miles south of Jacala, Hidalgo, April 8, 1939; collected by George Miksch Sutton.

SUBSPECIFIC CHARACTERS.—Differs from all known races of *Mitrephanes phaeocercus*[2] in one striking character: the uniform, strongly greenish tone of the crown, hind neck, and back. Like *M. p. phaeocercus* (Sclater) in size, but greener above, with crown, hind neck and back the same shade throughout rather than darker on crown; smaller, darker above and below, broader-billed, and greener above than *M. p. tenuirostris* Brewster; larger, and greener above than *M. p. nicaraguae* Miller and Griscom; and lighter, and greener above than *M. p. quercinus* van Rossem, a richly colored form in which the darkness of the crown contrasts sharply with the lighter tone of the hind neck and back.[3]

RANGE.—So far as is known, the mountains of northern Hidalgo.

REMARKS.—It is significant that no specimen of the 13 *M. p. phaeocercus* (from central and southern Vera Cruz, Guerrero, Morelos, Oaxaca, Michoacan, and Guatemala) or the 18 *M. p. tenuirostris* (from Jalisco, Durango, Guerrero, Mazatlan, Morelos, 'Mexique', Chihuahua, Sonora, and Tepic) examined in connection with our study, shows any marked intergradation with *hidalgensis* insofar as greenness in tone of the upper parts is concerned. Several specimens in the U. S. National Museum are, on the other hand, intermediate between *phaeocercus* and *tenuirostris* in color and in width of bill, extreme individuals of *tenuirostris* being instantly recognizable by their narrow bills, but other pale large-sized birds being quite broad-billed enough for *phaeocercus* or for any other of the known races.

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[1] The common name currently used for this bird is Dusky-tailed Flycatcher, an inept and misleading name based on Sclater's specific name *phaeocercus* rather than on Coues' generic name *Mitrephanes*. The name Crested Flycatcher is already in general use. Since the bird's distinct, triangular crest is surely its most noticeable external anatomical feature we hereby suggest the name Tufted Flycatcher. This name describes the bird's appearance and less directly its personality, whereas Dusky-tailed Flycatcher does neither.

[2] We do not agree with Hellmayr in calling *Mitrephanes aurantiiventris* (Lawrence) and the other yellow-bellied forms from farther south conspecific with *phaeocercus*.

[3] The flycatcher described as *Mitrephanes phaeocercus pallidus* Carriker and de Schauensee (*Proc. Acad. Nat. Sci. Philadelphia*, 87, 1935, 435) has been shown to be *Empidonax fulvifrons fusciceps* Nelson (see de Schauensee, *Auk*, 54, 1937, 540).

The four specimens of *quercinus* examined (from Guatemala and Honduras) are uniform in being dark in general appearance, brown rather than olive above, and very dark-crowned.

Our series of seven *hidalgensis* (four males, three females) are strictly uniform insofar as coloration of the upper parts is concerned. One male (G.M.S. field catalog No. 8537) is so richly colored on the throat and belly as to indicate considerable variation in the intensity of the general tone of the underparts. This same variability is noticeable also in *phaeocercus* and *tenuirostris*.

It appears that *hidalgensis* has evolved as a green-backed, northeastward-ranging extreme. Where the greenest-backed birds live will be revealed only when the northeastern frontiers of the range of the species have been thoroughly investigated.

MEASUREMENTS.—Type, wing, 71 mm.; tail, 62.5; exposed culmen, 10; tarsus, 13. Three other males: wing, 71, 71, 72; tail, 61.5, 63, 60.5. Three females: wing, 69, 70, 69; tail, 60, 60, 60.

We are grateful to the following for their assistance: A. J. van Rossem, Alexander Wetmore, Pierce Brodkorb, J. Van Tyne, and the authorities of the U. S. National Museum and U. S. Biological Survey.

CORNELL UNIVERSITY, ITHACA, NEW YORK
U.S. BIOLOGICAL SURVEY, GULFPORT, MISSISSIPPI

THE BIRDS OF DENVER AND MOUNTAIN PARKS. By Robert J. Niedrach and Robert B. Rockwell. The Colorado Museum of Natural History, Popular Series No. 5, 1939: 6 x 9 in., 126 pp., illus. $1.25 postpaid.

The authors and Alfred M. Bailey have produced for bird students of the Denver region a local handbook of unusual excellence. The annotated list of about 363 species and subspecies includes notes on field marks, abundance, zonal distribution, and remarks on habits and local status. The book is illustrated with many fine photographs of wild birds, some of them species rarely photographed, and several habitat pictures based on museum groups. This well-rounded book includes a folding map, key to localities, accounts of topography and life zones, an ornithological history of the region, a rather full bibliography, and an index to bird names.

It seems unfortunate that the authors of a faunal contribution like this should feel bound by some "authority" supposed to be inherent in the A.O.U. Check-List. In a number of cases they dutifully head the account of a bird with the scientific name which was used in the 1931 edition of that check-list and then show in a subsequent paragraph that they know some other designation to be more correct.—J. Van Tyne.

AN ALBINO LESSER SNOW GOOSE IN MANITOBA

BY J. DEWEY SOPER

TO Mr. A. Haak, Norwood, Manitoba, goes the credit for making the unusually interesting discovery of an albino Lesser Snow Goose (*Chen hyperborea hyperborea*). This occurred on April 24, 1939, as he was studying and photographing Blue and Lesser Snow Geese a few miles northeast of Meadows, Manitoba. This locality lies well within the celebrated concentration area where these birds feed and rest in prodigious numbers during the spring migration from Louisiana to the Arctic.

On this particular day, geese were disposed in dense masses on the sodden lowlands. Mr. Haak, from the confines of a blind, was intent upon securing some good flight pictures of the birds as they shifted in restless detachments about the district. Finally, in early afternoon the best opportunity presented when flocks passed within close range. A very small group contained the pure white individual referred to, which is assumed to be an albino Lesser Snow, rather than a Blue Goose (*Chen caerulescens*). One of the resulting "shots" was the exceptionally attractive photograph herewith reproduced, showing the albino at the lower right; it looks strangely immaculate in such spotless garb, brightly illuminated by the afternoon sun. As will be realized, the only Lesser Snow Goose diversion from the normal which would arise from albinism is the lack of black primaries in the wings.

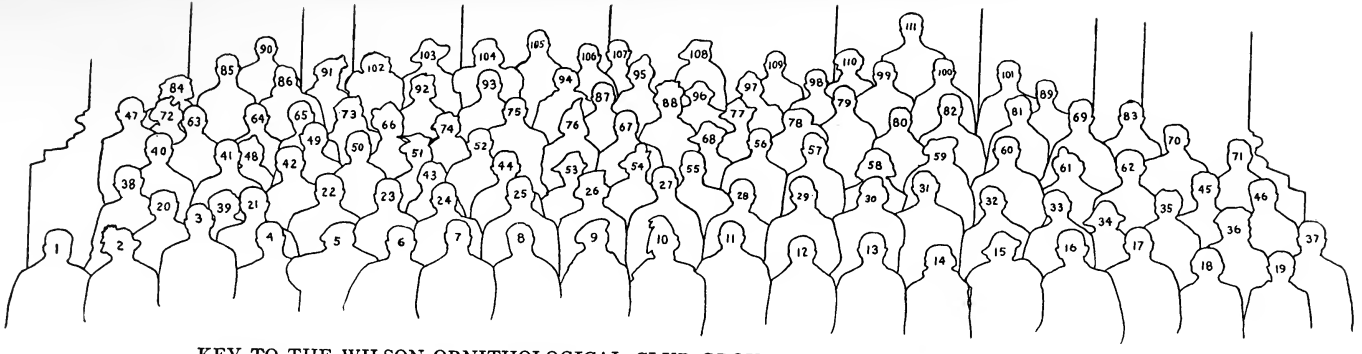
Mr. Haak informs me that this is the only albino goose of the kind which he has ever seen, though hundreds of thousands of typical Blues and Lesser Snows have come under his scrutiny during successive periods of migration. Other Manitoba naturalists have also had very extensive experience along these lines without, to my knowledge, seeing a pure white goose. My personal observation has collectively embraced vast numbers of these birds on the Arctic breeding grounds, and during the Manitoba migrations, without detecting a single albino. I have been unable to find any reference in the literature to such an individual, previously seen and recorded. All of this would seem to conclusively indicate that albinism is extremely rare in either of these species and that an individual, such as is shown in the photograph, is but one in millions.

NATIONAL PARKS BUREAU, DOMINION PUBLIC BUILDING, WINNIPEG, MANITOBA.

Albino Lesser Snow Goose (lower right)

Photograph by A. Haak

Group at the Annual Meeting, Louisville, November 25, 1939



KEY TO THE WILSON ORNITHOLOGICAL CLUB GROUP PHOTOGRAPH AT LOUISVILLE, 1939

1, Miles D. Pirnie. 2, Mrs. Lynds Jones. 3, O. S. Pettingill, Jr. 4, Gustav Swanson. 5, Mrs. Margaret M. Nice. 6, Carleton A. Beckhart. 7, Louis G. Flentge. 8, W. E. Saunders. 9, Mrs. Louis G. Flentge. 10, Mrs. Victor Coles. 11, Victor Coles. 12, Gerald Rogers. 13, James LaFollette. 14, Margarette E. Morse. 15, Vera Carrothers. 16, A. F. Ganier. 17, Floyd S. Carpenter. 18, Kate Roberts. 19, George R. Mayfield, Jr. 20, Lynds Jones. 21, G. M. Sutton. 22, C. W. G. Eifrig. 23, I. B. Boggs. 24, Parks Allen. 25, B. W. Baker. 26, Sylvia Staudt. 27, Reed W. Fautin. 28, Lawrence H. Walkinshaw. 29, Edward M. Brigham, Jr. 30, Mrs. Eugene P. Odum. 31, Eugene P. Odum. 32, George B. Thorp. 33, Maurice Brooks. 34, Mrs. Lucien Beckner. 35, Hedvig Swanson. 36, Mrs. George R. Mayfield. 37, Leonard C. Brecher. 38, Conrad Jamison, Jr. 39, Mrs. R. L. Mercke. 40, Karl H. Maslowski. 41, Harrison F. Lewis. 42, L. E. Hicks. 43, Margaret E. Gross. 44, Wm. A. Lunk. 45, George N. Rysgaard. 46, Peter Ward. 47, Joseph F. Spears. 48, Mrs. Karl H. Maslowski. 49, C. O. Decker. 50, L. B. Nice.

51, Theodora Nelson. 52, Harvey B. Lovell. 53, Emilia Yunker. 54, Amelia R. Laskey. 55, James B. Young. 56, Harry Leon Kutz. 57, S. Charles Kendeigh. 58, Isabelle Hellwig. 59, Mrs. H. S. Hill. 60, H. W. Hann. 61, Mrs. C. N. Edge. 62, Lucien Beckner. 63, Gordon Acomb. 64, Lawrence Acomb. 65, Allan Kain. 66, Mrs. George Kelly. 67, Cleveland P. Grant. 68, Mrs. O. S. Pettingill, Jr. 69, Peter Edge. 70, Earl G. Wright. 71, Peter Koch. 72, Mabel Slack. 73, Doris Huestis Speirs. 74, Mrs. John H. Mayer. 75, Robert W. Glenn. 76, Mrs. Cleveland P. Grant. 77, Mrs. Lawrence I. Grinnell. 78, Jeannette Duer. 79, Lawrence I. Grinnell. 80, William M. Walker, Jr. 81, G. H. Deutschlander. 82, Henry Meyer. 83, Don J. Wright. 84, Dorothy Hobson. 85, Joseph C. Howell. 86, J. Murray Speirs. 87, Richard L. Weaver. 88, Mrs. Gustav Swanson. 89, Karl E. Bartel. 90, J. Southgate Y. Hoyt. 91, Mrs. C. E. Peterson. 92, Margaret R. Knox. 93, John B. Calhoun. 94, Mary Lou McConnell. 95, Clara Alma Moore. 96, Mildred F. Campbell. 97, Maxine Smith. 98, Wendell P. Smith. 99, J. D. Webster. 100, John L. George. 101, Wm. M. Clay. 102, Mrs. E. O. Wilson. 103, Evelyn J. Schneider. 104, Mrs. Roger W. Barbour. 105, Roger W. Barbour. 106, W. C. Henderson. 107, Arthur Stupka. 108, Mrs. Frank Warner. 109, Burt L. Monroe. 110, Mrs. Josselyn Van Tyne. 111, Josselyn Van Tyne.

GENERAL NOTES

A Feeding Habit of the Herring Gull.—On November 18, 1939, I observed a flock of about 200 Herring Gulls (*Larus argentatus*) in a field in the southwest corner of Milwaukee County, Wisconsin, about ten miles from Lake Michigan. They were eating insects and worms in a newly plowed field and their method of following the plow seemed worthy of note.

Instead of the flock following the plow down the furrow as do grackles and other birds, these Herring Gulls were uniformly distributed the length of the field, which was about forty rods long and half as wide. The farmer was plowing with a two-plow tractor. As he plowed down the west side of the field, the gulls in the furrow on the east side would wait until he came opposite them and then fly across the field and start feeding in the furrows on the west side. Thus as the farmer plowed down the west side of the field a wave of gulls progressed down the field with the tractor. When the tractor reached the end of the field all the gulls were on the west side. As the farmer started up the field on the east side, the wave of gulls flying across the field kept pace with the tractor, so when he reached the other end of the field all the gulls were on the east side.

Thus, although the wave of gulls progressed the length of the field and back again behind the tractor, no one bird ever followed the tractor. Always there were different individuals alighting back of the tractor from that part of the other furrow directly opposite the tractor. In this way the birds all kept the same relative position in the field and each picked up food from a small area of ground. If a gull finished picking up all the food in its area, it did not fly or walk up or down the furrow but waited until the tractor had again passed it on the other side of the field and then flew across and again started to feed in its small area.

Within a short distance there were two other farmers plowing. As far as I could see all conditions on those fields were the same as on the field occupied by the gulls but neither of these two fields had a single gull feeding upon it. There seemed to be no plausible explanation of this unless it was due to the gregarious nature of the Herring Gull.—Alvin L. Throne, *State Teachers College, Milwaukee, Wisconsin.*

Raven in Southwestern Michigan.—According to W. B. Barrows ("Michigan Bird Life," 1912), the Raven was originally an abundant bird in Michigan. However, its range and numbers decreased. By 1912 the Raven population in the Lower Peninsula was restricted almost entirely to the northern part.

On April 27, 1889, Mr. F. H. Chapin of Kalamazoo, Michigan, found the Ravens nesting in a large swamp in Almena Township, Van Buren County, Michigan. One of the two birds which were near the nest was shot. I have examined the skin of this juvenile bird and the original records of Mr. Chapin, which are now in the University of Michigan Museum of Zoology. In 1892, on Mr. Chapin's last visit to the swamp, he heard one Raven, but could not find any trace of a nest. However, on April 23 of the same year he noted Ravens near the Gun River in southeastern Allegan County.

Since that time the Raven has apparently been very rare or absent from southwestern Michigan. It is probable, however, that a few individuals may have occasionally been present and mistaken for Crows, as were the two birds shot in this part of the state during the last 7 years.

On October 15, 1932, a juvenile Raven was collected by Mr. George F. Raz at Union Pier, New Buffalo Township, Berrien County, Michigan. Mr. Raz states that it regurgitated a pellet which upon examination proved to consist of a mass of feathers, remains of many Coleoptera, and three feet from some passerine birds. This Raven was skinned by a taxidermist and not sexed. The skin is now in the University of Michigan Museum of Zoology.

Mr. Royal Thayer shot a Raven (*Corvus corax* subsp.) on October 16, 1939, on the south shore of Lake Allegan near Allegan, Michigan (Sec. 14, T. 2 N., R. 14 W., Allegan County). It was given to the Swan Creek Wildlife Experiment Station. The size of this bird is as follows: weight, 1000 grams; arc of right wing, 406 mm; arc of left wing, 408 mm; extent, 1230 mm; tarsus, 63.5 mm; and the culmen, 69.5 mm. Each testis measured 4 mm. The bird's plumage and the persistence of its bursa of Fabricius indicated immaturity. An extreme infestation of ecto-parasites was evident.—Arnold O. Haugen, *Michigan Department of Conservation, Swan Creek Wildlife Experiment Station, Allegan, Michigan.*

The Western Golden-crowned Kinglet in Indiana.—Recently in examining the considerable series of Golden-crowned Kinglets in the U. S. National Museum I found a male of the western race *Regulus satrapa olivaceus* from the vicinity of Mineral Springs (10 miles west of Michigan City), Porter County, Indiana, taken October 26, 1923, by M. W. Lyon, Jr. The bird was caught in a mouse trap baited with bacon. The specimen attracted attention at once by the brighter green of the dorsal surface as it lay in a series of the eastern race, and on closer examination the more slender bill was evident. The wing measures 55.1 mm. and the tail 40.5 mm. I know of no other records for the central states for this bird, and it can only be considered a casual stray in this locality.—Alexander Wetmore, *U. S. National Museum, Washington, D.C.*

Migrant Shrike in Michigan in Winter.—On February 4, 1940, Louis W. Campbell and I found a shrike at the edge of a wooded area on "North Cape," 3 miles southeast of Erie, Michigan. I collected the bird and found it to be *Lanius ludovicianus migrans,* a species not supposed to occur in Michigan in winter. It proved to be an adult male, fat and in good condition in every respect. The bird was nearly black with soot, but when washed it made a handsome specimen, now in the University of Michigan Museum of Zoology.

W. B. Barrows (Michigan Bird Life, 1912) does not record the species in Michigan in winter, although B. H. Swales (*Wilson Bull.,* 15, 1903:21) included it in his list of winter birds of Wayne County, saying he had "seen but two; both in late February." Perhaps Barrows suspected these of being early migrants. There is in addition in the University of Michigan collection an apparently unrecorded specimen taken by J. Claire Wood on Dec. 2, 1906, at Grosse Pointe Farms, Wayne County. It also was an adult male. In the future field observers in southern Michigan will not be able to assume that any shrike seen here in winter "must have been" a Northern Shrike.—J. Van Tyne, *University of Michigan Museum of Zoology, Ann Arbor, Michigan.*

Incubation Behavior of Lanius ludovicianus in North Dakota.—Additional data gathered at the Shrike nest discussed in an earlier paper (*Wilson Bulletin,* **50,** 1938:246–8) may be of interest. This nest, near Jamestown, North Dakota, was begun about May 6, 1937, and the female was first fed by her mate May 10. Beginning May 15 an egg was laid daily through May 20 when the clutch of six was complete. The fourth egg was laid between 7:30 and 9:55 A.M. May 18, and the fifth between 8:15 and 9:25 A.M. the following day.

On May 15, 16 and 19 a bird was found sitting in the nest at 9:30 P.M. (the eggs were warm). At 8:30 P.M. May 17 a bird entered the nest and remained at least until dark, when further watching became impossible.

From May 22 through May 26, 942 minutes were spent watching near the nest. Incubation was abruptly ended May 27 by nest robbers. During this time 767 minutes were spent on the nest by the female, or 81.3 per cent of the time. Incubation periods averaged 23 minutes in length, ranging from 1 to 94 minutes.

Absences ranged from 0.5 to 28 minutes, averaging 5 minutes. Nine times the female left the nest in response to the arrival of her mate with food; 13 times she left independently. The male fed his mate on or near the nest about once in 23 minutes. The food was largely insects. A single impaled English Sparrow (*Passer domesticus*) was found near the nest tree.

The nest was "defended" from other species that came near about once in 20 minutes. Arkansas and Eastern Kingbirds (*Tyrannus verticalis* and *T. tyrannus*) were driven off 34 times, Bronzed Grackles (*Quiscalus quiscula aeneus*) 5, Brown Thrashers (*Toxostoma rufum*) 3, Baltimore Orioles (*Icterus galbula*) 2, and Mourning Doves (*Zenaidura macroura*), Redwings (*Agelaius phoeniceus*) and English Sparrows once each. The Kingbirds' pugnacity and persistence earned them more than their share of attention. Upon a number of occasions Kingbirds even put one or the other of the Shrikes to flight. On May 22 and 25 hostilities were unusually bitter. Bronzed Grackles were quickly and easily repulsed. The 2 or 3 Brown Thrashers continued to feed near the nest tree in spite of attacks. Grackles and Redwings were the most quickly attacked species.

The nest tree was near the northern boundary of the territory so that scarcely a third of the shelter belt in which the tree stood was of interest to the birds. I observed no conflict whatever with a neighboring pair of Shrikes nesting about one half mile south. The territory, mostly grass land and open field, was estimated to be from 20 to 30 acres in extent.—Archibald Johnson, *Jamestown, North Dakota.*

Prothonotary Warbler in Chester County, Pennsylvania.—Early on the morning of May 12, 1936 while making my rounds I heard an unmistakably new warbler song issuing from a sycamore and then from a willow tree in a small swamp near my home in Berwyn. The song was short and very loud. There proved to be three Prothonotary Warblers (*Protonotaria citrea*), two males and one female, all of which I had ample time to identify while the singing male chased the second male from place to place. This species had heretofore eluded me but now brings to 35 the list of warblers I have observed here.—Frank L. Burns, *Berwyn, Pennsylvania.*

Red Crossbills Summering in the West Virginia Mountains.—During July and August, 1939, considerable numbers of Red Crossbills (*Loxia curvirostra*) were observed by a number of persons in the Cheat Mountain range in Randolph and Pocahontas counties, West Virginia.

The birds were first noted by Brooks on July 14, when a flock of about thirty, containing red males and birds of greenish-yellow coloration, were seen. On July 22, I. B. Boggs, A. S. Margolin, and Brooks saw a flock of twenty-two birds, and a single individual at different times. In the flock of twenty there were red males, yellowish birds, and streaked juveniles. Sutton, Brooks, and others visited the area on July 29, Sutton remaining for the three following days. A single individual was noted by Miss Laura B. Moore on July 29. On July 30, Sutton shot a dull red male, watched it fall into a dense growth of ferns over an embankment, and spent nine hours searching for the bird, without success. He noted Crossbills flying over several times on July 31. The birds were last seen on August 6, when Margolin and Dean Bowers observed striped juveniles. On subsequent visits by Brooks, Karl Haller, and others, no Crossbills were seen.

All the local observations on Red Crossbills were centered around Gaudineer Knob, a peak of 4445 feet elevation in that part of the Cheat mountain range known as Shaver's Mountain. The dividing line between Randolph and Pocahontas counties follows the crest of the ridge which contains Gaudineer Knob.

The higher parts of the Cheat range are forested by a dense second growth of red spruce (*Picea rubra*), while a swamp at the foot of Gaudineer Knob has a

considerable growth of fir (*Abies sp.*). Near the top of Gaudineer, on a very steep slope, is a small stand of virgin spruce, a part of the locally famous Hamilton "wedge." Here the spruces tower to a hundred feet or more, and it was in the tops of these trees that the Crossbills found the cones on which they fed. In addition to the height of the trees and the steepness of the slopes, a further hindrance to collecting is offered by the dense undergrowth, masses of rhododendron, stunted spruces, and tall ferns in the slight openings.

Since no specimens were secured, it was, of course, impossible to determine the race or races of the Crossbills which we saw. Our purpose in publishing this rather indeterminate record is to call attention to three interesting possibilities which may account for the presence of the birds in the region, a territory in which they have not been previously noted.

1. The birds may have been part of a population nesting somewhere to the north or west.

2. They may have been stragglers from the more or less permanent Red Crossbill population in the mountains of eastern Tennessee.

3. They may have been part of a previously undiscovered permanent population in the Cheat mountains region.

As for the first of these possibilities, it seems unlikely that wanderers from more northern points would have concentrated here without being noted in other regions outside the normal range of the species. If such observations have been made, we have not learned of them.

Consideration must be given to the second possibility. Mr. Arthur Stupka, Park Naturalist of Great Smoky Mountains National Park, (in correspondence) states that during the six months prior to April, 1938, Red Crossbills were plentiful in the spruce-fir zone of that mountain region. He believes that the species bred there during the late winter of 1938. This period corresponded with a particularly heavy cone crop on the evergreens. Since that period, however, the birds have become scarce and scattered, following lighter crops of cones on the spruces and firs. It seems entirely possible that the Crossbills, finding food scarce in Tennessee, moved the few hundred miles north into the West Virginia mountains.

The third possibility is, perhaps, the most plausible of all. The Cheat mountain area is a vast expanse of high county, sixty to seventy miles in length, and eight to ten miles in breadth. All of it lies above 3,000 feet elevation, and there are numerous points above 4,000 feet and up to 4,800. Practically all the higher portions, and many of the lower, are clothed with a dense growth of red spruce, most of it of a size to produce cones.

Only three roads traverse this range in fifty miles of its extent and there are many high peaks which are seldom if ever visited by scientists or field observers. In fact, only within the last few years has the Gaudineer area been made accessible through the construction of a U. S. Forest Service road. It is entirely credible that a small permanent Crossbill population has been overlooked within this wilderness expanse. The presence of streaked juveniles lends support to the idea that the birds may have bred close by. It was impossible to determine whether any of the juveniles had uncrossed mandibles, a point which Griscom (*Proc. Boston Soc. Nat. Hist.*, 41, 1937:114) considers *prima facie* evidence of local breeding.—Maurice Brooks, *Division of Forestry, West Virginia University, Morgantown, West Virginia,* and George Miksch Sutton, *Department of Zoology, Cornell University, Ithaca, New York.*

Upland Plover—a Correction

On page 217 of the December, 1939 *Wilson Bulletin* we made the statement that "Forbush (1912) reports the Upland Plover feeding extensively on crowberries (*Empetrum nigrum*) while in Labrador." This is a misquotation. The statement refers to the Golden Plover.—Irven O. Buss, Madison, Wisconsin.

EDITORIAL

On January 5, 1940 Dr. Lynds Jones, a founder of the Wilson Ornithological Club and for thirty-six years editor of its *Bulletin,* celebrated his seventy-fifth birthday. We are glad to report that he is still actively studying birds and interesting people in ornithology. Dr. Jones holds a unique place not only in our organization but among American ornithologists. In the spring of 1895 he organized at Oberlin the first formal course in ornithology in any American college. He has been training ornithologists continuously ever since. To members of the Wilson Ornithological Club his long record of editing the *Bulletin* is outstanding among his accomplishments, though few of us have the experience to appreciate fully the tireless industry and steady loyalty to an ideal demonstrated by those thirty-six volumes of the *Bulletin.* As Dr. Glover M. Allen once remarked, "No one who has never undertaken something of this sort would have any idea of the amount of blood pressure needed to get out such a journal and avoid the many pitfalls of a printer's work, answer and pacify various contributors and produce a coherent piece of work."

The war in Europe is having a disastrous effect on ornithological work in many parts of the world. The types and many of the more valuable birds in great museums even as far away from the scene of fighting as Paris and London have been packed or even transported to other hiding places and research workers have largely had to give up their efforts to carry on investigations there. We have already heard of the suspension of publication of such journals as "The Bulletin of Animal Behaviour" (London) and the "Scottish Naturalist." There has been no news from our ornithological friends in such storm centers as Finland, Poland, and Czechoslovakia, but we would be relieved to hear that nothing worse had happened to them than the suspension of all of their scientific work.

Ornithological News

Charles M. Pomerat is now with the Department of Biology of the University of Alabama.

Jean Delacour, the well-known French ornithologist, is now in active service as a Captain of Artillery.

The new Museum of Natural History of the University of Minnesota is now completed. The offices are now occupied and the exhibits are being set up in their new cases. The new auditorium, seating 500, was opened with a bird lecture on February 8.

James T. Tanner has just received his Doctor's degree in Ornithology from Cornell University. The title of his thesis is "The Ecology and Life History of the Ivory-billed Woodpecker, *Campephilus principalis.*" The investigations for thesis material were made possible by a Research Fellowship of the National Association of Audubon Societies.

M. A. Carriker, Jr., is now in Vera Cruz collecting birds for the Smithsonian Institution.

J. Southgate Y. Hoyt has just received his Master's degree in Ornithology from Cornell University. The title of his thesis is "A Study of the Pileated Woodpecker, *Ceophleous pileatus.*"

Alexander Wetmore is Secretary General for the Eighth American Scientific Congress which meets in Washington May 10 to 18. Many papers to be given in Section II, Biological Sciences, will be of great interest to ornithologists.

Carl W. Buchheister has resigned as Secretary-Treasurer of the Massachusetts Audubon Society to become Assistant Director of the National Association of Audubon Societies. His place in Boston will be filled by C. Russell Mason of Sanford, Florida.

WILDLIFE CONSERVATION

TEXAS NATURE FEDERATION GETS RESULTS. Their recent campaign for protection for Brown Pelicans and to defeat a proposed bounty on "Buzzards" brought about the desired results. The bounty proposal was defeated and the Brown Pelican is on the list of birds protected in Texas! Jerry E. Stillwell, Secretary of this organization, reports that the fight will be continued to give protection to woodpeckers and Road-runners.

GAME IMPORTATIONS ON TRIAL. Conservation clubs urge and almost compel game departments to bring cotton-tails, Bob-white, pheasants, wild turkeys, etc., from other states and from foreign places for release in efforts to establish new game species or to stimulate local game populations. Quite a few states are continuing to turn out in northern coverts Bob-whites from the South. Rabbits are brought from tularemia districts and tame turkeys are put into wild turkey ranges. This hit-or-miss policy of game importation for release is now definitely being challenged, not only by students of wildlife management (and this includes many trained officials and staff men), but also by clear-thinking sportsmen and other conservationists. The challenge is based on sound ecology and also on a desire for economy. Ohio wisely uses its surplus of pheasants in Wood County for release in poorer hunting areas. Texas proposes moving deer and wild turkeys from established range to possible new territory, presumably using only native stock. Michigan had poor luck with imported, wild-trapped Hungarian Partridges but established a fine game farm stock by rearing breeders from a few clutches of eggs taken from the nests of wild birds already in Michigan, near the Ohio line. Many more examples of wise and appropriate restocking might be listed; but as yet the local and native stocks and species have been neglected in favor of exotics and outside sources. In commenting on Bob-white restocking practices, Herbert L. Stoddard says: "we always make a point of getting stock from the nearest available source as being probably better adjusted to the environment where we liberate them." Why cannot game officials heed the advice and example of recognized experts?

WILD TURKEYS. From Pennsylvania to Arizona various states are engaged in or are just beginning to think about wild turkey management. This usually takes the form of restrictions on shooting, as in the case of the complete protection recently given these birds by Missouri legislation, and the releasing of captive-reared stocks. In general these methods have not given the expected increases. Some of the difficulties confronting wild turkey restoration have been presented by Harold L. Blakey in the Biological Survey Leaflet No. 77. Wild turkeys thrive best where they are given adequate protection from poaching and where cover and food conditions continue favorable to them. Large acreages under protection favor the survival and increases of wild turkeys as is pointed out in the following note from Herbert L. Stoddard, Director of the Cooperative Quail Study near Thomasville, Georgia:

"One of the oldest and most consolidated groups of private game preserves in the Southeast is located between Thomasville, Georgia, and Tallahassee, Florida; over two hundred and fifty thousand acres being under intensive management for quail, wild turkey, and other game. The northern portion of the preserve area is rather heavily wooded with pine on the uplands and mixed hardwoods along water courses.

"By heavy planting of a year-around food supply (to supplement the uncertain natural 'mast' crops), *moderate* control of a few of the more destructive predators (particularly wild cats and foxes when they become too numerous), and conservative shooting practices, the owners have gradually built up a heavy

stocking of practically pure strain Eastern Wild Turkey. These turkeys have greatly increased in number and extended their territory during the past fifteen years. I estimated that there are between five and ten thousand of these grand birds on the preserves under discussion, while similar groups are being developed under up-to-date management practices near Albany, Georgia, to the north, along the great rivers and coastal section of South Carolina, and at various other points scattered over the deep Southeast. The part being played by private preserves in increasing and maintaining such a species as the Eastern Wild Turkey and in providing large protected acreages for many forms of desirable wildlife is little appreciated by ornithologists as yet, though it is of rapidly increasing significance as far as the South is concerned."

The Pittman-Robertson Act of 1937. No seriously interested conservationist should fail to get acquainted with the activities (at least in his own state) under the provisions of this Act which provides for return to the states of the tax on ammunition and firearms, or about $2,750,000 annually. Activities fall into three groups: (1) Land purchase for wildlife rehabilitation, (2) Land development, such as food and cover improvement or water stabilization, and (3) Research directed to the practical solution of problems in wildlife restoration. For the year ending June 1939, four states received as their shares over $45,000: Michigan, Texas, New York and Pennsylvania. Apportionment is on the basis of area and the number of small game licensees. Samples of the projects now approved and under way are given below, as announced from the office of Albert M. Day, in charge of "Pittman-Robertson" work for the U. S. Biological Survey.

1. "*Arizona Inaugurates Statewide Survey.*" The program calls for a wildlife survey to inventory the principal game and furbearing species as a first step in preparation for wiser use of the funds to be available for development and land acquisition.

2. "*Texas Restores Deer and Turkeys*" heads the announcement that this state will use some of its funds to redistribute and restore white-tailed deer and wild turkeys, moving deer from over-populated areas to uninhabited but suitable range. (We hope they will not yield to the too-common practice of stocking "tame" turkeys of mixed or unknown origins.)

3. "*Michigan to Study Sharp-tailed Grouse and Prairie Chicken.*" In less than twenty years the "Sharp-tails" have come from scarcity to abundance in the Upper Peninsula, or at least from obscurity to a position of importance as a game species. Michigan will use "Federal Aid in Wildlife Restoration" funds to make a study of these birds and the Prairie Chicken because very little is known of the factors which limit their numbers, and a management program is needed.

4. "*Illinois Purchases Green River Waterfowl and Upland Game Refuge.*" The Illinois State Department of Conservation has submitted a Federal Aid project for the purchase of an area containing numerous potholes and marshy spots, making it a desirable area for waterfowl, Prairie Chickens, fur-bearing animals, and other forms of wildlife. Future plans call for development of the area as a waterfowl refuge and game management research station. The boundaries will be fenced, an administration building constructed, and a series of small impoundments will be made. The research program will include experiments in game management.

Whether or not the new Federal Aid in Wildlife Restoration program will succeed depends, to be sure, on the choice of projects in each state but it also depends on the support of sympathetic and understanding conservationists, nature lovers as well as shooters. Look into the plans your Conservation Department or Division of Game is developing under its "Pittman-Robertson" or Federal Aid opportunities and form your own opinions.

—Wildlife Conservation Committee
Miles D. Pirnie, Chairman

ORNITHOLOGICAL LITERATURE[1]

HAWKS IN THE HAND. By Frank and John Craighead. Houghton Mifflin Company, Boston, 1939: 6 x 9 in., xiii + 290 pp., 57 plates, $3.50.

It would be unfair to review this book without a prefatory statement regarding its authors, for what might be thought a weakness or two in an ordinary volume become not only understandable, but distinct assets, when their background is known. Briefly then, Frank and John Craighead are twin brothers who are only now of an age to be first-year graduate students at the University of Michigan, but who became interested in falconry and the photographic study of birds of prey so early in life that they have already had an extraordinary range of experience in their field. They have here set down the story from their first boyhood adventures with the Barred Owl and Red-shouldered Hawk on the Potomac River near Washington, through undergraduate days at Pennsylvania State College, to recent vacation trips in western Ontario, Nebraska, and Wyoming. Their approach is entirely direct and straightforward, their literary style extremely simple, the general tone of the book completely and enthusiastically boyish. Since these qualities are exactly what the circumstances call for, they are good.

Although the Craigheads' initial interest seems to have been falconry, they are most widely known for their photographs, and this fact is emphasized by the prominent position given the illustrations in the make-up of the book. Plates without borders are no longer unusual in bird literature, nor is the grouping of all the plates at the back of a volume, but here the publishers have carried innovation one step farther and grouped the borderless illustrations all at the front, so that we have not one but fifty-seven frontispieces. The Craighead photographs are of course excellent, as many critics have long since discovered from seeing them on exhibition, and their reproduction in this particular case is satisfactory if not outstanding. One leaves this subject with the feeling that their unusual position is on the whole a successful publishing device for underlining their importance.

An assay of "Hawks in the Hand" as an addition to scientific knowledge leads to the curious conclusion that its contribution is slight in the obvious field, but may be considerable in a less expected direction. The text is full of information on the habits and life-history of hawks and owls in a state of nature, but these data in no case seem to go beyond what was already known to moderately experienced investigators. The corresponding information on the habits and personalities of the Craigheads' pet birds, however, is unduplicated in American bird literature so far as known to the reviewer, and derives unexpected value not only from its straight-forward accuracy but from the sympathetic understanding with which it is handled. The chapter on Sparrow Hawks, for instance, is well-filled with new and fascinating information which is presented in so beguiling a fashion that the reader's emotions are considerably involved within a very few pages. Bits like this might not be nearly so good had they been written with less of boyish freshness.

Having preserved thus far the objectivity of a proper reviewer, I cannot now resist the impulse to mention one more fine quality of the book from the frankly personal viewpoint of a man who has paralleled a good deal of the Craigheads' experience, notably with Duck Hawks, at twice their age. I am interested at their reaction to the individual personalities of their different pets, at the steps revealed both in and between the lines by which they apparently progressed to an appreciation of the Duck Hawk as the grandest bird of them all; but particularly, I am delighted at the authenticity of all their Duck Hawk material. They do not mention an incident, describe a scene, or feel an emotion in this whole connection which is not depicted with such faithful accuracy that I have seen or felt the identical things.

[1] For additional reviews see pages 29 and 31.

Summing up then, "Hawks in the Hand" is a tip-top boys' hobby-book—so good in fact, that its teaching may be expected to fall here and there on fertile ground, to the end that other parents will presently spend anxious hours as their sons swing on cliffs and survey the country from eagles' nests, and other college landladies will rise in rebellion against the untidy indoor habits of Long-eared Owls.—Joseph A. Hagar.

Bio-Ecology. By Frederic E. Clements and Victor E. Shelford. John Wiley & Sons, N.Y., 1939: 6 x 9 in., vi + 425 pp. $4.50.

This treatise synthesizes the fields of plant and animal ecology as it applies to natural groupings of plants and animals in nature and the relations of organisms to each other and to their environment. As such, the general viewpoint, methods of approach, and factual information are of fundamental importance to all "out-door" zoologists and botanists. Those ornithologists should be particularly interested who are seeking some other basic philosophy than that of the life-zone concept for interpreting the occurrence and distribution of animals; who wish to understand the dynamics of animal populations with respect to competition, territory, migration, feeding, cycles, and interrelations of other sorts; who have observed how habitats and populations change with time but have not fully understood the part played by organisms in producing these changes; and who suspect there is order and unity in the organic out-of-doors but hitherto have caught only fleeting glimpses of possible laws and forces involved. A synthesis of this sort is essential for an understanding of evolutionary processes, although application of these ecological principles to evolution is not a part of this discussion nor the ultimate goal. The ecological system contrasts with and does not supplant the zoogeographical one designed to explain the evolution and dispersal of species.

The basic philosophy of this book is that there are no habitats in which both plants and animals are able to exist in which both do not occur and influence each other. Unit groupings of organisms are communities in which some organisms play a dominant role and other organisms, such as birds, exert influences to a lesser degree. On land, plants are usually dominant, in water, animals. Dominance is shown where organisms receive the full impact of the environment and then modify conditions in such a way that other characteristic organisms usually occur with them and there is some interdependence. The community so reacts upon the habitat as to change it and make possible the invasion of other and different communities, this succession continuing until a final stage or climax is reached, which is relatively permanent. The species composition of the earlier stages must be in large part adjusted to the peculiar conditions of extreme physical habitats and shows some similarity in different climatic regions, but the nature of the climax is determined principally by the climate itself.

In characterizing either seral or climax communities, life-form of plants and life-habitats of animals are of major importance, as plants show adjustment to the environment best by changes in structure, while animals first show it in functions and behavior. The species concept is used, especially in describing communities of subordinate rank, as taxonomic units often agree with the ecological ones and constitute the only practical means for designating particular groups. Since climate is one of the chief environmental complexes to which communities must become adjusted, differences in climax in different geographic regions assume major importance as the basis for a study of geographic distribution. Hence there are the major units, or biomes, of desert, coniferous forest, tundra, deciduous forest, and grassland, not to mention others recognized in water. Each biome in turn may be subdivided into smaller units, associations, and these again into still smaller divisions, based principally on taxonomic composition. It is probably the biome that should receive chief consideration in analysis of bird distribution

upon a continental basis, but the smaller ecological units, both seral and climax, must enter into any analysis of local distribution.

To illustrate in concrete form the general principles and concepts discussed, the grassland biome is analyzed in detail. A map is given to show the limits of the biome and of its various associations. The usefulness of the book and the immediate availability of this whole ecological philosophy to bird students would have been increased if a map showing the location of the other biomes and their major divisions could have been included.

The book is intended for the advanced student and will require careful reading. There will be terms with which he may not be familiar but which are necessary for labeling the concepts. These terms have been held to a minimum and are usually well defined the first time they are used. Probably the student will not everywhere agree. The reviewer believes that the term migration is used in too broad a sense and should be limited to more or less extensive movements from which there is regularly a return, and that other terms, as dispersal or displacement, should be used in referring to one-way movements of various sorts. Then again, territory is not clearly distinguished from home range, the first being a defended area while the latter is not. In the chapter on migration, the discussion of physiological factors and stimuli seems over-expanded, and we miss an analysis of the role of migration in the dynamics of the community life itself.

Aside from the general philosophical treatment, the book is replete with thought-provoking ideas, such as the hypothesis that old age may be responsible for the descending slope of a population cycle. There is a bibliography of about 900 titles with an indication of where each reference is cited in the text. There is an extensive index, and for the more important concepts and terms the page where they are described is indicated in heavy type. We recommend the book for careful study.—S. Charles Kendeigh.

Natural History of the Birds of Eastern and Central North America. By Edward Howe Forbush. Revised and Abridged with the Addition of More than One Hundred Species by John Bichard May. Houghton Mifflin and Co., Boston, 1939: 7½ x 11½ in., xxvi + 554 pp., 97 colored pls. $4.95.

Ornithologists and bird lovers who desire Edward Howe Forbush's relatively expensive and now out of print three-volume "Birds of Massachusetts and Other New England States" may now have much of the text and the magnificent colored plates from paintings by Louis Agassiz Fuertes and Allan Brooks in this one handsome volume. There are complete indices to scientific and common names, an appendix listing "accidental" or "casual" species, and four new colored plates from paintings by Roger Tory Peterson.

Each species is treated individually as before but the detailed information once given under "Description", "Molts", "Field Marks", "Voice", "Breeding", "Range", etc. has either been omitted or radically condensed under four headings: "Identification', "Call" or "Song", "Breeding" and "Range". The delightfully written text under "Haunts and Habits" has been transferred intact, save for a few deletions or changes in wording. Material on species not formerly included is concisely and accurately presented. Dr. John B. May is to be commended for having performed so well this tremendous task of condensation, revision, and abridgment.

The Directors of the Massachusetts Audubon Society have been largely responsible for pressing the demands for the publication of this volume, thus giving to a larger public the literary skill and observations of Forbush and the plates by Fuertes and Brooks. But it is inconceivable that these individuals have been responsible for the sweeping title and utterly false grounds on which the book is advertised. Undoubtedly the publishers are alone to blame for having abandoned good sense for the possibility of larger sales.

"Natural History of the Birds of Eastern and Central North America" is advertised on the front flap of the jacket as containing "the life history and complete, accurate description of every bird to be found east of the Dakotas, Nebraska, and Kansas; it includes Florida to the south, eastern Canada to the north." Actually the life history of no bird in this book is complete. (The former volumes possessed information under "Breeding" that approached completeness.) There are no descriptions—only identification marks are given. The author does not describe nor even treat at all "every bird found east of" the states mentioned. The Eared Grebe, a common dweller of the prairie marshes of Minnesota and Iowa, is relegated to the accidental list. The implied scope of the book insofar as mid-western birds are concerned is not carried out. The Franklin's Gull, Yellow-headed Blackbird, Harris's and Clay-colored Sparrows are discussed ever so briefly in comparison to eastern birds and are not even illustrated. Presumably the publishers deem this book a likely competitor with all treatises on birds of eastern, central, and southern United States but it will be unfortunate if this book cuts into the sales of their excellent and truthfully advertised "Field Guide to the Birds" by Peterson.

The plates by Fuertes and Brooks compare favorably with those of the original work. The four plates by Peterson, however, have been carelessly engraved and do not do justice to this fine artist.—O. S. Pettingill, Jr.

Studies of Waterfowl in British Columbia, No. 9. Barrow's Golden-eye, American Golden-eye. By J. A. Munro. Trans. Royal Canadian Inst., 22, pt. 2, Oct., 1939: 259–318, figs. 1–4, pls. 2–6.

This is not just another paper in economic ornithology; it is a real contribution to the natural history of these waterfowl, based on 20 years' experience and observations. The author describes in detail the ranges, seasonal distribution, courtship and nesting habits; and much space is given to population and food studies. As to identification, the author emphasizes the less elaborate trachea of the drake Barrow's Golden-eye (*Glaucionetta islandica*), and almost entirely yellow bill of the adult female, from February to May. His field identifications of "yearling" females is evidently based on their darker bills. As a rule the adult females of the American Golden-eye (*G. clangula americana*) have much whiter wing coverts than do first year birds, but the author does not discuss wing differences as identification aids for either species. No help is offered in separating the first year hens of the two species. The more tapered bill and larger nail seem to identify most adults and yearlings of the Barrow's, but these bill characters proved variable in a series of ten juveniles from the Cariboo District. (It seems not unlikely that hybrids may occur in the northern part of British Columbia and in southern Alaska where breeding ranges slightly overlap.) The author states his belief that nesting areas are chosen on the basis of good feeding grounds rather than because of available nesting sites.

From examination of 116 stomachs of Barrow's Golden-eye and 80 of the American Golden-eye taken at widely separated and representative waters the author concludes: "The winter food of the American Golden-eye on coast waters appears to be substantially the same, under similar conditions of time and place, as that of Barrow's Golden-eye. While on fresh water both species feed upon salmon eggs, insect larvae, and occasionally small fish. On salt waters they eat crustaceans and mollusks and, for a short time, herring ova." * * * "The destruction of the clear eggs in the early part of the salmon run may represent a drain upon salmon production but of what extent it seems impossible to estimate." As regards the suggestion that local Golden-eyes be destroyed on the grounds that they compete for food with trout wanted by anglers, the author points out that the sandpipers and almost all birds about the lake also compete, and that ducks themselves have value for sport and food, as also do the trout. The paper concludes: "The breeding range of the American Golden-eye is extensive and because of its northern situation

the species is not subject to many of the vicissitudes connected with the propagation of the more southern nesting ducks. For this reason and because of its general abundance there is no immediate danger of any serious reduction in numbers. The situation in respect to Barrow's Golden-eye is quite different. The breeding range is comparatively small and includes much of the settled regions of British Columbia where young birds are shot for food and sport early in the hunting season. Nowhere does the species occur in numbers comparable to those of the American Golden-eye and summer populations may be reduced by drought as is the case with other southern nesting ducks. Thus any general project of control might seriously reduce the population of Barrow's Golden-eye."

No brief review can do justice to this paper. It well deserves careful reading by wildlife managers and other naturalists.—M. D. Pirnie.

TEMPERATURE, GROWTH AND OTHER STUDIES ON THE EASTERN PHOEBE by Dayton Stoner. New York State Museum Circular 22, November, 1939: 1–42, 27 figs.

A study is here reported of growth changes in 20 nestling Phoebes (*Sayornis phoebe*) distributed in 5 nests. An average of 6 measurements per day was made of body temperature, weight, lengths of 7 skeletal elements, and lengths of 4 flight feathers. Dimensions and weights are given of 20 eggs, although there is no indication whether the weights were of fresh eggs. The average size of the sets is given as 5 and the incubation period for 2 sets as 16 days.

The nestling period is divided into an initial interval of 3 days with slow growth, an intermediate period covering 9 or 10 days of vigorous growth, and a final period of 4 or 5 days of retarded or fluctuating growth. Perhaps it is not wholly accurate to say growth is slow during the first 3 days, for on the basis of percentage daily increment, weight, for example, increases 48 per cent per day during this period compared with only 23 per cent during the intermediate period.

Increase in body temperature was most rapid during the first 7 days. Temperature control is said to be established at 10 days although there is no evidence presented for this. The time of establishment of temperature control in young birds is important. This might be approximately determined under field conditions if two sets of readings are taken daily, one as soon as possible after normal brooding periods by the adult, the other after uniform periods when birds are exposed to air temperature. Giving average temperatures for the adult birds based on a few records only and as obtained by mercury thermometers is practically valueless because of the great variability in body temperature of small birds and because of the effect of handling.

Comparisons are made of growth rates in Phoebes with those of Barn and Bank Swallows. These comparisons would be more significant if the amount of variation within the species were better known. More important is the observation that maximum growth of feathers comes after the period of most rapid increase in weight and size, as the energy of the food is diverted from one channel into another. A useful discovery is the uniformity in length of primaries in young birds of the same age. With this knowledge a series of measurements may serve as a basis for the recognition of age.

Some 42 papers are cited in "References" at the end of the paper although only a half dozen or so are referred to in the text and many seem without particular bearing on the subject under discussion.

In general we commend the author for undertaking studies of this sort and hope that other bird students will follow suit. With the accumulation of sufficient data and careful analyses, useful information will become available on developmental processes, comparisons between species, and correlation with bird behavior. —S. Charles Kendeigh.

THE BEHAVIOR OF THE SNOW BUNTING IN SPRING. By N. Tinbergen. Trans. Linn. Soc. New York, 5, 1939: 94 pp., 2 pls., 20 figs. in text.

This is a definitely superior contribution to the subject of territorial behavior of birds and a publication that is of concern to every active worker in this field. Dr. Tinbergen has presented his study in two sections: first, a connected account of activities from the time the Snow Buntings arrive in spring in eastern Greenland to the conclusion of the nesting period, and second, a general discussion of territory, fighting, song, sex recognition and bigamy that centers about the events in the lives of the buntings but is also an effective review to date of the significant contributions on these topics. Not every describer of territorial behavior need attempt so general a report on the field, much as he should be familiar with it, but such a review by a person of Tinbergen's experience and judgment is indeed welcome.

The story of the Snow Buntings is well told, is rich in comparisons with other species, and is illustrated by sketches of significant postures and plumage patterns. Attention is directed especially to the stereotyped response of the territorial male to all strange buntings. Females coming into the vicinity are threatened as are males, and only at close range is a new attitude assumed, serving to display the conspicuous markings of the male. Following pairing, a period of pre-oestrum ensues, with unsuccessful attempts at coition by the male, followed by sexual flights.

In his general discussion, Tinbergen concludes that fighting during or before the formation of sexual bonds serves to secure objects or situations that are indispensable for reproduction The basis for attacking individuals is always sexual rivalry. Sexual fighting therefore serves to defend mate and territory against sexual competitors. The defense of the sex partner tends to prevent the partner from pairing with a second mate. "Like all causal factors that we are isolating from a whole complex of factors, it need not always be absolutely sufficient to prevent bigamy; it only helps establish monogamy." Monogamy in many species seems necessary for successful rearing of the young.

Tinbergen gives his definition of territory as follows: "Whenever sexual fighting is confined to a restricted area, this area is a territory." To avoid confusion with territory in the more general sense, he proposes to designate this type as sexual territory.

The sexual fighting of the female Snow Buntings is only partly connected with territory. The female never shows any knowledge of the exact boundaries of the male's area. The female is much more ready than the male to fight outside the territory, and, in fact, does not show the hesitation that is characteristic of the male in the same situation. The thing that releases sexual fighting in the female is another female that comes too close to the male.

Regarding the food value of territory, Tinbergen, contrary to some recent authors, favors the views of Howard in stressing the area as a food reservoir. Tinbergen thinks that, "it is idle to argue against a food value of the territory in general, and that it is necessary to recognize that there are many species of Passerines to which the territory is necessary to provide *a certain amount* of food. If this function is recognized, it is clear that it is irrelevant to claim that some of the food, or even much of the food, is taken outside the territory. . . ." He also concludes that territorial behavior does serve to prevent overcrowding. "Our only restriction is that the word prevent must not be taken in an absolute sense. As was pointed out before, a function of a biological process may not be expected to be absolute, for every process functions in coöperation with other processes." These opinions concerning the functions of territory find decided favor in the reviewer's mind. By recognizing these functions, there is no need to abandon the view that territory is essential, and was perhaps first important, in setting up and maintaining the sexual bond between members of a pair.—Alden H. Miller.

CANADIAN WATER BIRDS, GAME BIRDS, BIRDS OF PREY.
CANADIAN LAND BIRDS.
Two "Pocket Field Guides" by P. A. Taverner. Musson Book Co., Toronto, and David McKay Co., Philadelphia, 1939; 4½ x 6½ in., 291 pp. and 277 pp. $2.50 each.

These two helpful companion books are, according to the author's own words, introductions to the more detailed "Birds of Canada" from the same pen. The text and illustrations are almost entirely from that work, the new volumes therefore being basically abridgments of it; there is, nevertheless, some new material. The first book listed includes the groups of the current A.O.U. Check-List through the shorebirds, and in addition the owls; the other contains the pigeons, cuckoos, and remaining groups.

In plan bearing a marked resemblance to that of Chester A. Reed's "Bird Guides," the new books differ from them in having a more extensive, interesting, up-to-date and authoritative text and on the whole greatly superior illustrations. These include colored plates from the brush of Allan Brooks, F. C. Hennessey, Ronald Ward Smith (one) and the author. In the two books are only five colored plates (all new with this edition) that illustrate groups of species, most of them showing merely the heads and foreparts. Unfortunately the color reproduction throughout does not equal that in the "Birds of Canada," but this is offset, particularly in the "Water Bird" volume, by the presence of the author's many enlightening black-and-white drawings. Among several Canadian species for which one might expect to find illustration of some kind and does not, are the Ring-necked Duck, Winter Wren, Northern Shrike, and Rusty Blackbird.

Species whose northern limits barely touch the Dominion of Canada are in general treated only briefly or not at all. It seems likely, nevertheless, that the "Water Bird" volume will be about as useful in the northern quarter of the United States as in Canada. Dedicated to sportsmen, upon whom rests in large measure the responsibility for conserving our wildlife, this book supplies information on the present state of scarcity or abundance of many species; and it directs particular attention to those that are largely beneficial to man.

While Roger Tory Peterson's excellent picture gallery and guide, "A Field Guide to the Birds . . . East of the Rockies," is designed alike for beginner and the more advanced, there are some who feel that it is slightly too advanced as an introduction. If this be true, then there will always be a place for guides in the more popular style—such as Reed's and now Taverner's, with a certain stress on identification but with information likewise on habits. Perhaps the perfect, all-purpose guide is an impossibility. Of the two Taverner hand-books, the "Water Bird" one is at least unique in having as its keynote economic status and conservation.—T. D. Hinshaw.

BIRDS IN THE GARDEN AND HOW TO ATTRACT THEM. By Margaret McKenny. Reynal & Hitchcock, New York, 1939: 7 x 9½ in., xviii + 349 pp., text figs., tables, and 48 unnumbered pls. (16 colored, 32 halftone). $5.00.

Here is a book that is probably the best of its kind that has ever been written. It contains not only lucid, authoritative descriptions of methods of attracting birds to several kinds of gardens, of feeding and caring for them under all conditions, and of getting the most out of them in beauty and song, but also much well-chosen and very readable natural history material. Furthermore, it covers a wide field of related topics such as care and feeding of stray birds, migration and banding of birds, handling birds of prey, and photographing birds. The book should prove a good stimulus in designing and arranging one's garden to full advantage for the birds.

Miss McKenny has based her book primarily on northeastern birds and gardens but her chapters on sanctuaries, descriptions of birds, and plants to attract birds have been adapted to all parts of the country. The fact, however, that her book is somewhat regional does not in any way prevent the methods described from being universally applied.

The reviewer finds one bit of rather important information on attracting birds left out of this book, namely, the methods of drawing hummingbirds to gardens by the use of colored vials containing sweetened water. The presence of hummingbirds in gardens contributes greatly to their natural charm and he believes these methods warrant attention because they surpass in effectiveness the more obvious methods of attracting these birds by growing plants with bright blossoms mentioned by Miss McKenny.

The book is illustrated with 16 colored plates from T. S. Roberts' "Birds of Minnesota" and with 32 half-tones largely from photographs. Of course, the colored plates, beautiful as they are, were not originally painted for a garden book; thus the birds are without appropriate backgrounds. Walter A. Weber has designed and painted the jacket especially for this book. It shows a Cardinal in a glorious garden. How short-sighted of the publishers not to repeat this one appropriate color piece elsewhere in the book, thereby making it a permanent part!

There is a detailed table of contents and a list of important references. The text is well indexed but the plates and half-tones are neither indexed nor listed in the front of the book and consequently there is no quick access to this useful illustrative material.—O. S. Pettingill, Jr.

THE BEEPS. THE FLIGHTS AND CRUISES OF THREE MISSOURI TREE SPARROWS. By Virginia Holton. John Day Co., New York, 1939: 6 x 9 in., 192 pp. $2.00.

In "this true account" we are told that the birds followed Lieut. and Mrs. Holton "for nearly 50,000 miles even to the interior of China and back." The story begins in Kansas City where Mr. and Mrs. Beep were in the habit of following Lieut. Holton to the office every day and also of accompanying the Holtons as they drove in the country. Later they followed the Holtons' car to New York City and back; then rode the train to San Francisco; stowed away on the boats to Hawaii and China and thence followed the Holtons in all their wanderings until at last their (The Beeps') descendants accompanied them to New York. These "Tree Sparrows" "married" "Chinese Sparrows" in China and "California Sparrows" and "New York Sparrows" in this country. The Holtons never actually saw the Beeps on the ocean voyage to China, although they searched for them (p. 87); on the return trips the Beeps are apparently assumed to have hidden and fasted for two weeks at a time between ports (p. 190). This was a feat in itself, since Dr. S. C. Kendeigh has found that English Sparrows cannot live more than two days without food.

The adventures in the Far East were most astonishing. The Beeps "told all the neighborhood birds about me" (p. 161) and persuaded a Tailorbird to come along on the cruise from the Philippines to China.

"The psychic Beeps enjoyed the Eucharistic Congress held in Manila. They seemed to sense the spiritual atmosphere . . . The Eucharistic Congress seemed to the Beeps a very fitting thing in that many of the meetings were held just before sundown and the beautiful music of the choir blended in with the Beeps' evening worship" (p. 163).

The Holtons declined to band the Beeps as it would have been "disloyal" to their little friends to do so. They never tell us how they distinguished them from others of their kind, except that Beep (in China) had a tiny white spot on his

forehead. The photographs of the Beeps taken in China show them to be *Passer montanus.*

To return to the start of the story in Kansas City, one small difficulty here is that European Tree Sparrows do not occur in Kansas City. Introduced in St. Louis in 1870, they have never been recorded more than 50 miles west of that city—some 180 miles from Kansas City. The original Beeps must have been English Sparrows and the Beeps in China Chinese Tree Sparrows. The Beeps in San Francisco and New York were English Sparrows, already inhabiting those localities. Apparently wherever the Holtons went they found "Beeps."

This is a fairy story if ever there was one, yet it is presented as fact. "In recording this true story of the Beeps," writes Mrs. Holton, "I have endeavored to confine myself closely to scientific observations and not to let my mind wander into the fertile field of the imagination." (p. 15.) The Holtons seem to believe what they are telling us; they present it as a "beautiful true story of loyalty, courage, and unselfish devotion," with no conception of the amazing claims they are making for physical and mental performance by a sparrow.

The Holtons have various eye-witnesses, but they never exhibited their extraordinary birds to an ornithologist, nor apparently did the publisher ask the advice of any ornithologist. This book has made quite a stir in popular circles. All that is necessary is to point out that the Beeps in this country must have been English Sparrows, since European Tree Sparrows do not occur in Kansas City, and that the Beeps in China were Chinese Tree Sparrows, and the whole story collapses.—**M. M. Nice.**

Field Museum has just published the first two parts of Reuben M. Strong's great "Bibliography of Birds." These two parts, listing about 30,000 titles, complete the author catalogue. A third and final part, now in press, will contain the subject index. A full review will appear in *The Wilson Bulletin* as soon as the publication of the final part makes this possible.

Short Papers

Aldrich, John W. and David C. Nutt. Birds of Eastern Newfoundland. *Sci. Publ. Cleveland Mus. Nat. Hist.*, 4, No. 2, Dec. 28, 1939: 13–42 (A list of 93 forms found in "eastern Newfoundland" by the junior author or by previous workers. Unfortunately there is no map or definition of what is included in "eastern Newfoundland." Two new forms are described: *Penthestes atricapillus bartletti* and *Turdus migratorius nigrideus.* The paper concludes with a "Bibliography of Newfoundland Birds" of 31 titles, apparently covering the whole of Newfoundland.)

Aldrich, John W. Geographical Variation in Eastern North American Savannah Sparrows (*Passerculus sandwichensis*). *Ohio Jour. Sci.*, 40, No. 1, Jan., 1940: 1–8. (*P. s. mediogriseus* subsp. nov. named from Andover, Ashtabula County, Ohio.)

Barton, D. R. Apostle of the Birds. The life and times of Frank M. Chapman. *Natural History*, 45, No. 1, Jan., 1940: 48–51.

Buxton, E. J. M. The Breeding of the Oyster-catcher. *Brit. Birds*, 33, No. 7, Dec., 1939: 184–93.

Dambach, Charles A. and E. E. Good. The Effect of Certain Land Use Practices on Populations of Breeding Birds in Southwestern Ohio. *Jour. Wildlife Management*, 4, No. 1., Jan., 1940: 63–76, figs. 1–2, pl. 2.

Davidson, Verne E. An 8-Year Census of Lesser Prairie Chickens. *Jour. Wildlife Management*, 4, No. 1, Jan., 1940: 55–62, figs. 1–6. (*Tympanuchus pallidicinctus* in western Oklahoma).

Davis, William B. Birds of Brazos County, Texas. *Condor,* 42, No. 1, Jan., 1940: 81–5, map.

Elliott, John J. Winter Habits of Myrtle Warblers on the South Shore of Long Island. *Bird Lore,* 42, No. 1, Jan.-Feb., 1940: 19–24, 2 photos.

Emlen, John T. Jr. Sex and Age Ratios in Survival of the California Quail. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 92–9, figs. 1–3. (*Lophortyx californica*).

Fisher, Harvey I. The Occurrence of Vestigial Claws on the Wings of Birds. *Amer. Midl. Nat.,* 23, No. 1, Jan., 1940: 234–43, fig. 1.

Fitch, Henry S. Some Observations on Horned Owl Nests. *Condor,* 42, No. 1, Jan., 1940: 73–5.

Fried, Louis A. The Food Habits of the Ring-necked Pheasant in Minnesota. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 27–36, fig. 1.

Gabrielson, Ira N. The Refuge Program of the Biological Survey. *Bird Lore,* 41, No. 6, Nov., 1939: 325–32, 4 photos.

Gerstell, Richard and Wm. H. Long. Physiological Variations in Wild Turkeys and their Significance in Management. *Pennsylvania Game Comm., Research Bull., No.* 2, 1939 (60 pp., illus.).

Griffin, Donald R. Homing Experiments with Leach's Petrels, *Auk,* 57, No. 1, Jan., 1940: 61–74, text figs. 1–7.

Grinnell, Hilda Wood. Joseph Grinnell: 1877–1939. *Condor,* 42, No. 1, Jan., 1940: 3–34, illus. (Includes a bibliography of the 554 scientific papers of Joseph Grinnell.)

Haller, Karl W. A New Wood Warbler from West Virginia. *Cardinal,* 5, No. 3, Jan., 1940: 49–52, color plate. (*Dendroica potomac* sp. nov. from Berkeley County, 12 miles south of Martinsburg, West Va. "Superficially similar to *Dendroica dominica.*" A male and a female collected.)

Hamerstrom, Frances and Oswald Mattson. Food of Central Wisconsin Horned Owls. *Amer. Midl. Nat.,* 22, No. 3, Nov., 1939: 700–702.

Hosking, Eric J. Courtship and Display of the Slavonian Grebe. *Brit. Birds,* 33, No. 7, Dec., 1939: 170–73, 5 photos. (*Podiceps* [*Colymbus*] *auritus* in "Scotland.")

Hosking, Eric J. Incubation Period of Capercaillie and Precocity of Chicks. *Brit. Birds,* 33, No. 7, Dec., 1939: 198.

Huxley, Julian S. Notes on the Percentage of Bridled Guillemots. *Brit. Birds,* 33, No. 7, Dec., 1939: 174–83, 1 text fig.

Jewett, Stanley G. Hart Mountain Antelope Refuge. *U.S. Dept. Agric. Misc. Public. No.* 355, June, 1939 [copy received Jan. 29, 1940], 25 pp., illus. (Includes a nominal list of 120 species of birds and excellent illustrations of the habitats and fauna.)

Johnson, R. A. Present Range, Migration and Abundance of the Atlantic Murre in North America. *Bird Banding,* 11, No. 1, Jan., 1940: 1–17, map.

Kalmbach, E. R. The Crow in Its Relation to Agriculture. *U.S. Dept. Agric., Farmers' Bulletin, No.* 1102. 21 pp., 6 figs.

Kendeigh, S. Charles. The relation of metabolism to the development of temperature regulation in birds. *Jour. Exper. Zool.,* 82, No. 3, Dec., 1939: 419–38, figs. 1–5.

———. In Memoriam: Samuel Prentiss Baldwin. *Auk,* 57, No. 1, Jan., 1940: 1–12, pl. 1.

Klingersmith, Stacy. Upland Plover. *Jack-Pine Warbler,* 17, No. 4, Oct., 1939: 92–4, pl. 5.

Kutz, Harry L. The Diving Ability of the Black Duck. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 19–20.

McAtee, W. L. A Venture in Songbird Management. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 85–9.

McIlhenny, E. A. Sex Ratio in Wild Birds. *Auk,* **57,** No. 1, Jan., 1940: 85–93.

Meinertzhagen, R. Autumn in Central Morocco. *Ibis,* 1940, Jan.: 106–136. (Includes a discussion of the relation of humidity and soil color to bird plumage color.)

Miller, Alden H. A Hybrid Between Zonotrichia coronata and Zonotrichia leucophrys. *Condor,* 42, No. 1, Jan., 1940: 45–8, figs. 13–14.

Moreau, R. E. and W. M. Moreau. Observations on Swallows and House-Martins at the Nest. *Brit. Birds,* 33, Nov., 1939: 146–51. (*Hirundo r. rustica* and *Delichon u. urbica.*)

Noble, G. K. and D. S. Lehrman. Egg Recognition by the Laughing Gull. *Auk,* **57,** No. 1, Jan., 1940: 22–43, text fig. 1.

Norris, Russell T., John D. Beule, and Allan T. Studholme. Banding Woodcocks on Pennsylvania Singing Grounds. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 8–14, fig. 1, pl. 1.

Orr, Robert T. An Analysis of the Subspecific Status of Dowitchers in California. *Condor,* 42, No. 1, Jan., 1940: 61–3, fig. 18.

Sargent, Grace Tompkins. Observations on the Behavior of Color-Banded California Thrashers. *Condor,* 42, No. 1, Jan., 1940: 49–60, figs. 15–17.

Schlag, Carl W. More Hummingbird Notes. *Cardinal,* 5, No. 3, Jan., 1940: 57–65.

Soper, J. Dewey. Local Distribution of Eastern Canadian Arctic Birds. *Auk,* **57,** No. 1, Jan., 1940: 13–21, pl. 2.

Stevenson, James O. Two New Birds from Northwestern Texas. *Proc. Biol. Soc. Wash.,* 53, Feb. 16, 1940: 15–18. (*Baeolophus atricristatus paloduro* and *Richmondena cardinalis planicola* subspp. nov. from Armstrong and Randall counties.)

Test, Frederick H. Effects of Natural Abrasion and Oxidation on the Coloration of Flickers. *Condor,* 42, No. 1, Jan., 1940: 76–80.

Twining, Howard. Foraging Behavior and Survival in the Sierra Nevada Rosy Finch. *Condor,* 42, No. 1, Jan., 1940: 64–72, figs. 19–22.

Tiemeier, Otto W. A Preliminary Report on the Os Opticus of the Bird's Eye. *Zoologica,* 24, Nov., 1939: 333–38.

Uhler, F. M. and Stephen Creech. Protecting Field Crops from Waterfowl Damage by Means of Reflectors and Revolving Beacons. *U.S. Biol. Surv., Wildlife Leaflet* **BS-149,** Nov., 1939, 7 pp. (mimeo.).

Völker, Otto. Gelbes und rotes Lipochrom im Integument der Vögel. *Jour. f. Ornith.,* 87, No. 4, Oct., 1939: 639–43.

Wetmore, Alexander. Observations on the Birds of Northern Venezuela. *Proc. U.S. Nat. Mus.,* 87, 1939: 173–260. (Includes many notes on migrants from North America.)

Wing, Leonard and Millard Jenks. Christmas Censuses: The Amateurs' Contribution to Science. *Bird Lore,* 41, No. 6, Nov., 1939: 343–50, 4 maps, 1 photo.

Worth, C. Brooke. Egg Volumes and Incubation Periods. *Auk,* **57,** No. 1, Jan., 1940: 44–60, figs. 1–2. (Egg size is considered to be the chief factor determining length of incubation. Unfortunately much of the data on incubation periods relied on by the author is incorrect. He apparently has not taken the trouble to find modern data on the species he treats. For example, he uses the old 15-day figure for the Spotted Sandpiper although Theodora Nelson in 1930 and Henry Mousley in 1937 showed the true figure to be 20 to 21 days. The author seems also to have overlooked the classic paper on this subject by Oskar Heinroth, in the *Journal für Ornithologie,* 70, 1922: 172–285. Heinroth pointed out that the Ostrich hatches its egg in 42 days, the same period required by the Gannet for its egg of one-fifteenth the size or Leach's Petrel for its egg of one-fortieth the size.)

Yeager, Lee E. Subjects for Filing Wildlife Literature. *Jour. Wildlife Management,* 4, No. 1, Jan., 1940: 44–54.

PROCEEDINGS OF THE WILSON ORNITHOLOGICAL CLUB

By Olin Sewall Pettingill, Jr., Secretary

The Wilson Ornithological Club held its Twenty-fifth Annual Meeting in Louisville, Kentucky, on November 24–26, 1939. Headquarters and sessions were in the Brown Hotel.

This was the first time in its history that the Club had met in Kentucky. In spite of the fact that the meeting was set ahead one week to follow the unexpected date of Thanksgiving suddenly proclaimed by President Roosevelt, and in spite of the fact that many of the states, including Kentucky, did not follow this proclamation, attendance at the meeting was highly satisfactory.

Short business sessions were held Friday morning and Saturday afternoon. The Executive Council met on the evening preceding the meeting and again Friday evening. There were program sessions morning and afternoon on Friday and Saturday. An excellent photograph exhibit was presented. The exhibit was officially opened on Friday evening by a reception given to the members of the Wilson Ornithological Club by the Kentucky Ornithological Society and the C. W. Beckham Bird Club. Other social gatherings included the Annual Dinner on Saturday evening and several motor trips on Sunday to points of interest in Kentucky.

Business Sessions

President Margaret M. Nice called to order the first business session on Friday morning at 9:30. The minutes of the previous meeting were approved without being read since they had already been published in *The Wilson Bulletin.* The reports of the Secretary, Treasurer, Editor, Librarian, Membership Committee, Endowment Fund Committee, and Wildlife Conservation Committee were read and approved.

A list of persons nominated to membership during the current year was placed on the table for approval by the organization.

The President appointed three temporary committees.
They were:

Resolutions: W. E. Saunders, Amelia R. Laskey, and Lawrence H. Walkinshaw.

Auditing: Wendell P. Smith, Eugene P. Odum.

Nominating: Theodora Nelson, S. E. Perkins, III., J. Southgate Y. Hoyt.

The final business session was called to order at 4:45 Saturday afternoon. Persons nominated to membership during the current year were formally elected.

The Resolutions Committee presented the following resolutions which were then adopted:

Whereas, the Kings River Canyon in California is of outstanding value as a wilderness area, therefore, be it *Resolved,* that the Wilson Ornithological Club urge its establishment at a National Park.

Resolved, that the Wilson Ornithological Club desires to place itself on record as being heartily in favor of protection for all hawks and owls, believing that all of these species have their place in the scheme of nature and that it is a mistake to destroy them.

Resolved, that the Wilson Ornithological Club at its Twenty-fifth Annual Meeting on November 24–26, 1939, in Louisville, Kentucky, hereby tenders its thanks and appreciation to the Local Committee, consisting of Messrs. Brecher, Carpenter, Clay, Young, and Mesdames Schneider and Slack, and especially to its Chairman, Mr. Burt L. Monroe, for their untiring and successful efforts for the entertainment of the Wilson Ornithological Club entailing such careful planning and so much detailed work; be it further *Resolved,* that the Wilson Ornithological Club expresses its thanks to the Local Committee for arranging the splendid exhibit of bird photographs; and be it still further *Resolved,* that the Wilson Ornithological

Club hereby tenders its thanks to the Kentucky Ornithological Society and the C. W. Beckham Bird Club for their kindness to the visiting members of the Wilson Ornithological Club.

The Nominating Committee offered the following report:

President—Lawrence E. Hicks, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio.

First Vice-President—George Miksch Sutton, Cornell University, Ithaca, New York.

Second Vice-President—S. Charles Kendeigh, University of Illinois, Champaign, Illinois.

Secretary—Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minnesota.

Treasurer—Gustav Swanson, University Farm, University of Minnesota, St. Paul, Minnesota.

Additional Members of the Executive Council—Maurice Brooks, West Virginia University, Morgantown, West Virginia; Miles D. Pirnie, W. K. Kellogg Bird Sanctuary, Battle Creek, Michigan; Lawrence H. Walkinshaw, Battle Creek, Michigan.

The report of the Nominating Committee was accepted by motion and the Secretary was authorized to cast one ballot for the nominees, thus electing them officers of the Wilson Ornithological Club for the ensuing year.

The session was formally adjourned at 5:10 P.M.

Meetings of the Executive Council

The Secretary reported that since 1937 a questionnaire has been submitted to each person elected a member of the Wilson Ornithological Club. This questionnaire is actually the first of three pages originally submitted in 1937 to the entire membership. Since the present supply is running low, the Secretary asked whether it would be advisable to revise this questionnaire to send to all new members during the coming year. The Council thereupon instructed the Secretary to revise the questionnaire.

An interesting discussion was held on the possibility of inviting regional ornithological organizations to affiliate with the Wilson Ornithological Club. Such questions were raised as: How large should such an organization be? What would be its actual relationship to the Wilson Ornithological Club? What would be the benefits of such a relationship? The Council authorized the President to appoint a Committee on Affiliated Societies to study this problem and as soon as possible to submit a report with recommendations to the Executive Council. Maurice Brooks was chosen Chairman of this Committee, with Albert F. Ganier, S. Charles Kendeigh and Myron H. Swenk as the other members.

The Program Committee was encouraged to arrange for the next Annual Meeting a symposium, preferably on some aspect of game management or conservation.

The President asked for comments on the work and effectiveness of the new Wildlife Conservation Committee. It was the concensus of opinion that the accomplishments during the first year of its existence were satisfactory but that the scope of its work should be further increased. There should be more accounts of conservation activities published in *The Wilson Bulletin*. At the suggestion of Miles D. Pirnie, Chairman of the Committee, the Council recommended increasing the size of the Committee to include members from more sections of the country.

The Secretary brought the attention of the Council to a statement in the Constitution that may be interpreted as being contradictory to another statement in the By-laws. In Article III, Section 2, it may be inferred (as a result of the listing of officers of the Club in the preceding section) that the Editor is among the officers to be elected by ballot, whereas By-law 9 states that the Editor shall be appointed by the Executive Council. The Council ruled that the contradiction was undoubtedly an oversight and that Article III, Section 2, of the Constitution

should be corrected to read: "Officers, except the Editor, shall be elected by ballot at the annual meeting by the voting members."

Dr. Josselyn Van Tyne was appointed Editor of *The Wilson Bulletin*. Earlier in the year (in January) the Council had appointed Dr. Van Tyne to this office to fill the unexpired term of Dr. T. C. Stephens.

At the invitation of the Museum of Natural History of the University of Minnesota, the Minneapolis Audubon Society, and the Minnesota Ornithologists' Union, the Council voted to meet in 1940 in Minneapolis, Minnesota, on November 22–23. Sessions will be held in the new Museum building.

Program Sessions

The first program session opened on Friday morning at 9:30 with an address of welcome by the Honorable Joseph D. Scholtz, Mayor of the City of Louisville, and a response on behalf of the Club by President Margaret M. Nice. Other sessions followed on Friday afternoon, Saturday morning and afternoon.

The four sessions included 36 papers, of which only one was read by title. The papers given during the first three sessions were largely technical, being based on the following ornithological studies: life history, 10; distribution and migration, 6; bird behavior, 3; economic, 3; historical, 1; ecological, 2. The conservation programs of the Bureau of Biological Survey and the Hawk Mountain Sanctuary Association and the research program of the Edmund Niles Huyck Preserve were outlined by their respective representatives. The papers given during the fourth session were largely popular in nature, all but one being based on natural color motion pictures of birds. Three concerned expeditions, the remaining four concerned photographic studies of well known birds.

Below is given the program of papers together with brief abstracts:

Opening Session, Friday Morning, November 24.

1. An Unusual Oven-bird Family. (10 minutes).
   H. W. Hann, *Zoology Department, University of Michigan, Ann Arbor, Michigan.*
   (Abstract omitted because this paper is being published in full in the *Bulletin.*)

2. Another Year's Study of Nesting Eastern Bluebirds. (15 minutes).
   Amelia R. Laskey, *Nashville, Tennessee.*
   (Abstract omitted because this paper is being published in full in the *Bulletin*).

3. Winter Studies of Color-banded Chickadees. (Read by Title).
   George J. Wallace, *Pleasant Valley Bird and Wild Flower Sanctuary, Lenox, Massachusetts.*

4. Hawk Mountain Sanctuary Up-to-Date. (15 minutes). Mrs. C. N. Edge, *Hawk Mountain Sanctuary Association, New York, New York.*
   An account of the recent educational and conservational developments at the Hawk Mountain Sanctuary, Drehersville, Pennsylvania.

5. Economic Importance of the Double-crested Cormorant in Minnesota. (15 minutes). Gustav Swanson, *Division of Economic Zoology, University of Minnesota, St. Paul, Minnesota.*
   The examination of over 100 stomachs of the Double-crested Cormorant from Minnesota, together with correlated field studies, show that in the Interior the bird's food habits are more likely to be harmful than on the Atlantic coast. The major foods found in the stomachs examined were fishes usually

considered valuable as food and game fish. In Lake of the Woods the Cormorants interfere to a considerable extent with commercial fishing, and as a result, are much persecuted by the fishermen. A method of controlling the damage to commercial fishing without killing the birds was suggested.

6. A Method of Studying Migration. Illustrated by lantern slides. (20 minutes). J MURRAY SPEIRS, *University of Illinois, Champaign, Illinois.*

(Abstract omitted at the speaker's request since the material is to be used in a doctoral thesis.)

7. Factors Affecting Length of Incubation in Birds. Illustrated by lantern slides. (20 minutes). S. CHARLES KENDEIGH, *University of Illinois, Champaign, Illinois.*

The rates of oxygen absorption and moisture loss by embryos of the House Wren were measured at various stages of incubation and at a wide variety of temperatures. The rate of oxygen absorption and probably the rate of development increase up to 100° F. but not to higher temperatures. Moisture and weight losses also increase to a maximum with rise in temperature, this maximum coming at higher temperatures as development progresses. A 24-hour removal of eggs from the nest and exposure to various temperatures has least effect on hatching at 95° and 100° F. Considering the greater uniformity of response, high percentage of hatch, the average egg temperature in the nest, and the possible stimulation of fluctuating nest temperatures, 95° F. appears the approximate incubation temperatures in this species. Relative humidity in the nest averages about 35 per cent. The length of the incubation period may be determined by the stage of development attained at hatching, the total energy exchanges necessary to reach this stage, and the rate at which these energy exchanges take place.

8. Some Observations on the Mental Capacity of Birds. (15 minutes). ALBERT F. GANIER, *Nashville, Tennessee.*

The extent of the ability of dumb animals, including birds, to associate related observations and to conduct their actions accordingly, has long been a matter of discussion. This paper attributed considerable ability of this kind to birds, within their particular spheres of activity and to a greatly varying degree as between species. Numerous examples from the personal observations of the speaker were cited as proof.

FRIDAY AFTERNOON

9. More Waterfowl? Illustrated by lantern slides. (10 minutes). MILES D. PIRNIE, *W. K. Kellogg Bird Sanctuary, Battle Creek, Michigan.*

A discussion of the following statements: Waterfowl concentrations continue on good refuges. Ducks census methods are unsatisfactory. Waterfowl natural history studies are progressing rapidly under the American Wildlife Institute, Ducks Unlimited, and the United States Bureau of Biological Survey.

10. The Nesting of the Turkey Vulture in Ohio. Illustrated by lantern slides. (20 minutes). VICTOR COLES, *University of Cincinnati Teachers College, Cincinnati, Ohio.*

A detailed presentation of the nesting activities of the Turkey Vulture in the limestone caves of central Ohio. Various types of nesting sites were shown and data given on weight and measurements of eggs and young birds. Measurements were given of young birds from hatching to the time of leaving the nest at 80 days.

11. Species of Birds Described by Alexander Wilson. Illustrated by lantern slides. (15 minutes). LAWRENCE I. GRINNELL, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Alexander Wilson was the first who truly studied the birds of North America in their natural abodes and from real observation. He described thirty new species

and subspecies of birds. He ranks ninth among ornithologists in the number of North American species and subspecies first described. His greatest activity was among the Warblers and Fringillids. A number of species, and likewise the genus *Wilsonia* of Bonaparte, were named in honor of him.

Wilson made several expeditions in search of material information and subscribers to his 9-volume publication, "American Ornithology," which he profusely illustrated with his own colored plates. His most extensive expedition was by skiff, horseback, and afoot from Philadelphia to New Orleans.

12. New England's Purple Finch Invasion of 1939. Illustrated by lantern slides. (15 minutes). Richard Lee Weaver, *Dartmouth College, Hanover, New Hampshire.*

A record of the unprecedented invasion of Purple Finches which occurred in New England during the early months of 1939. Data were obtained by banding over 2100 individuals and marking 1000 of them with colored feathers. Returns from an appeal for information made by radio and the Associated Press were also summarized by the speaker.

13. Program of Research at the Edmund Niles Huyck Preserve, Rensselaerville, New York. Illustrated by lantern slides. (10 minutes). Eugene P. Odum, *Biological Research Division, Edmund Niles Huyck Preserve, Rensselaerville, New York.*

The E. N. Huyck Preserve, Inc. is a 500-acre tract located 27 miles southwest of Albany. It was set aside with endowment by Mrs. Huyck in memory of her late husband and in recognition of the need for preserving natural areas for recreation, education, and study. Approximately 100 acres comprise two artificial lakes and adjoining marshes, 200 acres in abandoned fields and orchards partly in a natural process of succession, partly with artificial planting. The area is well protected by surrounding territory of a similar nature. A scientific advisory committee has been set up and provisions made for a biological station, a resident biologist, and several summer investigators to devote their full time to research. Work is being planned along broad ecological lines with intensive investigations in many phases of field biology.

14. Ring-billed Gulls of the Atlantic Coast. Illustrated by lantern slides. (20 minutes). Harrison F. Lewis, *National Parks Bureau, Ottawa, Ontario.*

This paper was concerned with Ring-billed Gulls in breeding colonies in the northern part of the Gulf of St. Lawrence; the known history, number, situation, and size of such colonies; their protection, food supplies, mortality, and success; habits of the gulls in these colonies and their association with other species; results of banding juveniles in some of the colonies.

15. The Prothonotary Warbler—A Contrast in Nesting Conditions, Tennessee and Michigan. Illustrated by lantern slides. (20 minutes). Lawrence H. Walkinshaw, *Battle Creek, Michigan.*

Some of the data presented in this paper are outlined below:

I. Introduction.
   a. Comparison of regions.
   b. Number of bird-houses in use.
   c. Number of birds observed.

II. Nesting.
   a. Singing of males.
   b. Nesting dates in Michigan and Tennessee.
   c. Egg laying.
   d. Breeding season.
   e. Size of egg sets in Michigan and Tennessee.

III. Survival of young.
   a. Per cent of nest success in Michigan and Tennessee.
   b. Per cent of egg success in Michigan and Tennessee.
   c. Known factors causing destruction of young and eggs.

IV. Some difference in weights.
V. Banding.
VI. Territory.

16. Gathering of the Purple Martins. Illustrated by lantern slides. (20 minutes). Earl G. Wright, *The Chicago Academy of Sciences, Chicago, Illinois.*

An account of clocking the activities of Purple Martins from the time they arrived at the roost until they settled down for the night, and again in the morning when the birds left the roost.

17. Notes on the Development of Song Sparrows and a Cowbird. Illustrated by lantern slides and motion pictures. (30 minutes). Margaret M. Nice, *Chicago, Illinois.*

Song Sparrows and Cowbirds pass through three stages in the nest and two outside it before reaching independence at the age of four weeks. These are: (1), first 4 days, coordinations largely concerned with nutrition; (2), 5 and 6 days, first appearance of other motor coordinations; (3), 7, 8, 9 days, rapid acquisitions of new motor coordinations; (4), 10 to 16 days, leaving of the nest to attainment of flight; (5), 17 to 28 days, attainment of independent feeding reactions. The majority of passerines seem to attain a certain proficiency in flight at about 17 days and to become independent of parental care at about 28 days.

Saturday Morning

18. Observations on the Feeding and Courtship Activities of the Black Duck. (10 minutes). Harry Leon Kutz, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Under controlled conditions full-winged Black Ducks dived and secured grain placed in ten feet of water. Both full-winged and captive ducks utilize a method of "treading" to secure food in the shallows. The female Black Duck, both under wild and captive conditions, often assumes the initiative in courtship. In captive ducks, pugnacity of the male stimulates the female sexually.

19. The Breeding Warblers of the Central Appalachian Region. (15 minutes). Maurice Brooks, *West Virginia University, Morgantown, West Virginia.*

An ecological survey of the wood warblers which breed in the central Appalachian area, i.e., western Maryland, West Virginia, and western Virginia. It is believed that certain species, Golden-winged and Black-throated Green Warblers, for example, have here adapted themselves to breeding situations which are unique for those species. The distribution of the species also offers considerable support to Merriam's concept of life zones.

20. Roosting Habits of the Robin in Spring. (15 minutes). Joseph C. Howell, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

(Abstract omitted because this paper is being published in full in the *Bulletin.*)

21. Some Remarks on the Breeding Birds of the Spruce-Fir Forest in the Great Smoky Mountains National Park. (15 minutes). Arthur Stupka, *National Park Service, Gatlinburg, Tennessee.*

The spruce-fir forests which cover the upper parts of the higher mountains in the southern Appalachian region represent a modified type of Canadian zone. This is revealed by both the floral and faunal complex which prevails. Birds which breed within the limits of this zone in the Great Smoky Mountains National Park were discussed. Observations covered a period of four years.

22. Sex Ratio in Shorebirds. (10 minutes). Josselyn Van Tyne, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

A discussion of the little information available on the sex ratio of shorebirds. Large numbers must be checked to ascertain actual sex ratios of bird species. In the case of birds whose sexes are alike in plumage, hunter's bags or museum series are the main source of information. Since there seems to be no selection of one sex or the other in museum collecting of some of these species, the study of such series seems to be a proper method of determining the sex ratio. It was found, for instance, that 22 large North American museums contain 1,137 Wilson Snipe (*Capella delicata*) with full data, taken at all seasons and in all parts of the range. Of these, 654 were males and 483 females, or 135.4 males to 100 females.

23. Observations on the Nesting Habits of the Phoebe. (10 minutes). WENDELL P. SMITH, *Wells River, Vermont.*

Information on the time interval between arrival of the species and arrival of breeding individuals; mating; nest building; egg laying; incubation; care of young; growth rates and color changes in young; nest leaving; subsequent behavior of parents and young.

24. Recent Developments in Waterfowl Lead-Poisoning Investigations. (15 minutes). GUSTAV SWANSON, *Division of Economic Zoology, University of Minnesota, St. Paul, Minnesota.*

Experimentally it has been shown that a sub-lethal dose of lead poisoning may have an injurious effect upon the egg-laying capacity of Mallards. The fertility of the eggs laid, however, was not affected in the experiments.

Surveys of a number of lake bottoms in Minnesota have revealed that a large number of shot are usually available in any lake over which a considerable amount of shooting has taken place. Such lead shot has been shown to remain close enough to the surface of the lake bottom to be accessible to ducks even on refuge lakes which have been closed to hunting for five years.

25. The Present Status of the Conservation Program of the Bureau of Biological Survey. (15 minutes). W. C. HENDERSON, *Bureau of Biological Survey, Washington, D.C.*

A discussion of three aspects of the work of the Bureau: research projects; enforcement of the Bird Treaty Act; the installment of new measures according to the stipulations of the Pittman-Robertson Act.

26. Incubation Studies of the Yellow-headed Blackbird. Illustrated by lantern slides. (20 minutes). REED W. FAUTIN, *University of Illinois, Champaign, Illinois.*

During the summer of 1937 observations were made on the nesting activities of two colonies of Yellow-headed Blackbirds. One hundred and twenty-seven nests were investigated. Data were kept on 83 nests from the time the first egg was laid until the young hatched. Information was obtained on the length of the incubation period; attentiveness and inattentiveness of incubating females at various times during the day and at various parts of the incubation period; behavior of females and males during incubation; causes of nesting failures.

27. Bird Distribution and Biomes in Western Canada. Illustrated by lantern slides. (20 minutes). EUGENE P. ODUM, *Biological Research Division, Edmund Niles Huyck Preserve, Rensselaerville, New York.*

Bird life of deciduous forest, northern coniferous forest, mountain coniferous forest, tundra, and grassland were compared from observations made during the 1939 summer field trip in animal ecology conducted by the Department of Zoology, University of Illinois, under the leadership of Dr. V. E. Shelford. The trip covered more than 6,000 miles, north as far as Churchill and west to the Canadian Rockies. The varying roles of cover (habitat) and climate in controlling distribution were discussed in the consideration of the life zone and biome theories as they apply to the area traversed. It is important to consider abundance and necessary to distinguish between (1) climax

and sub-climax, (2) primitive and disturbed conditions in evaluating observations and theories.

28. Studies of the Life History of the Pileated Woodpecker. Illustrated by lantern slides. (20 minutes). J. Southgate Y. Hoyt, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

A report on three years study of the life history of the Pileated Woodpecker. Data were represented on the winter and summer ranges of a pair of birds; the year-round activities, courtship, nesting, habits, development and growth of young and post-nesting activities of a pair observed in the vicinity of Ithaca, New York. Presented for the first time were daily observations made throughout the period the young were in the nest and also observations made on a young bird reared in captivity.

29. The Mockingbird's Imitation of Other Species. (15 minutes). George R. Mayfield, *Vanderbilt Universtiy, Nashville, Tennessee.*

A statistical study of imitations of other species by the Mockingbird. Included were many records by the same bird and songs from Mockingbirds in various parts of the United States. It was established that nearly one-eighth of the Mockingbird's imitations are songs of the Carolina Wren; one-twelfth of the Blue Jay; one-fourteenth of the Cardinal, etc. The question of inherited song was treated.

Saturday Afternoon

30. Michigan Bird Life. Illustrated by motion pictures in natural color. (20 minutes). Parks Allen, *Ithaca, Michigan.*

A series of motion pictures in color of Kirtland's Warbler, Song Sparrow, Sandhill Crane, Yellow Warbler, Goldfinch and others.

31. Birds of Florida. A Natural Color Motion Picture Record of Birds Taken by the Charles F. Williams-Cincinnati Museum of Natural History Expedition. (20 minutes). Peter Koch, *Terrace Park, Ohio.*

A motion picture record of a month's bird-photographing expedition in Florida. Members of the expedition included Karl H. Maslowski, Woodrow Goodpaster, and the speaker.

32. Some Birds of Eastern Kentucky. Illustrated by motion pictures in natural color. (20 minutes). Wilfred A. Welter, *State Teachers College, Morehead, Kentucky.*

A series of portraits of birds in the mountainous section of Kentucky. Among the birds shown were Bewick's Wren, Hooded and Blue-winged Warblers, Yellow-breasted Chat, Meadowlark, and Acadian Flycatcher.

33. Adventures in Color with American Birds. Illustrated by motion pictures in natural color (30 minutes). Cleveland P. Grant, *Baker-Hunt Foundation, Covington, Kentucky.*

Outstanding motion pictures of Snow Geese in migration, courtship of the Ruffed Grouse and Prairie Chicken, and the nesting of a pair of Baltimore Orioles.

34. Ruby-throated Hummingbird and Wild Turkey. Illustrated by motion pictures in natural color. (20 minutes). Olin Sewall Pettingill, Jr., *Carleton College, Northfield, Minnesota.*

Picture studies of several hummingbirds obtaining food from artificial feeding devices at the Laurence J. Webster estate in Holderness, New Hampshire, and the nesting of a pair of hummingbirds near the University of Michigan Biological Station at Douglas Lake, Michigan. Also picture studies of wild Turkeys making periodical visits to feeding stations on Herbert L. Stoddard's Sherwood plantation in Georgia.

35. The 1939 Semple Expedition to Eastern Mexico. Illustrated with several paintings by the speaker. (30 minutes). GEORGE MIKSCH SUTTON, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

In March, April, and May, 1939, John Bonner Semple and George Miksch Sutton returned to Mexico, accompanied by Thomas D. Burleigh of the U. S. Bureau of Biological Survey. They visited seven states. In April they were joined by Frederick S. Loetscher, graduate student of Dr. Sutton's at Cornell. They made a survey at exactly the point visited by Frank M. Chapman in 1897. Their principal objective was the rediscovery of *Otus pinosus.*

36. Western Arctic Birds in Color. Illustrated by motion pictures in natural color. (20 minutes). CHARLES E. GILLHAM, *U. S. Bureau of Biological Survey, Edwardsville, Illinois.*

Motion pictures of birds taken on a trip sponsored by the Bureau of Biological Survey to northwestern Canada and the delta of the Mackenzie River. Excellent shots were obtained of Hudsonian Curlews, Northern Phalaropes, and various arctic breeding waterfowl.

THE BIRD PHOTOGRAPH EXHIBIT

An excellent Bird Photograph Exhibit was arranged in the South Room on the mezzanine floor of the Brown Hotel. This exhibit displayed camera work by members of the Wilson Ornithological Club and clearly showed the interest taken in photography by the organization. Each exhibitor was limited to three black and white photographs not less than 8" x 10" in size and three natural color photographs not less than 4" x 5" in size. A mimeographed list of the exhibitors was provided and the pictures were attractively placed on large, upright wall-boards.

One hundred and forty bird photographs were shown, the subject matter ranging from pictures of nests and young to enormous colonies of water-birds. Especially fine were numerous photographs of birds in flight, three natural color pictures of birds, and several black and white transparencies against artificial lighting.

Photographs were exhibited by the following members:

Cyril E. Abbott
Bernard W. Baker
Floyd S. Carpenter
Victor Coles
David Damon
Edward Fox Dana
J. C. Dickinson, Jr.
Adrian C. Fox
Albert F. Ganier
Charles E. Gillham
Woodrow Goodpaster
A. Haak
Harry W. Hann
D. Ralph Hostetter
J. Southgate Y. Hoyt
Allen Kain
Peter Koch
Karl H. Maslowski
Amos I. Means
Henry Mousley
Olaus J. Murie
Ralph S. Palmer
Miles D. Pirnie
Olin Sewall Pettingill, Jr.
Henry J. Rust
Evelyn J. Schneider
Thomas G. Scott
Mabel Slack
J. Murray Speirs
Henry O. Todd, Jr.
Ivan R. Tomkins
Jack Van Coevering
Lawrence H. Walkinshaw
Edward H. Wollerman

The Bird Photograph Exhibit was officially opened on Friday evening by a reception given to the members of the Wilson Ornithological Club by the Kentucky Ornithological Society and the C. W. Beckham Bird Club. Entertainment was "in good old Southern style!" Members not only had opportunity to study the Exhibit but to make the acquaintance of many Kentucky ornithologists.

The Annual Dinner

The Annual Dinner of the Wilson Ornithological Club, attended by 137 members and visitors, was held in the Crystal Ballroom of the Brown Hotel on Saturday evening. This dinner will be remembered as a notable occasion in the history of the Wilson Ornithological Club, for on this occasion the Club first attained a membership of *one thousand.* Vice-President Hicks, long an ardent campaigner in behalf of Club membership, announced that enrollment in the organization stood at 992, that the 1000 mark was tantalizingly near, and that this dinner would be an appropriate occasion on which to reach it. He thereupon asked for pledges and the responses were immediate.

The speaker at the dinner was Mr. Karl H. Maslowski of Cincinnati, Ohio, who showed his beautiful natural color motion picture film entitled: "Nature's Children." Remarkable were his close-up shots depicting the eating habits of a praying mantis, and likewise his camera studies of red foxes and chipmunks.

Excursions

On Sunday four motor trips were made to points of interest in Kentucky, the transportation being provided for all members. At least twenty-five members availed themselves of this opportunity.

Attendance

Registration showed the presence of 168 persons.[1] Of these 100 were members, 12 were Councillors, 4 were Past-Presidents. Dr. Lynds Jones was the only Founder present. Those members who came great distances to attend the meeting were Harrison F. Lewis of Ottawa, Canada, W. E. Saunders of London, Ontario, Richard L. Weaver of Hanover, New Hampshire, Wendell P. Smith of Wells River, Vermont, Miss Hedvig Swanson of Macon, Georgia, and Miss Fannye A. Cook of Jackson, Mississippi.

Altogether 15 states, the District of Columbia, and the Dominion of Canada were represented in Louisville. Naturally the state where an Annual Meeting is held provides the largest attendance. So this year Kentucky had the largest number present: 18 members and 34 visitors.

This is the first time that Kentucky has taken the lead in attendance at an Annual Meeting although it was second only to Indiana at the Indianapolis meeting in 1937. Next to Kentucky the state with the largest attendance was Michigan with 16 members and 6 visitors.

The list of members in attendance follows:

From **Georgia:** 1—Miss Hedvig Swanson, Macon. *Visitor,* 1.

From **Illinois:** 14—Mrs. M. M. Nice, C. O. Decker, L. B. Nice, Miss J. C. Duer, Chicago; R. W. Fautin, Mrs. D. H. Speirs, J. M. Speirs, Urbana; K. E. Bartel, Blue Island; S. C. Kendeigh, Champaign; L. G. Flentge, Des Plaines; C. E. Gillham, Edwardsville; C. A. Beckhart, Barrington; C. W. G. Eifrig, River Forest; Miss Maxine Smith, Rockford. *Visitors,* 3.

From **Indiana:** 5—S. E. Perkins, III, Miss M. F. Campbell, Miss C. A. Moore, Miss Dorothy Hover, Miss M. R. Knox, Indianapolis. *Visitors,* 5.

From **Kentucky:** 18—J. B. Young, Miss Emilie Yunker, W. M. Clay, H. B. Lovell, B. L. Monroe, F. S. Carpenter, L. C. Brecher, James LaFollette, Miss

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[1] This figure places the Louisville meeting fifth largest attendance, being exceeded in total registration by the 1939 Ann Arbor meeting (261), the 1937 Indianapolis meeting (238), the 1929 Des Moines meeting (202) and the 1934 Pittsburgh meeting (178). However, had registration been taken during the last session of the Louisville meeting when 400 persons were estimated as present, the meeting would have undoubtedly equalled, if not exceeded, the Ann Arbor meeting of last year.

Mabel Slack, Miss E. J. Schneider, Louisville; J. F. Spears, V. K. Dodge, Miss C. C. Counce, Lexington; C. P. Grant, Covington; Mrs. J. H. Mayer, Cynthiana; W. A. Welter, Morehead; Miss Edith Pearson, Miss Hazel Kinslow, Paducah. *Visitors,* 34.

From **Michigan:** 16—Mrs. George Burch, L. H. Walkinshaw, M. D. Pirnie, G. N. Rysgaard, Peter Ward, E. M. Brigham, Jr., Battle Creek; Miss M. E. Gross, Grand Rapids; Miss Katherine Merry, R. E. Olsen, Pontiac; J. Van Tyne, H. W. Hann, J. L. George, Mrs. R. L. Kahn, Ann Arbor; Mrs. G. A. Kelley, Detroit; Parks Allen, Ithaca; B. W. Baker, Marne. *Visitors,* 6.

From **Minnesota:** 4—O. S. Pettingill, Jr., Northfield; Gustav Swanson, St. Paul; Mrs. C. E. Peterson, Madison; Mrs. E. O. Wilson, Montevideo. *Visitors,* 2.

From **Mississippi:** 1—Miss F. A. Cook, Jackson.

From **New Hampshire:** 1—R. L. Weaver, Hanover.

From **New York:** 9—Miss Theodora Nelson, Peter Edge, Mrs. C. N. Edge, New York City; H. L. Kutz, J. C. Howell, L. I. Grinnell, G. M. Sutton, J. D. Webster, Ithaca; E. P. Odum, Rensselaerville. *Visitors,* 4.

From **Ohio:** 11—Mrs. C. H. Warner, L. E. Hicks, Columbus; Lynds Jones, Oberlin; Peter Koch, Victor Coles, Allan Kane, K. H. Maslowski, Gordon Acomb, Cincinnati; Miss Vera Carrothers, Miss M. E. Morse, Miss Isabella Hellwig, Cleveland. *Visitors,* 6.

From **Pennsylvania:** 3—R. W. Glenn, G. B. Thorp, Miss M. L. McConnell, Pittsburgh. *Visitors,* 4.

From **Tennessee:** 8—Mrs. A. R. Laskey, J. B. Calhoun, H. C. Monk, A. F. Ganier, G. R. Mayfield, Nashville; W. M. Walker, Jr., Henry Meyer, Knoxville; Arthur Stupka, Gatlinburg.

From **Vermont:** 1—W. P. Smith.

From **Virginia:** 2—D. R. Hostetter, Harrisonburg; J. S. Y. Hoyt, Lexington.

From **West Virginia:** 3—I. B. Boggs, Maurice Brooks, Morgantown; W. A. Lunk, Fairmont.

From **Washington, D.C.:** 1—W. C. Henderson.

From **Dominion of Canada:** 2—H. F. Lewis, Ottawa, Ontario; W. E. Saunders, London, Ontario.

Summary of Attendance: Total registration, 168 (Members, 100; Visitors, 68); Total from Louisville, 39 (Members, 10; Visitors, 29); Total from Kentucky, 52 (Members, 18; Visitors, 34). Total outside of Kentucky, 116 (Members, 82; Visitors, 34). Maximum number at each program session: Friday morning, 55; Friday afternoon, 80; Saturday morning, 95; Saturday afternoon, 400. Number at Annual Dinner, 137. Number of persons in group photograph, 111.

REPORT OF THE INDEX COMMITTEE

As it was deemed advisable not to recommence work on the index until further investigation had been conducted on apparently important improvements in indexing policies, progress the past year consisted mainly of these researches, and also in very fruitful conferences with Messrs. Strong, Kalmbach, and Van Tyne, in some correspondence on policy, and in the formulation of a policy sheet for the use of indexers. The studies having been completed, actual indexing is now going forward. Miss Phoebe Knappen has undertaken to finish the author-title indexing, and the chairman is now engaged in personally preparing a complete index, with all cross references, to a recent volume. This will serve as a final test of the adequacy of our system.

The Club owes a debt of gratitude to Mrs. Nice, to Dr. Strong, who retired last November as chairman of the committee, and to Dr. Van Tyne, who served in the same capacity in the interim. Their guidance and encouragement in furthering this undertaking have been invaluable.

Respectfully submitted,

Thomas D. Hinshaw, *Chairman*

December 31, 1939.

REPORT OF THE MEMBERSHIP COMMITTEE

In accordance with Dr. Olin Sewall Pettingill, Jr.'s, 1938 secretarial report to the Wilson Ornithological Club, the suggestions regarding membership solicitation were placed in effect.

In late February, 1939, letters were sent by Mrs. Margaret M. Nice, President, and your Membership Chairman to prospective State Chairmen. The response to these letters was good and the following State Chairmen were appointed:

California—John T. Emlen, Jr.
Colorado—Gordon Alexander
Georgia—H. C. Jones
Illinois—Frank Bellrose, Jr.
Indiana—Fred Thomas Hall
Kentucky—Robert M. Mengel
Michigan—Lawrence H. Walkinshaw
Minnesota—Kenneth D. Morrison
Mississippi—Miss Fannye A. Cook
Missouri—William Jenner
New England—Richard L. Weaver
New Jersey—Alfred E. Eynon
New Mexico—Lawrence V. Compton
New York—Mrs. Olive R. York
North Dakota—Miss Perna M. Stine
Ohio—Karl H. Maslowski
Oklahoma—Miss Edith R. Force
South Dakota—Philip A. DuMont
Tennessee—Albert F. Ganier
Texas—J. E. Stillwell
Utah—W. H. Behle
Virginia—J. Southgate Y. Hoyt
Washington—Vernon L. Marsh
West Virginia—Maurice Brooks
Wisconsin—G. A. Ammann
Wyoming—Otto McCreary
British Columbia—Walter S. Maguire

The first drive for members got under way in April and ended in June. The second drive began in September and has lasted until the present day.

Much of the work, naturally, has been on an experimental basis. Letters were sent in three forms:

(1) Printed letters (not mimeographed) to persons from large lists, presumably interested in birds in general.
(2) Printed letters to individual groups such as bird-banders, wildlife refuge workers and game managers. Each of this series pertained to the particular work of each group and was not general.
(3) Personally written letters to individuals where the occasion warranted.

It can be seen readily that to write personal letters to persons taken from lists would entail considerable expense both in regard to postage and to secretarial help. It is the opinion of your Membership Committee that the new folder describing the Wilson Club and its objectives, designed by Dr. Pettingill, is by far the greatest drawing power to prospective members since it tells the entire story practically without the aid of an additional letter. Every letter sent out contained one of these folders. Many select lists of prospective members have been used during the past year.

Approximately 3,500 persons have been circularized. One hundred and ninety-four members have been obtained.

It is significant that many persons receiving the folders and an invitation to join the Club sent in their applications at a much later date. The last application received by your committee just a few days ago was from the very first series of names circularized last April.

The actual cost of solicitation by the Membership Committee has been confined entirely to the cost of supplies and to postage. No additional secretarial help has been used to date.

Whatever success has been attained has been due chiefly to the careful plans made by your officers, to the new folder, and to the splendid cooperation of the State Chairmen and individual members who sent in names of prospective members.

Respectfully submitted,

BURT L. MONROE, *Chairman*

November 24, 1939

REPORT OF THE SECRETARY FOR 1939 [1]

In the Annual Letter I stated that I would have a happy announcement to make concerning the membership status of the Wilson Ornithological Club. Indeed, I now have! This year we lost only 93 members as against 127 members last year: 61 were delinquent in dues; 26 resigned; 6 were taken by death. Thirteen former members rejoined the Club and we have obtained 253 new members *giving us a total of 1044 members*. Thus we have made a net gain in membership over last year of 173 members.

Our membership, while most heavily distributed in the midwestern states, is rapidly becoming country-wide. Ohio and Michigan are tied for first place in greatest number of members, with Illinois following a close second. But it is gratifying to note the decided increase in numbers of members in New England, Pennsylvania, New York, and Texas.

The total distribution of members by states, provinces, and foreign countries is given below. The figures in parentheses indicate the number of members new to the organization in 1939.

UNITED STATES		
Arizona	8	(3)
Arkansas	5	(1)
California	49	(8)
North Carolina	6	(3)
South Carolina	5	(2)
Colorado	11	(4)
Connecticut	8	(3)
North Dakota	12	(5)
South Dakota	6	
Delaware	2	
Florida	10	(3)
Georgia	13	(3)
Idaho	3	
Illinois	86	(20)
Indiana	31	(6)
Iowa	38	(4)
Kansas	4	(2)
Kentucky	25	(11)
Louisiana	8	(2)
Maine	6	(1)
Maryland	13	(3)
Massachusetts	28	(5)
Michigan	96	(23)
Minnesota	41	(17)
Mississippi	6	(2)
Missouri	25	(7)
Montana	5	(3)
Nebraska	14	(2)
New Hampshire	5	(2)
New Jersey	17	(5)
New Mexico	8	(3)
New York	75	(18)
Ohio	96	(14)
Oklahoma	15	(5)
Oregon	5	
Pennsylvania	51	(14)
Rhode Island	2	(2)
Tennessee	19	(4)
Texas	29	(11)
Utah	8	(2)
Vermont	1	
Virginia	14	(1)
West Virginia	13	(3)
Washington	7	(2)
Washington, D.C.	30	(2)
Wisconsin	29	(6)
Wyoming	7	(2)
CANADA		
Alberta	1	(1)
British Columbia	3	
Manitoba	5	(2)
Nova Scotia	1	
Ontario	21	(4)
Quebec	3	
Saskatchewan	1	
FOREIGN COUNTRIES		
Alaska	2	(2)
China	1	(1)
Cuba	1	
Finland	1	
Great Britain	2	(2)
Holland	1	
New Zealand	1	
Northern Rhodesia	1	(1)
Peru	1	
Switzerland	1	(1)
Venezuela	1	
Virgin Islands	1	

The 253 new members are classified as follows: Sustaining, 5; Active, 30; Associate, 218. The total membership is classified as follows: Honorary, 5; Life, 7; Sustaining, 39; Active, 234; Associate, 748.

[1] Revised through December 31, 1939.

Our record gain in new members that brings us for the first time in the Club's history up to and beyond the one-thousand mark has been due partly to the continued efforts of the Secretary with the cooperation of his fellow officers, but chiefly to the persistent work of the Chairman of our new Membership Committee. During this meeting the chairman of that committee will speak to you and will, I hope, describe his unique committee and methods of procedure. I cannot say whether he will give you any indication of the amount of correspondence that has been involved, the great time and energy that the work has required, and the great personal burden that it has been to him. But whatever his remarks may be, we have sufficient imagination to realize how greatly we are indebted to him.

This year our membership solicitation work has been greatly facilitated by the publication of an attractive membership solicitation folder. Several copies are available for examination purposes at the Registration Desk. I should advise each one of you to study this folder. You may learn much about the Wilson Ornithological Club that you do not yet know. While this folder has been issued by the Club at considerable initial expense, it is in a way a permanent acquisition. Its entire form is being kept in a Northfield, Minnesota, printing house and additional copies may be run off from it when needed.

Possibly it may interest you to know that each person elected to membership is formally notified by the Secretary. At the same time he is asked to fill out a copy of the questionnaire similar to the one submitted to the entire membership in 1937. Thus we in charge of the Club continue to keep ourselves informed of our membership and to know who our members are.

The Local Committee is to be congratulated on the fine Bird Photograph Exhibit. I hope that members in attendance will appreciate the great personal expenditure of time and money that this Exhibit has meant to the Local Committee. Please repay the Committee by studying this Exhibit carefully during your spare moments.

As Chairman of the Program Committee, may I solicit criticisms and suggestions pertaining to the present program, its arrangement, scope, and general content. While it is now too late to make radical changes, nevertheless such expressions of opinion will guide us in making up the program in years to come.

Respectfully submitted,

Olin Sewall Pettingill, Jr., *Secretary*

November 24, 1939

REPORT OF THE WILDLIFE CONSERVATION COMMITTEE

Just a year ago we presented the first annual report of this Committee. Events of the past year indicate that the wildlife conservation activities suggested then were fairly appropriate and possible of accomplishment.

The September issue of *The Wilson Bulletin* presented more than a page of wildlife conservation notes with an announcement from the Editor that summaries of information gathered will be printed regularly together with the recommendations of the Committee. Members are invited to contribute data and opinions.

Plans for a conservation symposium for this meeting failed, but your Committee recommends an expression of views and suggests a symposium for the next meeting of this Club.

During the past year the committee members have exchanged views on legislative and educational programs and have begun plans for an inventory of conservation activities in all states. In developing our conservation program it is not only necessary but also is very desirable to have more members actively participating in local programs and in helping the Committee learn of the needs and progress in wildlife affairs throughout the country.

The Committee urged the Department of the Interior to continue all possible protection for waterfowl and received a reassuring letter from Chief Gabrielson. Needs for increased protection are now being studied by the Biological Survey and your Committee.

Among suggestions received from committee members and on which I wish your reactions are the following:

That a list of Conservation workers be prepared for each state, indicating which are Wilson Club members. (Each list might in part be compiled from the Secretary's questionnaire of 1937.)

It is urged that we "go slow" in arriving at conclusions and in making recommendations, but there is no need for going slow in promoting natural history inventories which are the only sound basis of wildlife conservation. We especially need data on rare species and on those which are vulnerable because of colonial nesting or extreme pressure from hunters.

In addition to participation in various parts of our program we urge members who can give financial aid to do so. Studies such as the three-year study of the California Condor are deserving of help. Contributions can also be used to good advantage in promoting interest in wildlife conservation.

Again let us remind you that the success of the Wilson Club Conservation Committee section of the *Bulletin* depends not only on the Editor and your Committee but depends also on each of you and your contributions of conservation news. To be of lasting benefit, either to the birds or to the people who are to enjoy them, a sound conservation program must develop slowly but steadily. We rely on you.

Respectfully submitted,

MILES D. PIRNIE, *Chairman*

November 25, 1939

WILSON ORNITHOLOGICAL CLUB LIBRARY

Recent gifts are as follows:
Ralph Beebe—5 pamphlets, 5 periodicals.
Paul Errington—6 pamphlets.
W. C. Legg—current numbers of "Field Ornithology."
Marius Morse—2 pamphlets.
National Park Service—1 book.
Margaret M. Nice—1 book, 3 pamphlets, 54 periodicals.
Schenectady Bird Club—Nos. 1 to 7 of "Feathers."
O. A. Stevens—1 pamphlet.
Dayton Stoner—1 pamphlet.
Texas Game, Fish and Oyster Commission—4 pamphlets.
U. S. Bureau of Biological Survey—2 books.
L. H. Walkinshaw—5 pamphlets, 2 periodicals.
Wisconsin Conservation Department—7 pamphlets.

REPORT OF THE ENDOWMENT FUND COMMITTEE

Total Endowment Fund shown by report dated Nov. 22, 1938:		
Bonds in safety deposit box of Fletcher Trust Co.		$2,261.25
Balance cash in savings account, Fletcher Trust Co., Indianapolis		109.03
Grand total, Nov. 22, 1938		$2,370.28
Received during year 1939:		
Interest coupons on U.S. Postal Savings 2½% coupon bonds due Jan. 1, 1939 and July 1, 1939 and deposited in savings account, St. Anthony Park State Bank	$ 19.50	
Interest on savings account in St. Anthony Park State Bank	.82	
	$ 20.32	
Total Endowment Fund, Nov. 24, 1939:		
Bonds in safety deposit box at St. Anthony Park State Bank (value at maturity, $2,530.00)		$2,261.25
Balance cash in savings account, St. Anthony Park State Bank		129.35
Grand total		$2,390.60

November 24, 1939

Respectfully submitted,

GUSTAV SWANSON, *Chairman*

REPORT OF THE LIBRARIAN FOR THE YEAR ENDING NOVEMBER, 1939

I have the honor to present herewith the ninth annual report of the Librarian of the Wilson Ornithological Club.

As a result of last year's cataloguing of the collection, little work was necessary in administering the library this year. Books were arranged on the shelves so they could be used to the best advantage, and the additions to the library were accessioned as they were received.

The most noticeable addition to the library was the increased number of exchanges. We are now getting regularly 46 publications.

Many valuable gifts continue to come to the library. Large boxes were received from Wendell Taber and Winsor M. Tyler of Cambridge, Massachusetts, Lynds Jones of Oberlin, Ohio, Mrs. Margaret M. Nice of Chicago and W. J. Willis of Long Island, New York. Others who have given pamphlets, reprints and books to the library are A. C. Fox of Fargo, North Dakota, Burt Gresham of Winnipeg, Manitoba, Ralph Beebe of Ecorse, Michigan, Paul A. Stewart of Leetonia, Ohio, Lawrence H. Walkinshaw of Battle Creek, Michigan, Robinson C. Watters of Cambridge, Maryland, Leon Kelso of Washington, D.C., Paul Lechevalier of Paris, France, Leonard Wing of Pullman, Washington, E. L. Sumner, Jr., of Menlo Park, California, Maurice Brooks of Morgantown, West Virginia, Mrs. F. C. Laskey of Nashville Tennessee, Miles D. Pirnie of Battle Creek, Michigan, Francis Harper of Swarthmore, Pennsylvania, Dayton Stoner, Albany, N. Y., Josselyn Van Tyne of Ann Arbor, Michigan, G. J. Wallace of Lenox, Massachusetts, and W. L. McAtee of Washington, D.C.

Among the gifts were runs of many magazines such as *The Oölogist, Bluebird, British Birds, Osprey, Guide to Nature, American Ornithology, Victorian Naturalists, Le Naturaliste Canadien, The Migrant* and the *Oölogist's Record.* The total number of pieces added to the library exclusive of the periodicals is 872.

The stock of the *Wilson Bulletins* have been arranged for easy accessibility and efficient use.

Respectfully submitted,

F. RIDLEN HARRELL, *Librarian*

November 18, 1939.

REPORT OF THE TREASURER FOR 1939

Receipts for 1939

Balance as shown by last report, Nov. 22, 1938	$ 187.64
Dues:	
Associate	1,062.40
Active	537.75
Sustaining	207.50
Subscriptions	133.49
Sale of back numbers of *The Wilson Bulletin*	239.40
Contributions of authors toward publication	31.00
Gifts	45.00
Miscellaneous receipts	10.70
Total	$2,454.88

Disbursements for 1939

President's expense (postage)	$ 3.84	
Annual meeting expense (1938, 1939 in part)	161.72	
Membership, Ecological Soc. and Illinois Cons. Council	4.00	
Book plates	2.65	
Secretary's and membership committee expense (postage, supplies, printing, clerical aid)	382.07	
Editor's expense, *Bulletin,* postage, supplies	1,586.03	
Treasurer's expense, postage, printing, etc.	64.12	
Subscription refunds	9.90	
Shipping back numbers of *Bulletin* from Sioux City to Ann Arbor	93.69	
Checks returned	10.50	
Bank charges—Check collection fees, bookkeeping charge, deduction on foreign exchange	36.56	
Reprints (for which authors paid W.O.C.)	21.88	
Total		$2,376.96
Balance on hand in St. Anthony State Bank, Nov. 22, 1939		$ 77.92

Respectfully submitted,

Gustav Swanson, *Treasurer*

November 24, 1939.
Approved by Auditing Committee
Wendell P. Smith
Eugene P. Odum

The Wilson Bulletin Publication Dates

The actual dates of publication of the four numbers in 1939 were: March 31, June 22, September 28, and December 23.

TO OUR CONTRIBUTORS

Our members are asked to submit articles for publication in the *Bulletin*. Manuscripts will be accepted with the understanding that they have not been published or accepted for publication elsewhere.

MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

ILLUSTRATIONS. Photographic prints, to reproduce well as half-tones, should have good contrast and detail. Please send prints unmounted, and attach to each print a brief but adequate legend. Do not write heavily on the backs of photographs.

BIBLIOGRAPHY. Literature cited should ordinarily be listed at the end of articles. These citations should be complete and references to them in the text should be made by the year of the citation and the exact pages referred to.

PROOF. Galley proof will be submitted to authors and must be returned promptly. Expensive alterations in copy after the type has been set must be charged to the author.

REPRINTS. The Club is unable to furnish free reprints to authors. Arrangements will be made, however, for such reprints to be made at cost. A scale of costs, based on the number of pages, is given below. Orders for reprints should accompany the returned galley proof. Charge will be made for a minimum of 100 reprints.

REPRINT SCHEDULE OF THE WILSON BULLETIN

	1 page	2 pp.	4 pp.	8 pp.	12 pp.	16 pp.	Each Additional 4 pp.
100 copies	$1.95	$2.10	$2.40	$4.15	$5.90	$7.00	85c
Each Additional 100 copies	95c	1.00	1.40	2.20	2.90	3.50	55c

Covers: $3.85 for first 100 copies; $1.40 for additional 100 copies.

ANNUAL MEETINGS OF THE WILSON ORNITHOLOGICAL CLUB

		President
1914—Chicago	February 5	T. C. Stephens
Chicago Academy of Sciences		
1914—Chicago	December 29-30	T. C. Stephens
1915—Columbus	December 28-29	T. C. Stephens
1916—Chicago	December 27-28	T. C. Stephens
1918—Pittsburgh	January 1-2	W. F. Henninger
1919—St. Louis	December 29-30	M. H. Swenk
1920—Chicago	December 27-28	R. M. Strong
1921—Chicago	December 26-27	R. M. Strong
1922—Chicago	October 24	T. L. Hankinson
Field Museum; with A.O.U.		
1923—Cincinnati	Dec. 31-Jan. 1, 1924	T. L. Hankinson
1924—Nashville	November 28-30	A. F. Ganier
Peabody College		
1925—Kansas City	December 28-29	A. F. Ganier
1926—Chicago	November 26-27	A. F. Ganier
Chicago Academy of Sciences		
1927—Nashville	Dec. 30-Jan. 1, 1928	Lynds Jones
1928—Ann Arbor	Nov. 30-Dec. 1	Lynds Jones
University of Michigan		
1929—Des Moines	December 27-28	Lynds Jones
1930—Cleveland	December 29-30	J. W. Stack
1931—New Orleans	December 28-29	J. W. Stack
1932—Columbus	November 25-26	J. M. Shaver
Ohio State Museum		
1934—Pittsburgh	December 28-29	J. M. Shaver
Carnegie Museum		
1935—St. Louis	December 30-31	J. Van Tyne
1936—Chicago	November 27-28	J. Van Tyne
Chicago Academy of Sciences		
1937—Indianapolis	December 27-28	J. Van Tyne
1938—Ann Arbor	November 25-26	M. M. Nice
University of Michigan		
1939—Louisville	November 24-25	M. M. Nice

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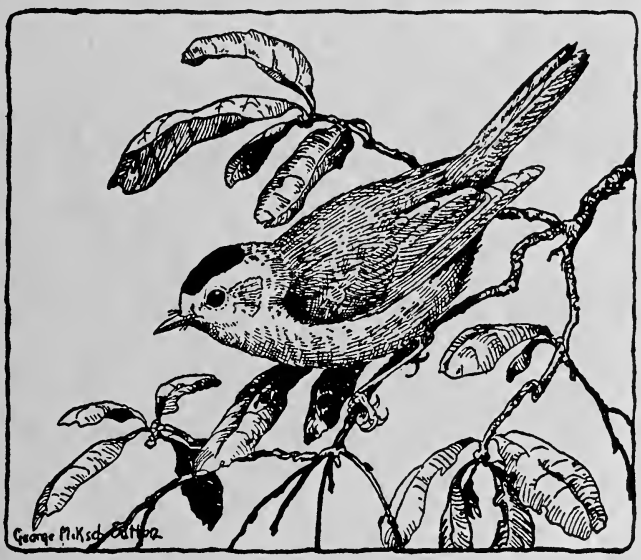
The Wilson Bulletin



Published by the

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Ann Arbor, Michigan

CONTENTS

THE WILSON BULLETIN

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All articles and communications for publication, books and publications for review, exchanges, and claims for lost or undelivered copies of the magazine, should be addressed to the Editor.

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Entered as second class matter July 13, 1916, at Ann Arbor, Michigan, under Act of Congress of March 3, 1879.

THE WILSON ORNITHOLOGICAL CLUB

Founded December 3, 1888. Named after Alexander Wilson, the first American ornithologist, and called the "Father of American Ornithology."

The officers for the current year are:

President—Lawrence E. Hicks, Ohio State University, Columbus, Ohio.
First Vice-President—George Miksch Sutton, Cornell University, Ithaca, N.Y.
Second Vice-President—S. Charles Kendeigh, University of Illinois, Champaign, Ill.
Treasurer—Gustav Swanson, University of Minnesota Farm, St. Paul, Minn.
Secretary—Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minn.
Editor—Josselyn Van Tyne, University of Michigan, Ann Arbor, Mich.
Associate Editors—Margaret M. Nice and Pierce Brodkorb.

Membership dues are: sustaining membership, $5.00; active membership, $2.50; associate membership, $1.50 per calendar year.

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 52 13,814 JUNE, 1940 No. 2

POLYANDRY IN THE OVEN-BIRD[1]

BY HARRY W. HANN

IN a previous paper (Hann, 1937) the author has described the usual habits of the Oven-bird *(Seiurus aurocapillus)* with respect to territory, mating, and care of the young, but a case has been observed recently which is so different from any known before that it seems worth while to describe it.

In the ordinary behavior of the Oven-bird the males and females have single mates, and the males chase all other males from their territory. Ownership of territory usually is respected by neighboring males, and an occasional chase in the right direction is all that is needed to keep the territory free from intruders. Copulation takes place between mates during the nest-building and egg-laying seasons only. After the young hatch the male aids with the feeding, and when the young leave the nest each parent takes a part of the brood for later care. The male remains in the home territory, unless it is late in the season, and the female goes into a neighboring territory, sometimes passing from one adjacent territory to another. Neighboring males are tolerant of these females and their young, and may take considerable interest in them, though the concern seems to be largely one of curiosity. Some exceptions to these rules were found previously when one male had two mates at the same time, and when a female copulated with two neighboring males in her own territory, then later visited a neighboring male in his territory during her incubation period. The case of the male having two mates may be attributed to an extra female entering his territory, and the behavior of the female perhaps to an over-supply of sex hormones. In the case which was observed recently a female had more than one mate, the condition known as polyandry, and this situation I will describe in some detail.

On May 30, 1939, I found an unfinished nest along the border of the territories of two males which I called Numbers 73 and 74. I considered the nest as belonging in the territory of 74 because a male had sung not far away in his direction, and twice when this male sang the female answered by chirping, once very sharply, as if reproving him for singing a song meaning "all's well" when the observer was near. On

[1] Contribution from the Department of Zoology, University of Michigan.

June 6, the day the fifth and last egg appeared, I found that Number 73 was singing near the nest, and at the same time Number 74 was singing at his usual post some distance away. I then changed my recording of the nest from file 74 to 73. Later I found that it belonged to both.

On June 19 when the young were two days old, I trapped the female and banded her, placing a metal band on her left leg and a black celluloid band on her right leg. I also trapped a male which proved to be Number 73, and banded him with a metal band on his right leg and a red one on the left. During the next morning as I was watching the nest I discovered that an unbanded bird was carrying food to the young, whereupon I trapped it on the following day, June 21. It proved to be a male, as indicated by the absence of a brood patch, and obviously was Number 74. I banded him with a metal band on the right leg, and a blue band just above it on the same leg, since another male in the woods had a blue band on the left.

These were complicated family relations, but more was to come. I already had noticed a male chasing the female and trying to copulate with her on June 20. After banding the second male I found that this intruder was a third male still unbanded, and apparently one that I had designated according to territory as Number 79. During the few days that followed while the young were in the nest, he entered the area repeatedly, sometimes coming within a meter of the nest. The banded males chased him when they found him, sometimes one following him and sometimes the other. Usually he went for some distance, but at other times merely dodged to one side, or even chased the 74 male. His interest centered chiefly in the female, but he probably was attracted to some extent by the nest and young, though he did not help feed them. He sang often in his territory, which lay to the west, and occasionally sang within fifteen or twenty meters of the nest, but since he did not come to the nest I had no chance to band him. Whether or not the female encouraged him in his attentions was a little uncertain. I did not see her actively invite his approaches as the females sometimes do, and usually she dodged him or turned and faced him causing him to retreat. He apparently was successful, however, in some of his attempts at copulation.

The two banded males continued to feed the young, and in fact did most of the feeding from the time I discovered the second male, three days after hatching, until the young left the nest. During the sixteen hours and thirty-five minutes that I watched the nest, Number 73 fed thirty times (42 per cent), 74 twenty-eight times (39 per cent) and the female fourteen times (19 per cent). Since the female usually brought small helpings, however, and 74's were a little larger than 73's, I think that 74 brought about fifty per cent, 73 forty-three per cent and the female seven per cent of the food.

The writer was anxious to see what distribution would be made of the young birds when they emerged from the nest, and fortunately was present when they left. At 8:37 A.M. on June 25, the first bird hopped from the nest and made its way south, and three minutes later all had left, one by one. None of the adults was at the nest at the time, but Number 73 discovered the first bird as he came with a mouthful of food. He apparently would have fed it, but the female arrived just then, drove him away and took charge of the young bird herself. I had to leave the blind to get a better view of what was going on, and this added to the usual excitement of leaving the nest, but probably did not influence the distribution of the birds. I could not see all that happened, but I noticed the female taking two birds to the west, incidentally toward 79's territory, and shortly afterward accompanying another down into the gully on the north. Later she returned to this last bird, led it on across to the other side and turned to the left. A couple of hours afterwards I found her bringing this bird back across the gully where she then had three young in close proximity. The Number 79 male did not try to get any young birds, but he followed the female continually as she led the young, often within a meter of her.

I was anxious to see whether the 74 male got any young as a reward for his work, but he succeeded in keeping well out of sight at the time. Two days later, however, I found him about seventy meters to the southeast, obviously in 73's territory, caring for a young bird. The female and Number 79 at this time were near where I had left them two days before, and while I was watching, he made an apparently successful attempt at copulation. I was unable to locate 73 that day, but four days later I found him seventy meters south of the nest in his own territory caring for a young bird. This made the disposal of the young quite certain; that is, the banded males got one young bird each and the female three. Quite evidently the female had to speed up her feeding to jump from seven per cent to sixty per cent, and at the same time give a good deal of attention to the Number 79 male, but I did not follow their later behavior to ascertain particulars.

In trying to analyze the causes which led to this peculiar family situation, one can get a little light from the previous conditions which to the best of my knowledge were as follows: The female presumably had been 73's mate at a previous nest about a hundred meters to the south, and started a nest here when her former eggs, in addition to two cowbird's eggs, were collected on May 29. Number 74 apparently was unable to secure a mate and was drawn over by the presence of the female. Number 79 is believed to be a male which had a mate and nest previously some distance to the southwest, but the female deserted the nest on June 10 during one of my experiments, and her later history is not known. The arrival of the male in the vicinity of this nest must have been at least several days after incubation began, and perhaps

after hatching, since he was not noticed until June 20 when the young were three days old. Just why he was drawn here is not clear, unless he received a little encouragement from the female. That the female may have been attracted by his attentions is indicated by the fact that she went directly to his territory when the young left the nest. As to Number 73, he must have been more tolerant than the average male, or he would have driven out his rivals.

Discussion

Mayr (1939) in a recent paper ably reviewed the question of sex ratio in wild birds and also its relation to mating. Polygyny, the mating of a male with more than one female, is the normal condition in certain species such as the Boat-tailed Grackle (McIlhenny, 1937), and happens occasionally among species like the Song Sparrow (Nice, 1937), which are usually monogamous. Polyandry is much less common, and according to Mayr is confined to such species as the phalaropes, in which the female takes the initiative in the mating activities. The last statement would not take into consideration such cases as the present one in which occasional polyandrous matings might occur among species with the usual habits of mating. Perhaps this condition is more common than has been supposed since it is difficult to detect. The question might be raised as to whether the presence of the extra banded male here was not "pseudo-polyandry," a term used by Mayr to describe cases where extra males merely help in the feeding. Though the two banded males were not observed copulating with the female, the presence of both near the nest was observed at egg-laying time, and probably both copulated with her. At least the relationship began early and was more deeply seated than just interest in the young birds. The unbanded male must have come on the scene later, and may be considered as an interloper, but nevertheless a mate also.

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Department of Zoology, University of Michigan, Ann Arbor, Michigan

LIGHT VERSUS ACTIVITY AS A REGULATOR OF THE SEXUAL CYCLE IN THE HOUSE SPARROW[1]

BY GARDNER M. RILEY

IT has been well established for the male House Sparrow, *Passer domesticus,* (Riley, 1936, 1937; Kirschbaum and Ringoen, 1936; Ringoen and Kirschbaum, 1939), as well as for a large number of other birds (literature reviewed by Rowan, 1938), that artificial lengthening of the daily period of wakefulness during the inactive phase of the sexual cycle results in a recrudescence of the gonads. It is generally assumed that the external factor exerts its primary effect on the anterior lobe of the pituitary, causing this gland to release the gonad stimulating hormones. This view is supported by the work of Benoit (1936) who found that hypophysectomized ducks did not respond to light treatment. It has also been reported (Benoit, 1935) that pituitaries from light-treated immature ducks stimulate ovarian development in the immature female mouse, whereas pituitaries from untreated ducks fail to bring about this response.

Two methods have been used to prolong experimentally the daily period of wakefulness. By the first method, and the one most commonly used, the birds are subjected to gradually lengthened daily light periods. In the second method, instead of increasing the daily illumination, a gradually increased period of enforced activity in darkness is added to a basic light day.

In the Junco (*Junco hyemalis*) Rowan (1929) observed gonadal recrudescence regardless of which method was employed. Appearing to corroborate this finding was the observation (Rowan, 1937) that Starlings (*Sturnus vulgaris*) collected within the city of London, where they are subject to frequent disturbances, approached the breeding condition almost two months in advance of country birds. More recently, in a brief note this author (Rowan, 1938*b*), announced that both House Sparrows and Juncos showed advanced gonadal development after subjection to increased periods of enforced wakefulness in total darkness, "following a preliminary training period of two weeks in a faint and continuously diminishing glow." On the basis of these observations Rowan advances the hypothesis, well stated in a recent review article (Rowan, 1938*b*), that "light is concerned only insofar as it provides a means of keeping the animals awake and physiologically active, but is in itself of no further significance, and that increasing diurnal activity induced by increasing increments of illumination, is the stimulating factor that activates the pituitary."

[1] Aided by grants from the National Research Council, Committee for Research in Problems of Sex; grants administered by Prof. Emil Witschi.

Bissonnette (1931), using the Starling, but otherwise following an experimental procedure very similar to that employed by Rowan, observed that increased periods of activity resulted in no increase in spermatogenic activity. As Rowan (1938) has already pointed out, however, this author's data do not indicate entirely negative results since the testes of two Starlings were described as being "enlarged considerably." In general, however, the gonads of Starlings subjected to increased exercise failed to show the recrudescence which uniformly followed increased illumination, leading Bissonnette to consider light, per se, as the essential external factor in the modification of the sex cycle.

In spite of widespread interest in problems relating to the factors controlling rhythms of sexual activity, it still remains an open question as to whether light or physiological activity is responsible for the seasonal activation of the bird pituitary. It was in an effort to provide further experimental data in support of one view or the other that an improved type of apparatus for enforcing activity was devised and the following experiments undertaken.

Material and Methods

An apparatus for insuring a constant state of wakefulness in complete darkness was constructed from a metal drum similar to the common oil drum 34.5 inches in length and 23 inches in diameter (Fig. 1).

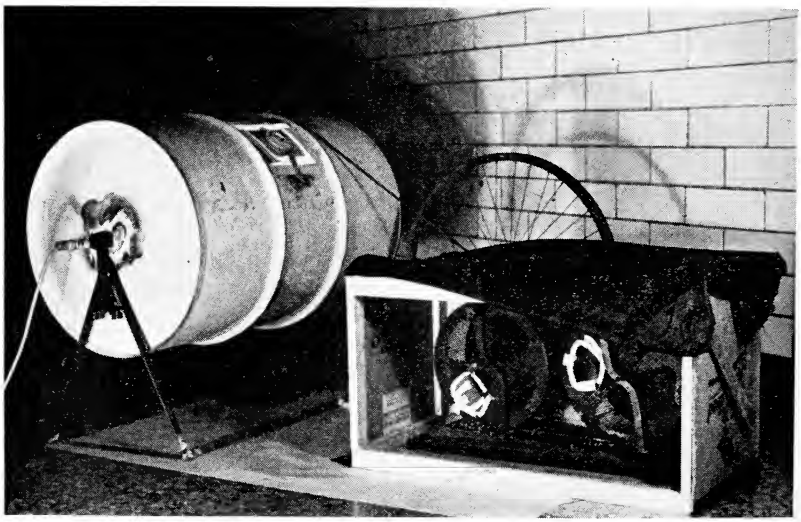

Fig. 1. Photograph of the apparatus used to enforce wakefulness in complete darkness.

The activation chamber was equipped with axles and mounted on a metal frame. Access to the interior was made possible by a flanged door fitted to the wall of the drum. For ventilation a hole one-half inch in diameter was drilled at the base of each axle and an air line conducted through one of them. The apparatus was driven by an electric motor, the speed of rotation being regulated by a system of intermediate pulleys. In Experiment 3 two small wire-mesh exercise cages (6 inches wide by 12 inches in diameter) were added to the above described apparatus. These small cages were enclosed in a dark compartment, tightly sealed on five sides and covered with a double thickness of black sateen in front. In Experiment 3 light was added to the large activity drum. The cord for this light (60 watt bulb) was passed through the second vent at the base of the axle.

The House Sparrows were caught in barns located in the vicinity of Iowa City and kept in large stock cages in the laboratory until a few days before the start of each experiment. At this time the birds were laparotomized and the size of the left testis was determined by caliper measurement or the ovary inspected and compared with the stages described for the House Sparrow by Riley and Witschi (1938). With the exception of the periods when the activity-treated birds were in the revolving drum the birds were divided into groups of four or five and kept in wire cages, 10 inches wide, 13 inches high, and 20 inches long. Except where it is stated otherwise, the Sparrows were maintained on a diet of cracked corn. The food was removed from all birds at the end of the basic light day.

Bouin's fluid was used as a fixative in all instances and Heidenhain's iron haematoxylin as a stain for the testicular tissue.

Conditions and Results of Experiment 1

Thirty male sparrows were started in the first experiment on November 16, 1938. The birds were kept in a windowless room with a 100 watt bulb providing the source of light for a basic 9 hours. At the end of this time (5:00 P.M.) 15 birds were transferred to the drum and kept awake for an additional 7½ minutes. The drum rotated at the rate of one revolution every one and one-half minutes. The remaining 15 birds were left exposed to the light. Both motor and light were connected with the same automatic switch. At 8:00 A.M. the following morning, the light was again turned on and the birds in the drum were returned to the light-exposed cages. Each day until the termination of the experiment (December 31, 1938) this procedure was followed, the period of wakefulness always being increased an additional 7½ minutes.

At the termination of the experiment (46 days from the start) only 6 birds remained in the light-treated group while 13 remained in the activity group. Another bird in the latter group was healthy up to the

forty-third day of the experiment but was found dead, apparently as the result of an injury. The fifteenth bird in this group had been sacrificed earlier since there were indications of injury. The high mortality in the light treated group was due primarily to an eye infection which is known to affect House Sparrows in nature as well as in the laboratory.

From the third week on there was definite evidence of progressive testicular changes in the light-treated birds as evidenced by a progressive darkening of the bills. This change of bill pigmentation was in marked contrast to the bills of the activity-treated Sparrows which continued to retain the yellow color characteristic of the sexually quiescent male Sparrow (Keck, 1934). The findings at autopsy, summarized in Table 1, showed testicular enlargement in all light-treated birds, whereas the testes of activity-treated birds had remained the same size as they were at the beginning or had even regressed.

It is to be noted that the testis size attained by light-treated birds falls considerably short of that attained by the testis during the normal breeding season. It is also less than the average testis size (7.9 mm.) in four Sparrows that had been subjected to light treatment for 25 days just previous to the start of this experiment. There was one essential difference in the method of treatment of these birds as compared with that used in earlier experiments. Previously the birds were not on a basic light day but were exposed to daylight and the gradually increasing light intensities of morning. Whether these conditions offer more favorable conditions for such experiments has not yet been determined. It was with the intention of bettering the general environmental conditions, however, that certain changes were made in the second experiment.

Conditions and Results of Experiment 2

In the second experiment (starting January 8, 1939) the equipment was moved to a better ventilated room, well lighted by windows on one side. For the basic 9-hour day, the birds were in cages a few feet from, and facing these windows. At the end of the 9-hour day the birds to be kept awake by activity were transferred to the drum as in the previous experiment while the birds to be light-treated were moved to cages within a large metal tank, covered by black sateen. Thus both groups of birds were subjected to the same amount of handling and very similar environmental conditions at all times. Again, the source of the additional light was a 100 watt bulb, and the daily increment was 7½ minutes. The rotation of the drum, however, was only half as fast as in Experiment 1, making one revolution in three minutes.

In this experiment, the activity group of Sparrows consisted of 10 males and 10 females. Half of the birds, with the sexes equally divided,

TABLE 1

EFFECT OF INCREASED LIGHT AND ACTIVITY PERIODS ON MALE SPARROWS

Bird No.	Treatment	Period of experiment	Dimensions of left testis (mm.)		Volume[1] of left testis (mm.)		Final bill color
			Beginning	End	Beginning	End	
29	Light	Nov. 16–Dec. 31	2.0 x 1.5	3.3 x 2.0	2.4	7.1	Brown
36	Light	Nov. 16–Dec. 31	2.5 x 2.0	4.6 x 3.3	5.5	24.0	Blue
50	Light	Nov. 16–Dec. 31	1.5 x 1.0	4.0 x 2.8	0.8	16.5	Brown
810	Light	Nov. 16–Dec. 31	1.5 x 1.0	3.0 x 2.5	0.8	10.6	Brown
811	Light	Nov. 16–Dec. 31	2.0 x 1.5	4.2 x 3.2	2.4	22.6	D. Blue
844	Light	Nov. 16–Dec. 31	1.3 x 1.0	6.5 x 5.0	0.7	86.6	D. Blue
808	Activity	Nov. 16–Dec. 31	2.0 x 1.5	1.6 x 1.0	2.4	0.8	Yellow
812	Activity	Nov. 16–Dec. 31	1.5 x 1.0	1.2 x 1.0	0.8	0.6	Yellow
813	Activity	Nov. 16–Dec. 31	2.5 x 2.0	1.8 x 1.0	5.5	0.9	Yellow
814	Activity	Nov. 16–Dec. 31	1.5 x 1.0	1.5 x 1.0	0.8	0.8	Yellow
815	Activity	Nov. 16–Dec. 31	2.0 x 1.5	1.5 x 1.0	2.4	0.8	Yellow
816	Activity	Nov. 16–Dec. 31	1.5 x 1.0	1.6 x 1.0	0.8	0.8	Yellow
818	Activity	Nov. 16–Dec. 31	2.0 x 1.5	1.5 x 1.0	2.4	0.8	Yellow
820	Activity	Nov. 16–Dec. 31	1.2 x 1.0	1.4 x 1.0	0.6	0.7	Yellow
821	Activity	Nov. 16–Dec. 31	1.2 x 1.0	1.5 x 1.0	0.6	0.8	Yellow
822	Activity	Nov. 16–Dec. 28	1.2 x 1.0	1.2 x 1.0	0.6	0.6	Yellow
823	Activity	Nov. 16–Dec. 31	1.2 x 1.0	1.4 x 0.9	0.6	0.7	Yellow
824	Activity	Nov. 16–Dec. 31	1.5 x 1.2	1.3 x 1.0	1.1	0.7	Yellow
832	Activity	Nov. 16–Dec. 31	1.5 x 1.0	1.5 x 1.0	0.8	0.8	Yellow
842	Activity	Nov. 16–Dec. 31	1.8 x 1.0	2.0 x 1.0	0.9	1.0	Yellow
846	Indoor Control	Dec. 31	—	1.7 x 1.0	—	0.9	Yellow
847	Indoor Control	Dec. 31	—	1.4 x 0.9	—	0.7	Yellow
848	Indoor Control	Dec. 31	—	1.8 x 1.0	—	0.9	Yellow

[1] The formula $(4/3\ \pi\ Rr^2)$ for computing the volume of an ellipse was used with R representing the radius of the greatest diameter and r the least diameter.

were placed on the regular corn diet, while the other half were placed on a diet of egg, bread and milk. The light-treated group consisted of 10 males and 6 females. As with the previous group, half the males and females were fed corn and the other half the mixed diet.

Very soon after the start of the experiment it was noted that coccidiosis was prevalent in the stock of Sparrows and within 20 days, twelve of the activity-treated and five of the light-treated birds had died or were sacrificed because of such infection.

At the termination of the experiment on the thirty-fifth day, there were only 5 birds left in the activity-group and 8 in the light-group. At autopsy, the findings were in complete agreement with those of the previous series (Table 2). The bills of light-treated males had darkened in every case, whereas the bills of the two surviving males subjected to prolonged activity remained light. The testes of birds of the light group had increased in size and histologically exhibited a picture of progressive spermatogenesis. The gonads of birds in the activity-group remained unchanged.

With the females, neither increased light nor activity resulted in stimulation of the ovary. We have pointed out earlier (Riley and Witschi, 1938) that the female House Sparrow responds much less readily to light stimulation than does the male, so the present negative results are not surprising. Although the testis differences in the birds on corn and mixed diets are not great, more birds on the latter diet survived, indicating that its use was somewhat advantageous.

Conditions and Results of Experiment 3

In the third experiment, started March 4, 1939, the experimental birds were divided into three groups. One group of 8, 4 males and 4 females, was subjected to the conditions of the revolving drum plus light from a 60 watt bulb; a second group, 2 males and 2 females, was subjected to activity in darkness in the small activity cages, while a third group, 2 males and 2 females, received additional illumination (60 watt bulb) in the aforementioned tank.

Since the male Sparrows under natural conditions are approaching the breeding condition at the time when this experiment was begun, a careful selection was necessary. Only those males were used which had a light bill or a wide yellow base (indicating gonadal regression) and whose testes were small.

The results (Table 3) corroborate those of the previous experiments. The testes of all birds treated with light, regardless of whether they were subjected to the conditions of the drum or not, were all markedly enlarged (Fig. 2). Histologically, advanced stages of spermatogenesis were found in the testes of birds of both groups. The testes of two males (Fig. 2) which had been subjected to increased increments

TABLE 2

EFFECT OF INCREASED LIGHT AND ACTIVITY PERIODS ON SPARROWS ON DIFFERENT DIETS

Bird No.	Sex	Conditions of Experiment		Period of experiment	Dimensions of left testis (mm.) or ovarian stage		Vol. of left testis (mm.)		Final bill color[2]
		Treatment	Diet		Begin.	End	Begin.	End	
896	F	Act.	Corn	Jan. 8–Feb. 12	0[1]	0			Y
882	M	Act.	Mixed	Jan. 8–Feb. 12	1.6 x 1.0	1.8 x 1.2	0.8	1.4	Y
892	M	Act.	Mixed	Jan. 8–Feb. 12	1.5 x 1.0	1.5 x 1.0	0.8	0.8	Y
831	F	Act.	Mixed	Jan. 8–Feb. 12	0	0			Y
898	F	Act.	Mixed	Jan. 8–Feb. 12	0	0			Y
835	M	Light	Corn	Jan. 8–Feb. 12	1.5 x 1.0	2.8 x 1.5	0.8	3.3	Br.
853	M	Light	Corn	Jan. 8–Feb. 12	1.5 x 1.0	2.7 x 1.8	0.8	4.8	Br.
834	M	Light	Mixed	Jan. 8–Feb. 12	1.7 x 1.2	3.0 x 1.5	1.3	3.5	Bl.
874	M	Light	Mixed	Jan. 8–Feb. 12	1.7 x 1.0	3.0 x 1.5	0.9	3.5	Bl.
875	M	Light	Mixed	Jan. 8–Feb. 12	1.8 x 1.3	5.0 x 3.8	1.6	9.0	D. Bl.
880	M	Light	Mixed	Jan. 8–Feb. 12	1.3 x 0.9	3.0 x 2.0	0.5	6.3	Bl.
856	F	Light	Mixed	Jan. 8–Feb. 12	0	0			Y
894	F	Light	Mixed	Jan. 8–Feb. 12	0	0			Y
847	M	Control	Mixed	Jan. 8–Feb. 12	1.5 x 1.0	1.5 x 1.0	0.8	0.8	Y
854	M	Control	Mixed	Jan. 8–Feb. 12	1.8 x 1.0	1.8 x 1.2	0.9	1.4	Y
825	F	Control	Mixed	Jan. 8–Feb. 12	0	0			Y
827	F	Control	Mixed	Jan. 8–Feb. 12	0	0			Y

[1] Ovarian Stage 0 refers to the typical quiescent condition described by Riley and Witschi, 1938.
[2] In describing the bill color; Y = yellow, Br. = dark brown, Bl. = blue, D. Bl. = dark blue.

of activity in darkness remained small and showed no progressive spermatogenic changes. In no group did the females show an appreciable positive response, the ovaries and oviducts remaining at a stage comparable to that observed at laparotomy.

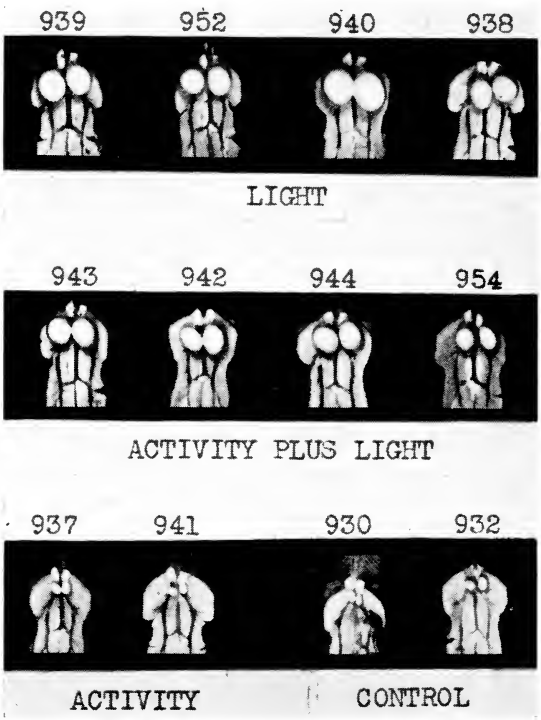

Fig. 2. The testes of experimental and control birds of Experiment 3 are shown. The gonads of all birds receiving light, whether alone or in combination with activity, show enlargement; those of activity-treated birds show the lack of any stimulation. Actual size.

Discussion

When the factors, light and activity, are completely separated there seems little doubt as to the importance of the former in stimulating testicular development in the House Sparrow. It is probable that the failure to separate these two factors may explain, at least in part, the results of previous workers. The six Juncos used in Rowan's original exercise experiment showed definite gonadal recrudescence, the testis of the last bird killed (after 42 days of treatment) measuring 3.4 mm. in length. In this experiment, light, though reduced to a minimum

TABLE 3

COMPARISON OF THE EFFECTS OF LIGHT, LIGHT PLUS ACTIVITY AND ACTIVITY ALONE ON SPARROWS

Bird No.	Sex	Treatment	Period of experiment	Dimensions of left testis (mm.) or ovarian stage		Vol. of left testis (mm.)		Final bill color
				Begin.	End	Begin.	End	
938	M	Light	Mar. 4–Apr. 8	3.0 x 2.0	4.2 x 3.3	6.3	23.8	Bl.
939	M	Light	Mar. 4–Apr. 8	2.2 x 1.8	4.5 x 3.3	3.7	25.5	Bl.
940	M	Light	Mar. 4–Apr. 8	1.7 x 1.2	5.5 x 4.5	1.3	58.5	D. Bl.
952	M	Light	Mar. 11–Apr. 8	2.2 x 1.3	4.2 x 3.2	1.9	22.6	D. Bl.
948	F	Light	Mar. 4–Apr. 8	I[1]	I			Y
949	F	Light	Mar. 4–Apr. 8	I	I			Y
927	F	Light	Mar. 11–Apr. 8	I	I			Y
934	F	Light	Mar. 11–Apr. 8	I	I			Y
942	M	Act. Light	Mar. 4–Apr. 8	2.2 x 1.4	4.0 x 3.0	2.3	18.9	D. Bl.
943	M	Act. Light	Mar. 4–Apr. 8	2.0 x 1.3	4.5 x 3.5	1.8	28.9	D. Bl.
944	M	Act. Light	Mar. 4–Apr. 8	2.7 x 2.0	4.0 x 3.0	5.7	18.9	Y. B.[2]
954	M	Act. Light	Mar. 11–Apr. 8	2.6 x 1.8	4.0 x 2.8	4.4	16.5	D. Bl.
946	F	Act. Light	Mar. 4–Apr. 8	I	I			Y
947	F	Act. Light	Mar. 4–Apr. 8	I	I			Y
950	F	Act. Light	Mar. 4–Apr. 8	0	0-I			Y
937	M	Activity	Mar. 4–Apr. 8	1.6 x 1.2	1.8 x 1.0	1.2	0.8	Y
941	M	Activity	Mar. 4–Apr. 3	1.6 x 1.0	1.5 x 1.0	0.8	0.8	Y
931	F	Activity	Mar. 4–Apr. 8	I	I			Y
953	F	Activity	Mar. 11–Apr. 8	0	0			Y
930	M	Indoor control	Mar. 4–Apr. 8	2.0 x 1.5	1.7 x 1.0	2.4	0.9	Y
932	M	Indoor control	Mar. 4–Apr. 8	2.8 x 1.8	1.8 x 1.3	4.7	1.6	Y
974	F	Indoor control	Preserved Apr. 8	—	0			Y
975	F	Indoor control	Preserved Apr. 8	—	0			Y

[1] Ovarian Stage I is characterized by an ovary somewhat enlarged over the quiescent condition with small follicles conspicuous on its surface.
[2] Y.B.=yellow base.

and described by the author as a "feeble glow," was necessary to prevent the birds from being killed by a moving bar and accompanying gearing. The control birds exposed to the same intensity of light but not subjected to enforced exercise showed no testicular development. The important difference between these two groups of birds appears to be the fact that the birds in the activity cage remained awake while the controls were "permitted to sleep." In other words, it is possible that the birds that were forced to remain awake were also able to perceive the feeble light present, while the sleeping birds, with closed eyelids and heads tucked under their back feathers, were subject to none of this additional light.

Again in Bissonnette's experiments we find that the "work cages remained in deep shade." Of a total of 12 male Starlings subjected to "increased muscular work," Bissonnette records that the gonads of two (treated from January 15 to April 15) were medium in size and further describes them as being "enlarged considerably." It appears surprising that after 90 days of "work" treatment the testes of these birds should be larger than those of a control bird. However, one would hesitate to give the same interpretation to these cases as was given to Rowan's results. Here a complicating factor is introduced since for the first 63 days of the experimental period the birds were subject to increasing day lengths (normal astronomical increase in day length), while for the last 27 days the birds were on a reduced and constant light schedule of 10 hours daily. Bissonnette suggests that the increase in testis size might have all taken place before the change in the light schedule was made. The absence of any appreciable stimulation in 9 other Starlings subjected to prolonged activity treatment, in spite of the fact that the experiment was not conducted in complete darkness, indicates that the Starling may require higher intensities of light than the Junco or, as already suggested by Rowan (1938a), negative reactions may be the result of unfavorable excitation of the birds.

It is not the purpose of this discussion to consider at length the subject of light intensity in relation to the sex cycle but certain observations are pertinent to the above considerations. Rowan (1929) suspected that his failure to get uniform results in his earliest experiments with Juncos was due to too low intensity of light. This was corrected in later experiments with more uniformity in results and led this author to express the view that an optimum light intensity was essential to keep the birds physiologically active and uniformly responsive (Rowan, 1938). On the other hand, Miyazaki (1934) described the Japanese practice of "yogai" whereby bird fanciers place a burning candle before their bird cages at the end of the day so that they might have singing birds during the winter holiday season. Certainly this is a response to a light of very low intensity. However, it does not mean that Rowan's conclusion was unfounded since the birds

in the "yogai" were household pets, and thus subject to more disturbance than isolated laboratory birds. It appears that if there is some outside disturbance or a mechanical means of keeping the birds awake, light of a relatively low intensity is sufficient to stimulate the pituitary; otherwise, the light must be sufficiently strong to act as a disturbing factor itself.

It is difficult to state what factor is responsible for the sexual precocity of the London Starlings as compared with country birds, since here again light and disturbance are not entirely separated. An interesting alternative to Rowan's explanation has recently been advanced by Bullough and Carrick (1939). On the basis of their observation these authors conclude that the majority of the country Starlings are of the migratory, continental type, whereas the London starlings are of non-migratory, British type. It is shown "that a difference exists between the time of onset of sexual activity in these two types of birds," the migratory group leaving England before the testes begin to enlarge but at a time when the permanent resident group has already become activated.

The significance of the results of the present study lies in the complete separation of the two factors, light and physiological activity. In our experience there is no exception to the rule that lengthened periods of wakefulness in darkness do not provide a stimulus for testicular development. On the other hand, when light is supplied to these "activity" birds, a similar testicular recrudescence takes place as in birds receiving the light treatment alone.

The question arises as to whether the strange conditions of the mechanical activator might not result in such a state of excitation that the bird would be in a physiological condition unfavorable to spermatogenic activity. In Experiment 3 with the Sparrows in the revolving activator lighted, it could be observed that some of the birds were more excited than is customary in the light experiments. This excitability and enforced activity, however, did not result in extraordinarily high body temperatures. The temperature of Sparrows in the three groups (light, light with activity, activity in darkness) ranged from 106° F. to 108° F. after three hours of treatment. During the day it is not unusual to record a temperature as high as 111° F. In birds asleep during the middle of the night it is about 104° F. (Riley, 1937). It is not probable that the activity birds were subject to fatigue since in spite of enforced periods of wakefulness considerable fat deposits were observed at autopsy.

The experiments of Benoit (1937) in which the duck pituitary was directly illuminated emphasize the importance of light as a gonad-stimulating factor. When light was projected through a glass rod to that part of the orbit that is closest to the pituitary, a strong gonad stimulation resulted after 20 days of treatment. On the other hand,

the response was negligible in ducks with an opaque rubber shield lining the orbit and subjected to a stream of light directed toward the region of the sectioned optic nerve and pituitary. All these birds were subjected to similar disturbing conditions, such as removal of the eyeball, manipulation of foreign objects within the orbit, and enforced immobilization, yet, only when light was permitted to penetrate to the region of the pituitary was gonadal stimulation observed.

Rowan (1938a and 1938b) suggested that the negative results which Bissonnette obtained with the Starling as compared with his own successful stimulation of Juncos may have been due to a difference in temperament between these two species. If the negative results observed in our present experiments are due to unfavorable excitation, then we must conclude that, in spite of such a condition, light is capable of stimulating the hormonal mechanism responsible for the progressive development of the testis resulting in spermatogenic activity and the release of the male sex hormone.

Conclusions

Rowan (1925, 1926) first brought out the fact that "light stimulation" brings about a precocious development of seasonal sex activity in some (possibly all) birds of the northern Temperate Zone. In an effort to elucidate further the mechanism of this effect the same author considered the possibility of such intermediate factors as increase in vitamin D supply (Rowan, 1931) or, later, of prolonged physiological activity. The first suggestion has been revived in somewhat modified form by Perry (1938). While Rowan had assumed that increased irradiation produced the vitamin in the oil of the plumage, Perry contended that it was in the food, also exposed to extra lighting, that this increase was effective. The latter alternative seems obviated through our experiments. All birds, whether finally showing enlargement of the testes or not, were fed only during the normal day, which was spent in stock cages under identical conditions. No lighting was given to the food of the "light" birds. Rowan's activity theory was opposed by Benoit (loc. cit.) and Bissonnette (loc. cit.). The present study also leads to the conclusion that the light stimulation of the hypophysis is independent of general physiological activity of the bird. The temperature readings suggests that it is even independent of the metabolic rate though it is not certain yet that light may successfully stimulate the hypophysis while the bird is sound asleep and its temperature at the usual accompanying low of 104° F.

Summary

1. A study was undertaken to determine the efficacy of two factors, increasing light and increasing activity periods, in producing an activation of the House Sparrow's pituitary.

2. The method of lengthening the daily light period was similar to that followed by most authors engaged in this work, i.e., the gradual lengthening of a basic light day with increments of electric light. For gradually increasing the daily period of activity, a revolving drum was used which forced the birds to remain awake in complete darkness.

3. The experiments were conducted during a period extending from November 16, 1938 to April 8, 1939. The duration of treatment ranged from 35 to 45 days.

4. Without exception the testes of Sparrows subjected to light treatment showed significant enlargement and progressive spermatogenic changes. A darkening of bill pigmentation accompanied the gonadal development. On the other hand, the bills of activity-treated males retained the light color characteristic of the sexually inactive male, and the testes remained in a quiescent state. The absence of any progressive spermatogenic changes was confirmed histologically.

5. A combination of forced activity and extra lighting stimulates the testes to a condition approximating that of the light treated birds.

6. In females neither increased light nor activity rations were effective in stimulating ovarian development.

7. The incomplete separation of the two factors, light and activity, is suggested as the possible explanation for the positive results of the enforced activity experiments of previous authors.

8. When the two disputed factors, light and activity, are completely separated there seems little doubt as to the importance of the former in regulating sexual activity in the Sparrow.

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FURTHER NOTES ON THE NESTING HABITS OF THE VIRGINIA RAIL

BY HENRY MOUSLEY

SINCE the publication of my paper on the Virginia Rail (*Rallus limicola*) in the *Wilson Bulletin* of June 1937, I have had further opportunities of studying the incubation period of this rail, having watched daily three further nests from their construction to the subsequent hatching of the young. The first of these later nests was discovered in 1938, situated nearly opposite the 1936 nest, only on the opposite side of the marsh just seventeen yards away. It was a much smaller and prettier nest, well concealed in a tuft of fine sedges, and I was fortunate in finding it in the making. The first egg was laid on May 13, and an additional one on every succeeding day—except the twentieth, which was very wet—up to the twenty-second, when the ninth and last egg was deposited.

It has been rightly said that it is very difficult to flush a rail and see it fly for any distance. This was the case in 1936, for I never saw the bird fly at all, but had plenty of opportunities of watching it sneak from the nest and either remain nearby or vanish in the cattails. In the present case, however, the bird allowed a very close approach before springing off the nest and flying to the end of the marsh, giving me an uninterrupted view of its manner of flight. It was not until June 8, very near hatching time, that the parent refused to fly from the nest, flushing along the ground and remaining nearby. I was hoping to obtain pictures of the young on the following day, but at 9 A.M. the eggs were still unhatched. I waited until about 2 P.M. but as there were still no signs of the young I left and returned early the next morning, June 10. On my arrival, five young had already left the nest, and a few hours later the four remaining eggs had hatched out and these young had also gone. There were no empty shells left in the nest. During the incubation period, I never saw more than one parent at or near the nest, but when the young had appeared both of them were constantly in view, calling continually to the now scattered young.

Since the above was written I have been fortunate in again (1939) finding in adjacent cattail marshes two more nests in the making, thus giving me further opportunities of checking my previous findings. One nest I found on May 13, the first egg being laid on May 20, the ninth and last, on May 28. The first chick appeared on June 15, 18 days after the laying of the last egg. The second nest was located on May 18, the first egg being deposited on May 22, and the ninth and last, on May 30. The first chick appeared on June 17, thus again giving a period of 18 days from the laying of the last egg.

The site of these two last nests formed an interesting contrast. No. 1 was in an open spot in the cattails (Fig. 1), while No. 2 was in another cattail marsh but located in a tuft of rushes at the foot of some willow bushes on the extreme edge of the marsh. As in the case of the nests of 1936 and 1938, only one bird was ever seen at the site until the eggs began to hatch, but thereafter both parents were in evidence, running excitedly about the nest within arm's reach.

When I visited nest No. 1 on the morning of June 15, three young had already hatched and left. On the following morning, five of the remaining six eggs had also hatched out, and the young—with the exception of one which was just emerging—had left the nest. The one

Figure 1. Nest of Virginia Rail in open part of the marsh. May 30, 1939.

remaining egg was addled. I was most fortunate in the case of this last youngster in obtaining a photograph (Fig. 2), showing the egg tooth, black band across the bill, and best of all, the tiny claw at the outer digit of the wing. It has been stated that the bill of these little glossy greenish-black chicks is scarlet, or orange-red, but at least in the early chick stage, I have always found it to be pinkish-white crossed by a black band. No empty shells were found in the nest.

Upon my visit to nest No. 2 in the morning of June 17, seven young had hatched out and two of them were still in the nest. The two remaining eggs hatched out the following day and the young had left

the nest when I arrived. In all four cases, the young have hatched out within a period of 24 hours. This nest was well concealed by the convergence of the rushes and willow boughs over the top. The parents behaved in exactly the same manner as in the previous cases, and likewise, there were no empty shells found in the nest.

Examining the facts obtained in these five intensive studies, we may conclude that the average period between the laying of the last egg and the appearance of the first young is 18 days, and in the case of the last young, 19 days. The 1938 bird was first found on the nest on May 21, the day before the laying of the last egg. Neither of the two birds in 1939 was found on the nest until the day the last egg was laid.

Figure 2. Young and egg of Virginia Rail. June 16, 1939.

In the *Auk* for October 1937, Dr. L. H. Walkinshaw says: "The eggs are laid as a rule, one each day, and are pipped for about forty-eight hours before hatching and all hatch out within a period of twenty-four hours, as a rule, for incubation does not start until the day before, or upon the day the last egg is deposited. The incubation period is twenty days. The young can swim and walk about almost immediately." Although Dr. Walkinshaw's study extended over a period of fourteen years (1920-1934), during which time 44 nests were examined, it would appear from the detailed list that only two of these could be checked very closely, and upon these two, apparently, the incubation period of

20 days was based, the period at all other nests being estimated. As will be seen, most of the findings at my 5 carefully checked nests agree with those of Dr. Walkinshaw, except in regard to the incubation period, which I find to be 19 rather than 20 days.[1]

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Notes on the Birds of Kentucky. By Alexander Wetmore, Proc. U.S. National Museum, **88**, No. 3089, 1940: 529–574.

This is the third of a series of papers on birds of the east-central States based upon data and specimens obtained by field parties of the National Museum. The work in Kentucky was done in 1938 and covers 167 forms. As in the case of the reports on the West Virginia and Tennessee collections already published, the author includes also other Kentucky specimens which are deposited in the National Museum.

On the whole the avifauna of Kentucky has northern affinities, but in some ten species both northern and southern races occur in the State. In eight other species both eastern and western races were found, at least on migration. The House Wren, however, is the only species which is recorded as having different races breeding in the eastern and western sections of Kentucky.

Dr. Wetmore includes taxonomic notes on several species. He is not able to recognize more than two races of *Vireo griseus* in the east, and he follows Ridgway's disposition rather than the later arrangement of Todd or of Oberholser. The Red-eyed Vireo and the Bronzed Grackle are treated as full species, and the name *Quiscalus versicolor* is again upheld for the latter. Oberholser's recent divisions of the Redstart into two races is considered unwarranted, but the author agrees with Oberholser in separating a western subspecies of the Swamp Sparrow. Todd and Sutton's recently described *Penthestes carolinensis extimus* is accorded recognition. The eastern forms of *Passerculus* are critically reviewed in the light of the recent monograph of this group by Peters and Griscom, with most of whose conclusions the author is in agreement.

As in the reports on West Virginia and Tennessee no attempt has been made to review the literature of the State or to present a complete list of birds already recorded, but in view of the paucity of published information on the distribution of birds in Kentucky, the paper is a very worthwhile contribution to the avifauna of the eastern United States. Its value is the greater since no other systematic ornithologist has critically studied subspecific variation in this area. Dr. Wetmore's careful work is of considerable importance to local students as well as to those of wider interests.—P. Brodkorb.

[1] I have read the note by Dr. H. B. Wood in this same number of the *Auk* (1937: 535–6) but I am afraid it contains too many assumptions to warrant our accepting its conclusions as to the exact incubation period of the Virginia Rail. The nest was not visited between May 13 (5 eggs) and May 25, yet the author assumed that the last egg was laid on May 16. What if the bird had missed a day in laying an egg as did one of mine? Again, the nest was not seen after June 1 until June 3, when it was found destroyed with only cold eggs and dead embryos left. Yet it was upon the problematical date of hatching of these embryos that he arrives at the incubation period of 20 days!

WASHED BIRDSKINS

BY GEORGE MIKSCH SUTTON AND WILLIAM MONTAGNA

ANYONE who has collected birds extensively in southwestern Pennsylvania or in the northern Panhandle of West Virginia knows only too well how badly soiled a bird may become. A Pittsburgh Hairy Woodpecker may become so black in winter that its wings lose their spots. The underparts of Carolina Chickadees in the Wheeling region may become so dirty that the breast and belly are as dark as the throat-patch. Nearly every Pittsburgh winter specimen of Downy Woodpecker in the Carnegie Museum's large series of that species is so soiled that it can instantly be picked out as a "Pittsburgh bird." Such specimens may be acceptable enough for certain studies. They can be measured. But what place have they in a taxonomic series where painstaking color comparisons must be made?

A few years ago the senior author made a special study of the Chickadees of the northern Panhandle of West Virginia. Believing the flanks of the Carolina Chickadee to be less bright than those of the Black-cap, and the edgings of the secondaries less strikingly white, he proceeded with his investigations, finding to his surprise and disappointment that, basing his decisions upon flank-color and distinctness of white wing-edging alone, he could not identify his birds. He learned in time that a four-syllabled "phoebe" call-note was characteristic of *Parus carolinensis,* while a two-syllabled call-note was characteristic of the other; that the tail of *carolinensis* was short in appearance, even in the field; that the "dees" of the *chick-a-dee-dee-dee-dee-dee* cry were apt to be more rapidly given in *carolinensis* than in *atricapillus;* but he utterly failed to find color differences that were constant and satisfying. In desperation he began *washing* thoroughly (in soap and water) all specimens collected, in the hope of finding what their true colors were. Eventually he amassed a considerable series of perfectly clean birds and found, again to his surprise, that the flank color in his winter Carolina Chickadees was nearly if not quite as bright as in the Black-caps, and that the white edging of the secondaries was equally distinct in the two forms.

This discovery led him to wash a series of *carolinensis* specimens collected near Thomasville, Georgia. The laundered Georgia birds, compared with laundered West Virginia birds, were distinctly *gray-winged. Parus carolinensis extimus* Todd and Sutton was straightway named as a new subspecies, with Bethany, Brooke County, West Virginia, as the type locality. The color characteristics of *P. c. extimus* were described as being very close to those of average *P. a. atricapillus.* And this was *known* to be the case, for most of the specimens used in making the comparisons had been thoroughly washed.

This Chickadee study led the senior author to investigate further the condition of material with which he was working. So confused was he by the dirtiness of most of the specimens collected along the Ohio

Figure 1. Upper row: Four Downy Woodpeckers, *Dryobates pubescens*, freshly collected, ready for washing and skinning.

Lower row: The same four Downy Woodpeckers, washed and prepared as skins by the junior author.

River that he fell to washing every bird that he took. The results of this somewhat heroic treatment were astonishing. Dingy Baltimore Orioles emerged fluffy and brilliant, their gay colors completely restored. A breeding male Blackburnian Warbler (taken at Lake Terra Alta, Preston Co., West Virginia) that appeared to be abnormally dull, came out normally bright. Solitary Sandpipers that were gray-bellied came out white-bellied as they ought to be. Song Sparrows with vague chest-streaking came out clearly marked. After washing a hundred or so birds during the course of several seasons of study, he decided that thoroughgoing taxonomic work on upper Ohio Valley birds was utterly impossible without washed material. As a result practically the whole of his private West Virginia collection is washed—from kinglets and gnatcatchers to hawks and owls. With specimens of this sort in hand the various shades of grays or browns can be compared and described with some degree of assurance that their darkness is the result of feather-color rather than of dirt.

At Cornell University most locally collected specimens now being added to the Louis Agassiz Fuertes Memorial Collection of Birds are thoroughly washed before they are skinned. While the process is somewhat onerous and time consuming, the results are most gratifying. Mild soap is used in making a thick suds, the plumage is thoroughly washed and rinsed, and the specimen is dried before skinning begins. Cleaning a Hairy Woodpecker may require ten or fifteen minutes. But the time is well spent.

The Method

Several birds may be washed at the same time. If small, they must be washed soon after shooting even in cold weather, for the belly-skin quickly becomes tender. Suds may be made from Lux in hot water, then cooled to about the temperature of the hand before washing begins. Bloody birds should be washed *in plain cold water* until all clots are loosened and stains removed, before they are put into suds. Blood-covered plumage becomes heavily viscous in soapy water.

All the birds (the wet ones that have had the blood washed off, and the perfectly dry ones) are now put into the tepid suds, their mouths plugged thoroughly with non-absorbent cotton. They are washed by being moved rapidly back and forth held loosely in or under the fingers. Belly plumage of nuthatches, creepers, and woodpeckers sometimes must be rubbed between thumb and fingers until it is free of dirt. No part of the plumage can be neglected.

After the bird has been thoroughly washed it must be rinsed in clean, cold water. Two or three complete immersions are desirable. It may then be put on cheesecloth, on an old linen napkin, or paper toweling and gently blotted until no water drips from the feathers.

Next it is immersed in naphtha or carbon tetrachloride,[1] gently squeezed or "wrung out," and the blotting process is repeated. It is now ready for plaster of Paris. With the aid of an old tooth brush, it is put through this stage of the process quickly, the powder being dusted through the feathers until they are dry. The powder must be patted and shaken and blown out of the feathers. The specimen is taken outdoors, if possible. The plaster must be blown off thoroughly lest a "bloom" cling to the feathers.[2]

Now the bird is skinned. If certain shot wounds continue to bleed, corn-meal or plaster is liberally applied and the holes plugged with cotton. If an eye has been shot, the sclerotic fluid is blotted up by pressing the ball firmly from the outside with a plug of absorbent cotton. If, by the time the skin has been removed, certain parts are blood-stained, these parts must be washed again with plain water, carbon tetrachloride applied to hasten evaporation, and the damp plumage again dusted through plaster. Before the skin is stuffed the plumage must be pounded and blown free of plaster.

Shorebirds

A transient shorebird is fat. Its plumage usually is not dirty, however. If it is merely bloody, it may be skinned out *without preliminary washing*, carefully scraped free of fat, washed thoroughly in plain water, then plunged into naphtha or carbon tetrachloride, and finished with dusting through plaster. If its plumage is dirty as well as greasy, the well-scraped skin must be washed in thick suds, rinsed thoroughly, blotted inside and out, dipped into carbon tetrachloride, blotted again, treated inside with borax (or other preservative), then run through plaster. One difficulty with treatment of this sort is that the whole skin may be stretched a bit. If the bird is washed before skinning, the skin will not be pulled out of shape in the least.

Badly Shot Small Birds

It is occasionally necessary to preserve the skin of a small bird that has been very badly shot. The remark calls to the senior author's mind his first West Virginia specimen of Connecticut Warbler. This bird, collected at close range, was "all there," but it was exceedingly fat and its rear parts were so badly shot that by the time the skin was removed all the plumage was grease-soaked. Skins of this sort, though they appear to be hopeless, may be made into first-class speci-

[1] Carbon tetrachloride is expensive but non-inflammable. Its fumes are poisonous, so it should be used with care. However, the authors have used it for years, suffering no ill effects.

[2] Black birds such as crows and grackles rarely need a complete washing. If they need extensive washing their plumage should be dried with a fan if possible, the feathers being lifted and patted with a clean brush.

mens if they are immersed in carbon tetrachloride with great care, allowed to "soak" for a few minutes, then blotted, and run through plaster. If shot wounds need to be sewn up, the skin must be moistened with water before needle and wet silk thread are used.

Ducks

Ducks are rarely dirty, but they usually are fat. If most of the fat is removed by scraping with a scalpel or snipping with scissors, the skin may be immersed in carbon tetrachloride or naphtha for an hour or so (or all night!), then stuffed without being run through plaster. By the time the skin is finished the feathers will have become perfectly dry.

Caution

1. If it is not possible to wash a small bird soon after it is killed, better not attempt to give it a general washing. Especially is this true in hot weather. Specimens that are "slipping" cannot be washed without loss of many feathers.
2. A bloody bird must be washed *in plain cold water* first, then put into suds.
3. *Never* put a soapy bird directly into carbon tetrochloride. Thorough rinsing in plain water is very important.

Remarks

This question may well be asked: How can perfectly clean specimens be compared with anything but other perfectly clean specimens? The answer to this question may take the form of another such query as: How can we compare *any* two birds until we know exactly how much dirt is in their plumage? Much taxonomic work has been done in North America recently. Many new subspecies have been named and are being named. Is it not reasonable to suggest that this headlong rush be stemmed a bit, that more care be used in preparing material, and that absolutely clean birds be preserved? Once we have before us series of clean, well-prepared skins we will not need to resort to such time-honored phrases as "allowing for dirt," "disregarding this discoloration of the underparts" and so forth, and will know whether our winter Song Sparrows are brown-backed or gray-backed or, in fact, gray-brown in tone.

The authors wish to thank Mr. Charles S. Brand, volunteer associate in the Department of Zoology at Cornell University, who was good enough to photograph with great care the four Downy Woodpecker specimens before and after washing.

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THE BIRDS OF ANTICOSTI ISLAND, QUEBEC

By Frank W. Braund and E. Perry McCullagh

THERE has been but little study of the avifauna of Anticosti Island, partly because the ownership of the entire island was for many years vested in the Menier family. They used the island as a private game preserve, permitting only invited guests the privileges of the area. Since 1926 the Consolidated Paper Corporation has held title to Anticosti and has commercialized the natural resources.

A. E. Verrill (1862a) was the first to report on the birds of Anticosti, publishing a list of the birds he observed there in the summer of 1861. William Brewster (1884) accompanied Professor Hyatt on an expedition to the Gaspé and Labrador. En route they circled Anticosti and landed at various points, including Fox Bay. Dr. Joseph Schmitt (1904) was posted on the island from 1896 to 1904 and included an account of the birds in his monograph devoted to the island. Fortunately his many specimens were identified by the ornithologist C. E. Dionne of Laval University. Later (1920) Dionne himself published a paper on Anticosti birds based on the reports and specimens of Mr. Willie La Brie who lived on the island in 1913, 1916, and 1917. W. Sprague Brooks spent August 23 to September 15, 1919 on the island and later allowed Harrison Lewis to utilize his manuscript list. In 1920 Brooks published a description of the Anticosti representative of the Canada Jay, calling it a new species. Harrison F. Lewis (1924 to 1938) has published one excellent general account and several shorter contributions devoted to the birds of the island.

Personnel and Itinerary

Our party consisted of the authors; Dr. F. W. Merica, a surgeon of Cleveland; and Mr. Philip N. Moulthrop, assistant mammalogist of the Cleveland Museum of Natural History. Dr. Merica made the trip especially for the sake of the fishing but sometimes volunteered to assist. Mr. Moulthrop devoted himself largely to the preparation of specimens. Mammals, as well as birds were collected. The field observations were made principally by the authors of this paper.

We arrived on the island the evening of June 16, 1937 and made our base at Fox Bay until our departure on the afternoon of July 1. We secured the use of a large motor sailboat and made trips to points as much as 30 miles away. We would sail to a protected bay, collect two or three miles into the interior, and then return by boat. Braund and Moulthrop and two guides made a brief collecting trip to Eel Falls where they camped from midday on June 27 to early afternoon on June 29.

Anticosti Island

Anticosti Island is situated in the northern part of the Gulf of St. Lawrence, about 360 miles east-northeast of Quebec City, between latitudes 49° 4′ and 49° 53′ north and longitudes 61° 40′ to 64° 30′ west. It is about 135 miles in length and averages about 25 miles in width.

The island is largely of limestone formation, the whole shore being marked by broad curves and shallow bays. From the north coast near its west end and along the entire south coast, reefs jut out as far as 3 miles to sea. The south shore is low, rising gradually in successive terraces from a few feet to 400 feet in height. This terracing disappears toward the center of the island. Along the north coast the cliffs rise sheer from 50 to nearly 400 feet in height. In most places the cliffs are a few yards from the sea but are farther back from the shore behind the bays. Every few miles the cliffs project to form huge rounded capes of crumbling limestones undercut by the waves.

There are about 100 rivers and brooks on the island, none of them navigable. Some of these streams flow to the sea on limestone floors in a succession of beautiful falls and rapids. Others, such as Salmon and Fox Rivers, enter the sea in wider channels over beds of sand and gravel. Lakes occur at all altitudes. Some are arms of the sea cut off by bars, some are rock-floored pools, and others on the plateaus are boggy ponds.

The geology of Anticosti Island is especially interesting in view of the fact that the late Ordovician and early Silurian deposits are believed to be more complete here than anywhere else in America. According to Twenhofel (1928), the rocks which make up the island were laid down evenly in shallow and comparatively quiet waters as sedimentary deposits of ancient seas. The inorganic materials were apparently derived from the erosion of the Canadian shield on the north mainland. The strata dip slightly to the south.

Typical notes on the weather during our stay at Fox Bay read as follows: "June 22, temperature at 7 A.M. 40° F., strong northeast wind, rain and fog all day. June 24, temperature about 40° F. with strong north wind all day, foggy with rain in the morning, fog continuing all day. June 28, temperature at 7 A.M., 58° F., east wind with rain, clearing at 10:30 A.M., sunny in afternoon." Fog is apparently much more common at the east than the west end of the island. According to Twenhofel (1928), summer begins in May and ends in August. Snow falls in October. The average low temperature in winter is —4° to —13° F. and the highest temperature occurs in July, the maximum being 78.8° F., with the average temperature from the latter half of May to August about 50° F. Our guides told us they had seen ice packs closing the channel between the north of the island and the mainland of Quebec, a distance of about 20 miles at its narrowest portion, as late as June.

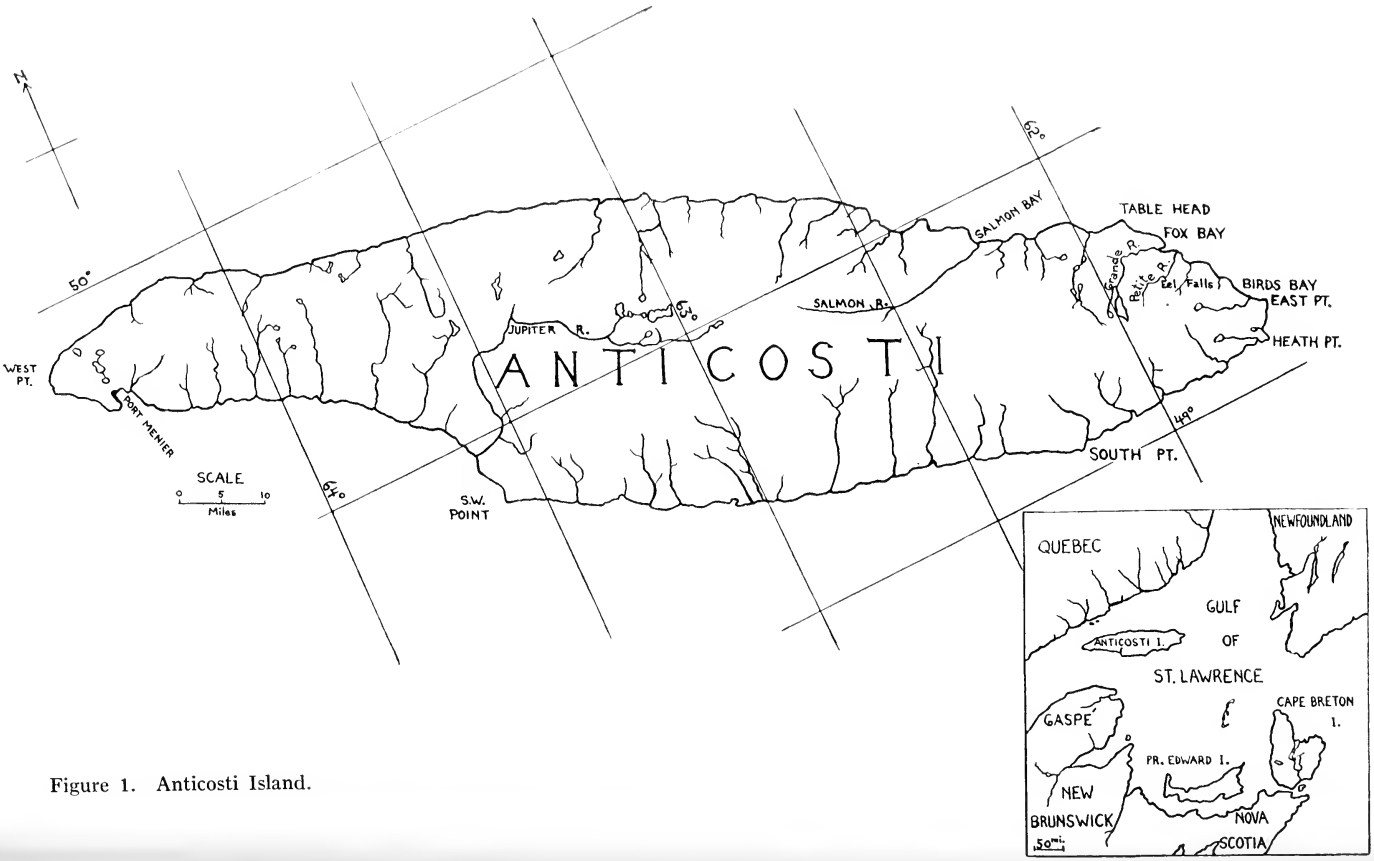

Figure 1. Anticosti Island.

Plant and Animal Life

Much of the island is forested, chiefly with spruce and balsam fir. There is, however, some white pine, American aspen, and balsam poplar. Here and there about Fox Bay willows may be seen and inland near Eel Falls an occasional mountain ash, tamarack, paper and yellow birch.

Small mammals, except the white-footed mouse (*Peromyscus maniculatus*), are scarce or entirely lacking. The guides believed they have seen an animal which answered the description of a shrew, but we found none. The mouse differs from the white-footed mouse found elsewhere and has recently been described by Moulthrop (1937). The Norway rat (*Rattus norvegicus*) and European house house (*Mus musculus*) have apparently come to the island on ships.

The larger mammals include hares, muskrats, foxes, possibly minks and martens, beavers, otters, moose, and bears. The white-tailed deer is extremely common. Reindeer and elk have also been liberated on the island. The reindeer may be increasing. Of these animals it appears that the only ones which are indigenous are the white-footed mouse, the bear, and the otter. Fishers and bison introduced by Menier are presumed to be extinct, as are also the martens and the wapiti. In the sea near Fox Bay we saw many seals which the guides called "Tête cheval," a large seal perhaps 10 or 12 feet long, and smaller seals which they believed to be of different species. The large seal has been identified by Newsom (1937) as the gray seal (*Halichoerus grypus*).

Many of the streams abound in salmon and trout. Cod are numerous and many halibut are caught about Fox Bay. Lobsters occur about the submerged reefs and there is a good daily catch at Fox Bay. The remains of a large cannery on the shore of the bay seems to indicate that the lobster is now less plentiful than formerly. Eels occur in the rivers. Frogs are present but there are apparently no snakes on the island.

Collecting Stations

Fox Bay Camp.—Fox Bay is a broad, shallow bay, a little over a mile in width and somewhat less than a mile in depth. It lies on the north shore of the island about 15 miles from its east end and faces the sea toward the northeast. Much of its water is no more than one to one and a half fathoms in depth. Its northwest and southeast extremities are marked by rounded points of land. The former shows the beginning of low cliffs but the latter, Reef Point, is backed by hilly land. From this point as its name suggests, a long reef extends and is marked by the waves which break over it. The shore is rough shale gravel, which along the whole mid-portion of the bay is thrown back into a round, even ridge 10 to 15 feet above the sea and 50 to 100 feet in depth. This is topped by deep coarse grass, blue iris, and dandelions and behind it a few small trees. Behind this ridge lies a broad, very shallow bay. Into

this bay at its northeast end enters "La Grande Riviére" and at its southeast end, enters "La Petite Riviére," surrounding a small island. To the east of the bay and behind it, the low land is forested in patches with spruce and balsam. Farther back, the land rises gently to small, boggy lakes. It was impressive to see a series of two or three such lakes within a few yards of each other, their water levels arranged like steps 6 to 10 feet in height. In these lakes we found the Great Black-backed Gulls nesting.

On the southeastern curve of the ridge around the bay stand two houses and a few small frame buildings. One of the houses is the home of M. Noel, a game warden, and the other, our headquarters, is a house built previous to 1900 by the government as a post for observers. Behind these houses the land falls away to a wooded meadow containing willows as well as evergreens. Farther back the trees are dwarfed, many spruces and tamaracks only a few feet in height surrounding low, wide areas of bog heath and sedge mat. Here the wet trail led between hummocks of moss covered with Labrador tea, azaleas, and blue-berries, among which grow several types of small flowers. These heaths called by the natives "les plains" are a mile or more in length and if one walks toward their centers the sedge mat quakes threateningly at the edges of black pools in some of which deer had drowned.

Traveling by boat southeast along the coast, we watched seals at play at the bases of the waterfalls and on the lower cliffs European Cormorants on their nests. About 6 miles from Fox Bay one may, by entering along a stream bed, gain the top of a cliff. Here we walked eastward along a rough trail which follows the telephone line surrounding the island. The trail passes through stands of spruce and balsam 20 to 30 feet in height, crosses small streams and traverses wide, boggy marshes which extend to the edges of the cliffs facing the sea. At the edge of this trail, we looked over Gull Cliff Bay to the nesting sites of thousands of sea birds. At the top of the long curve of the cliff we stood about 125 feet above the sea. The short, gnarled spruces were bent away from the sea, and here and there were the remains of Kittiwakes and Gannets which had probably fallen prey to foxes. Along this cliff by thousands the neat nests of the Kittiwakes were placed on the small ledges, most of them completely inaccessible due to the overhand of the cliff.

Eel Falls Camp.—Starting from the camp at Fox Bay we traveled southward. Behind the first long row of boggy "plains" the trail leads in the general direction of "La Petite Riviére" across wet wooded bogland. Following this rough trail for about four miles south of Fox Bay, we returned to the banks of the river and climbed upward to the lower margin of a heavily wooded ridge which rises sharply to a new plateau about 50 feet above. There we found that the little river pitched off a bench of rock into a neat cylindrical basin of limestone 25 to 30 feet

in height and 30 feet in diameter. Here hundreds of eels were clinging to the wet limestone beneath the falls to which they give their name. At a little distance from the falls near the edge of the stream we pitched our camp. This long ridge is thickly wooded with tall spruce, balsam, and birch. Southward above the ridge the land is flat again and leads away gradually to shorter trees and another series of long, open muskegs dotted with small lakes.

Acknowledgments

We wish to acknowledge the co-operation and suggestions of Mr. Harold L. Madison, formerly director of The Cleveland Museum of Natural History, and we wish to thank Dr. John W. Aldrich, Curator of Ornithology in the same institution, for his helpful advice during our preparation for the expedition and his assistance on the manuscript of this report. We are especially indebted to Dr. Harry C. Oberholser of the United States Biological Survey for many helpful suggestions as well as for comparison and identification of the specimens obtained and encouragement in the preparation of our data. We wish to acknowledge the courteous co-operation of Mr. Herbert W. Brandt in furnishing information regarding probable nesting sites and dates, and for the use of his cliff-scaling equipment which we found indispensable. Thanks are due to the Consolidated Paper Corporation for the privilege of collecting on Anticosti Island.

List of Birds

The following list includes the 179 species and subspecies which have been authoritatively recorded from Anticosti Island. In a number of cases we have used the scientific names recently advocated by Dr. Oberholser (1938). New subspecies of *Penthestes atricapillus, Certhia familiaris,* and *Geothlypis trichas* are described in this paper. Our specimens are deposited in The Cleveland Museum of Natural History.

As Lewis (1926:179) has pointed out, Ellis Bay of earlier authors is now called Port Menier.

Gavia immer immer (Brünnich). Common Loon.—Lewis (1924) observed this loon "rather commonly at Ellis Bay." Verrill (1862a) lists it as "very common." Brewster (1884) says "of general distribution along the Gulf." Schmitt (1904) found newly hatched young July 7, 1901.

We found this loon common along the coast, feeding in the calm salt water bays as well as inland on the larger muskeg lakes. From 2 to 10 individuals were seen almost daily at Fox Bay and Eel Falls between June 17 and 30.

Gavia stellata (Pontoppidan). Red-throated Loon.—Verrill (1862a) says "very common, breeds." Brewster (1884) saw the Red-throated Loon on Anticosti. Schmitt (1904) found it "fairly common." Dionne (1920) also reported it very common. Lewis (1938b) writes that he saw two adult Red-throated Loons with one downy young bird July 15 in a pond near Port Menier and an adult and young the next day in another pond.

We found one individual on June 23, two miles east of Fox Bay.

Colymbus auritus (Linnaeus). Horned Grebe.—Schmitt (1904) says a young specimen was killed in October at Sanatorium Bay at the west end of the island. Dionne (1920) saw two in 1916. Brooks (1919) saw a female with three downy young on Lake Gamache. Lewis (1924) observed several pairs at Ellis Bay.

Puffinus griseus (Gmelin). Sooty Shearwater.—Schmitt (1904) says of this species that it is rather rare in summer, being seen sometimes offshore from the island.

Oceanodroma leucorhoa leucorhoa (Vieillot). Leach's Petrel.—Verrill (1862a) often saw these petrels about Anticosti but found none breeding. Schmitt (1904) lists them as rather common in summer.

Oceanites oceanicus (Kuhl). Wilson's Petrel.—Brewster (1884) found this species common and of general distribution. Schmitt (1904) considered the species rare and very irregular in occurrence.

**Moris bassana* (Linnaeus). Gannet.—Verrill (1862a), Schmitt (1904), and Dionne (1920) report this bird as common at Anticosti Island, while Brooks (1919) saw a number flying off Ellis Bay and was informed by M. Gagnon that a colony bred at Wreck Bay at the east end of the island. In 1923 Captain Oscar Mercier (Lewis, 1924) stated that he believed that Gannets had nested on the high Gull Cliffs between Heath Point and Fox Bay during all of his ten years experience in the region.

We found the Gannet rather abundant along the north coast of the island, feeding off the capes from early morning to late evening. Though the cliffs west of the Fox Bay Camp were about the same elevations as those to the east of the bay the birds were confined to the latter location where there was a concentration in two large colonies at Gull Cliff Bay. The precipitous cliffs in this area are about 200 feet high with narrow jutting ledges of limestone 3 to 4 feet wide, and 10 to 30 feet below the sod-covered top. Here, with thousands of Kittiwakes, Murres, Puffins, Guillemots and Razor-billed Auks, were nesting approximately 500 Gannets. The nests were untidy, wet, foul-smelling masses of seaweed and kelp with a few tufts of moss and grass. Their total depth was from 6 to 8 inches and their diameter 24 inches. The edges of the nests hung loosely over the ledges. In the center of the mass was a poorly defined depression, 4 to 6 inches in diameter, in which were laid single, deeply stained, reddish brown eggs. The occasional fresher egg was grayish white. Eggs collected from eight of these nests on June 27 ranged from fresh to two-thirds incubated. The same day there were many more young in the nests than eggs. Most of the adults refused to leave their nests, even when we descended with rope and steel ladder to within a few feet of them. Throwing bits of rock was not enough to dislodge them. Many of them moved awkwardly about their nests in mild excitement, making a guttural grunting sound. While so doing one individual disgorged a large half-digested fish.

**Phalacrocorax carbo carbo* (Linnaeus). European Cormorant.—The status of this species seems to have varied in the past. Verrill (1862a) reports, "breeding in large numbers on cliffs at East Point." Brewster (1884) found a breeding colony of about 20 nests at Wreck Bay. Schmitt (1904) found it especially in the eastern part of the island at Fox Bay. In contrast to these observations, Lewis (1924) reports, "the present status of this species on Anticosti is uncertain, but it is probable that some breeding colonies still exist there." Oliver Austin, Jr. (1932) states, "the European Cormorant formerly bred south to Newfoundland, the Gulf of St. Lawrence, and the Bay of Fundy. A few are still reported to breed in the Gulf of St. Lawrence." On June 20, six miles east of the Fox Bay camp, we collected two and observed hundreds of European Coromorants in company with Kittiwakes and Murres nesting on the ledges of the cliffs. The cliffs in this area varied in height from 100 to 300 feet. In the Salmon River

* We have marked thus all species of which our party collected specimens.

district, 36 miles west of the Fox Bay camp on June 26, a second colony was observed. The nests of sticks, kelp and other sea-weed contained well-developed young on June 20 and 26.

Phalacrocorax auritus auritus (Lesson). DOUBLE-CRESTED CORMORANT.—Schmitt (1904) says that this cormorant nests on the island and is fairly common in summer; Dionne (1920) found it fairly common.

Ardea herodias herodias (Linnaeus). GREAT BLUE HERON.—Verrill (1862a) saw what appeared to be a Great Blue Heron at Ellis Bay. Schmitt (1904) lists it as rare, one collected at Ellis Bay. Dionne (1920) saw only one on the island.

Botaurus lentiginosus lentiginosus (Montagu). AMERICAN BITTERN.—Verrill (1862a) caught a young bird August 4. Schmitt (1904), Dionne (1920), and Brooks (1919) report this species common.

We saw an American Bittern June 23, two miles east of Fox Bay.

**Branta canadensis canadensis* (Linnaeus). COMMON CANADA GOOSE.—Verrill (1862a), Brewster (1884), and Schmitt (1904) found this species common and breeding. Lewis (1924) saw 16 at Ellis Bay on June 10.

On a small inland lake studded with numerous small islands, 2 miles southeast of the Fox Bay camp, an old gander with 3 very small downy young was found on June 25 swimming and feeding along the grassy shores of the lake. The nest on a small island was observed through the glass and appeared to be of grasses only. The female concealed in the tall grasss at the upper end of the lake could be heard protesting our presence. The gander and one gosling were collected. The remaining 2 goslings were placed under the care of our neighbors, the Noel family, where they were thriving when we departed July 2. On June 28, a pair was surprised while feeding in a grassy area 50 feet from the shore of a small lake in a muskeg area near the Eel Falls camp. Considerable time was consumed in an unsuccessful attempt to find the nest. On June 21 we saw a goose flying low over the sea three miles west of the Fox Bay camp.

Branta bernicla hrota (Müller). AMERICAN BRANT.—Schmitt (1904) and Dionne (1920) report this species as common during migration spring and fall. Lewis (1924) reports seeing large flocks of 3,000 to 4,000 birds at Ellis Bay on June 10, 1922.

Chen hyperborea atlantica Kennard. GREATER SNOW GOOSE.—Schmitt (1904) says that young birds in gray plumage were observed occasionally along the coast.

Anas rubripes Brewster. BLACK DUCK.—Verrill (1862a) found it "very abundant, young seen July 3." Brewster (1884) also lists this species as "common, brood of young seen." Schmitt (1904), Dionne (1920), and Brooks (1919) all list the Black Duck as very common. Lewis (1924) saw 4 at Ellis Bay on June 14, and 5 on June 15.

We saw a small flock of 6 adult birds in a small bay along the sea on June 23.

Chaulelasmus streperus (Linnaeus). GADWALL.—Verrill (1862a) reports a few individuals were seen and a young one collected.

Dafila acuta tzitzihoa (Vieillot). AMERICAN PINTAIL.—Schmitt (1904) reports this species as rare but nesting on the island. Lewis (1924) quotes from a letter from Verrill that one of his party collected 2 specimens on August 6. Lewis (1926) observed 7 at Port Menier on May 26.

Nettion carolinense (Gmelin). GREEN-WINGED TEAL.—Schmitt (1904) lists this species as rare. Dionne (1920) writes, "Rare; found only one pair with 9 young." Brooks (1919) saw a flock of 30 on August 26, 1919. Lewis (1926) records several seen at Port Menier from May 23 to June 1.

We saw one individual on June 18 at Fox Bay.

**Querquedula discors* (Linnaeus). BLUE-WINGED TEAL.—Brewster (1884) says, "fishermen report that small numbers occur at Fox Bay."

On June 20, we collected a male in small marsh near Fox Bay. On June 25 a second Blue-winged Teal was observed 3 miles south of the Fox Bay camp. On

June 28, 2 were flushed from a small muskeg lake in the close proximity of the Eel Falls camp.

So far as we know, Anticosti Island marks the northeastern limit of the range of this species.

Spatula clypeata (Linnaeus). SHOVELLER.—H. E. Graham (1939) reports shooting a Shoveller which came in with a flight of Black Ducks at the west end of the island on October 11, 1938.

Nyroca americana (Eyton). REDHEAD.—Schmitt (1904) records it as rare in migration.

Perissonetta collaris (Donovan). RING-NECKED DUCK.—Schmitt (1904) says he collected one, May 26, 1902, but considered it rare.

Fulix marila nearctica (Stejneger). GREATER SCAUP DUCK.—Lewis (1924) saw 12, presumably of this species on June 10, 4 on June 14, 1922, at Lake Gamaché, Ellis Bay, and (1926) again reports having seen several in 1926. Schmitt (1904) reports it was seen only in the spring during migration.

Fulix affinis (Eyton). LESSER SCAUP DUCK.—Schmitt (1904) says that this duck occurs in the autumn, winter, and spring and a few nest on the island.

Glaucionetta clangula americana (Bonaparte). AMERICAN GOLDEN-EYE.—Schmitt (1904) found it fairly common throughout the year. Dionne (1920) lists it as common. Brooks (1919) noted several near Ellis Bay. Verrill (1862a) caught young of this species one-third grown on July 9.

Glaucionetta islandica (Gmelin). BARROW'S GOLDEN-EYE.—Schmitt (1904) records this species as fairly common except in summer, stating that some always nest on the island.

Clangula hyemalis (Linnaeus). OLD-SQUAW.—Verrill (1862a) found this species very common, breeding abundantly. Brewster (1884) saw a few at East Point, July 7. Schmitt (1904) lists it as passing the winter on the island but not nesting. Dionne (1920) considers it a common transient. Lewis (1924) saw one at Ellis Bay, June 13, 1922.

Histrionicus histrionicus histrionicus (Linnaeus). EASTERN HARLEQUIN DUCK.—Schmitt (1904) found this species in the region of South Point.

Somateria mollissima borealis (Brehm). NORTHERN EIDER.—Schmitt (1904) records it as fairly common in winter from September to April.

Somateria mollissima dresseri Sharpe. AMERICAN EIDER.—Verrill (1862a) reports this bird "common about Anticosti." Schmitt (1904) and Dionne (1920) both report it as "very common." Lewis (1930) writes, "large batch of American Eiders observed along south shore of Labrador Peninsula in 1929." Townsend (1916) translating Beetz's notes writes, "American eiders have been in the habit of nesting on the isles of the Gulf." We saw 2 at Deep Bay on June 30.

Somateria spectabilis (Linnaeus). KING EIDER.—Verrill (1862a) saw a skin that had been collected on the island. Brewster (1884) and Schmitt (1904) both mention that the natives assured them that it was common in winter. Dionne (1920) lists it as fairly common.

Melanitta deglandi (Bonaparte). WHITE-WINGED SCOTER.—Brewster (1884) observed this bird at East Point. Schmitt (1904) lists it as, "fairly common." Lewis (1924) saw one at Ellis Bay June 13, 1922. Macoun (1909) writes, "at Anticosti it arrives about the end of May and remains about a month."

A small flock of this species was seen several times, feeding in the shallow protected bays of the sea west of Fox Bay. They were extremely shy, taking wing when we ventured nearer than 200 to 300 yards. Recorded observations were: Galleote River to Heath Point, 2 on June 17; 2 miles west of Fox Bay, 20 on June 20, 1937.

Melanitta perspicillata (Linnaeus). SURF SCOTER.—Schmitt (1904) recorded this duck as fairly common. Dionne (1920) considered it common during migration. Lewis (1924) saw one at Ellis Bay, June 13, 1922.

Oidemia americana Swainson. AMERICAN SCOTER.—Dionne (1920) observed this scoter several times. Schmitt (1904) found it rather rare.

We saw a flock of 3 on June 20 at Fox Bay.

Lophodytes cucullatus (Linnaeus). HOODED MERGANSER.—Brooks (1919) relates that several were seen in summer of 1919 by Professor W. H. Twenhofel.

Mergus merganser americanus Cassin. AMERICAN MERGANSER.—Combes (1896) lists this bird without comment. Schmitt (1904) found it rather common. Brooks (1919) writes: "a few were noted in the summer of 1919 by Professor W. H. Twenhofel of the University of Wisconsin."

We found this species quite common, though not as abundant as the Red-breasted Merganser, between June 17 and 27. It was observed along the north shore in the tide water bays and the mouths of streams. It appeared in flocks of 2 to 12 birds.

**Mergus serrator serrator* (Linnaeus). RED-BREASTED MERGANSER.—This was one of the commonest of the ducks found on the island, 78 individuals being observed in 8 days. Verrill (1862a) reported a nest with 6 eggs found July 17, and young seen July 3, and Schmitt (1904) found a nest with fresh eggs July 20, 1903. Dionne (1920) and Brooks (1919) both report this form common on the island.

This species occurred along the coast and in the river mouths where it was observed feeding in the open pools of the rivers and streams. None were seen in the numerous lakes of the muskeg areas in the vicinity of the Eel Falls camp.

On June 18 we found a nest with 12 fresh eggs on the ground, sheltered and completely hidden by low-growing, matted branches of spruce. The nest, composed of short dead spruce twigs with a small quantity of down ringing the outer edge of the cupped depression, was located on a small island in a pool at the mouth of Fox Bay. The female was collected.

Astur gentilis atricapillus (Wilson). EASTERN GOSHAWK.—Schmitt (1904) reports this bird as a rare permanent resident. Dionne (1920) found it not common. Brooks (1919) says the species is common at Ellis Bay.

Accipiter striatus velox (Wilson). SHARP-SHINNED HAWK.—Verrill (1862a) saw one at Salmon River. Schmitt (1904) and Dionne (1920) reported it common.

Buteo jamaicensis borealis (Gmelin). EASTERN RED-TAILED HAWK.—Schmitt (1904) records this species as a rather rare permanent resident.

Buteo lagopus s.johannis (Gmelin). AMERICAN ROUGH-LEGGED HAWK.—Schmitt (1904) writes that this species was common some years.

Aquila chrysaëtos canadensis (Linnaeus). GOLDEN EAGLE.—Combes (1896) reports Mr. Gibsone, lighthouse keeper at Heath Point, gave him a foot of a Golden Eagle. Schmitt (1904) lists it as a rare permanent resident bird and found a nest on Jupiter River.

Haliæetus leucocephalus washingtoniensis (Audubon). NORTHERN BALD EAGLE.—Verrill (1862a) saw one or two in July at Ellis Bay. Schmitt (1904) calls the Bald Eagle a rare permanent resident which nests in June and July. Dionne (1920) found it fairly common. Brooks (1919) saw one or two every day.

Circus cyaneus hudsonius (Linnaeus). MARSH HAWK.—Schmitt (1904) and Dionne (1920) list this hawk as rather rare.

**Pandion haliaëtus carolinensis* (Gmelin). OSPREY.—Lewis (1924) reports one nesting at Ellis Bay, June 15. Verrill (1862a), as well as Brewster (1884), report seeing a few at Ellis and Fox Bays. Dionne (1920), however, reports this species as very common.

The natives reported a small colony of Ospreys nesting in the vicinity of Ellis Bay, stating that this bird was much more numerous on the south than on the north shore of the island. A pair was observed each day, usually appearing in mid-afternoon to fish over the western portion of Fox Bay. After the capture of a fish they would fly southwest to the interior of the island, to return within 30 minutes to fish again. Undoubtedly this pair was feeding young somewhere southwest of the Fox Bay camp.

We collected a female at Fox Bay on June 22, 1937.

Falco rusticolus obsoletus Gmelin. Black Gyrfalcon.—Schmitt (1904) reports seeing a few each summer. Dionne (1920) saw one in 1916.

Falco peregrinus anatum Bonaparte. Duck Hawk.—Dionne (1920) saw this hawk quite frequently on Anticosti.

Falco columbarius columbarius Linnaeus. Eastern Pigeon Hawk.—Schmitt (1904) lists it as occurring rarely in the summer. Dionne (1920), however, considered it very common. Brooks (1919) found this hawk fairly common about Ellis Bay. Lewis (1938a) saw one stoop at 2 Greater Yellow-legs along the shore at Port Menier on May 25, 1926.

Cerchneis sparveria sparveria Linnaeus. Eastern Sparrow Hawk.—Schmitt (1904) reported this little hawk as rather rare and as occurring in summer only. Dionne (1920) saw one individual.

Bonasa umbellus togata (Linnaeus). Canada Ruffed Grouse.—Lewis (1926) saw a number in the vicinity of Port Menier and was informed by the natives that this bird had been recently introduced from mainland stock.

We saw none but were informed by the natives that they were fairly common.

Lagopus rupestris rupestris (Gmelin). Rock Ptarmigan.—Lewis (1924) writes, "Brewster has recorded 2 specimens taken on Anticosti by Mr. Gardiner, of his party." Schmitt (1904) lists them as a fairly common permanent resident bird.

The natives informed us that a very few were still seen from time to time.

Porzana carolina (Linnaeus). Sora.—Schmitt (1904) found this rail rare in summer. One specimen collected by M. Malouin was given to Schmitt. Dionne (1920) saw but one individual.

Gallinula chloropus cachinnans Bangs. Florida Gallinule.—Schmitt (1904) says of this species: "Summer. Rather rare."

Fulica americana americana Gmelin. American Coot.—Schmitt (1904) considers the Coot a rare summer resident.

Charadrius semipalmatus Bonaparte. Semipalmated Plover.—Dionne (1920) found this plover fairly common in autumn. Brooks (1919) saw a small flock on August 26.

Oxyechus vociferus vociferus (Linnaeus). Killdeer.—Dionne (1920) reported a single bird seen on the beach at Anse aux Fraises.

Pluvialis dominica dominica (Müller). American Golden Plover.—Schmitt (1904) found it fairly common in autumn. Dionne (1920) records it as fairly common.

Squatarola squatarola squatarola (Linnaeus). Black-bellied Plover.—Schmitt (1904) observed them fairly common during autumn migration. Dionne (1920) also considered it fairly common. Brooks (1919) saw a number near Ellis Bay.

Arenaria interpres morinella (Linnaeus). Ruddy Turnstone.—Schmitt (1904) reports the Ruddy Turnstone as fairly common in September. Dionne (1920) found it common in autumn. Brooks (1919) reports having seen several.

Rubicola minor (Gmelin). American Woodcock.—We have been unable to find any definite record that this species has been collected or seen on Anticosti. Brewster (1884) writes, "Mr. Gardiner thought that he flushed another [Woodcock] in a springy place at Fox Bay, Anticosti, but the foliage was so dense that he did not get a clear sight of it." The Consolidated Paper Corporation, owners of Anticosti, list Woodcock as one of the game birds to be taken in season. From this it would seem that more Woodcock occur on the island during migration than published observations disclose.

We saw but one of this species. It was observed for several minutes on June 28, feeding along the mucky border of a muskeg area before taking flight.

**Capella gallinago delicata* (Ord). Wilson's Snipe.—Judging from our experience and that of all other authors, this snipe is apparently fairly common on Anticosti Island, appearing along the mud flats and seashore to feed early in the morning among the kelp and debris left by an ebbing tide. It was observed to leave its feeding grounds singly and in pairs for the interior in the mid-forenoon. Along

the shores of the ponds of the muskeg areas at the Eel Falls camp it was observed feeding in small groups during the latter part of the day. This species undoubtedly breeds on the island, though no nests have been reported to date. We collected a female at Fox Bay on June 18.

Phaeopus hudsonicus (Latham). HUDSONIAN CURLEW.—Brewster (1884) saw at East Point large flocks of what he took to be this species. Schmitt (1904) observed it during autumn migration. Dionne (1920) lists it as fairly common.

**Actitis macularia* (Linnaeus). SPOTTED SANDPIPER.—This species was not as common about Fox Bay as others have evidently found it elsewhere on the island. Verrill (1862a), lists it as common, breeding; Brewster (1884) abundant. Schmitt (1904) says, "fairly common; nests on the island."

We found this species not common in the areas explored, occurring only locally along the sea coast. Extending west of Fox Bay and encircling the bay is a ridge of loose washed limestone, with an elevation of 6 feet above high tide. This ridge flattens at its top to a width of 10 to 30 feet and extends some 2 miles to meet the receding cliff at the western extremity of the bay. Behind this ridge lie fresh water bays of Fox River and salt water lagoons. Where a little spruce needle humus gathers along the ridge top, there appears a luxuriant growth of coarse tall grass. Other areas are topped with various sizes of round and flat limestone dotted with an occasional tuft of weed or grass. This is the habitat of the Spotted Sandpiper and we observed but few elsewhere. On the ridge, three-fourths of a mile west of the Fox Bay camp, stood an abandoned lobster cannery shed with several smaller storage sheds. Several of these had collapsed with timber and shingle debris scattered over the ridge top. A bird, which proved to be the female, was flushed from between two timbers of one of these collapsed sheds, its behavior indicating a nesting bird. We collected the bird and found the 4 eggs and nest, a slight depression in the shingle debris ringed with a few dry stems of grass.

It has been the general opinion that incubation of the eggs is performed entirely by the male of the species. A. C. Bent (1929) says, "in incubation as well as courtship, the male [Spotted Sandpiper] has been shown to assume duties which are usually ascribed to the female." From our findings it would appear that the female at least shares the incubation duties.

We flushed a second bird from a densely grassed area, 100 yards from the above described nest. The vegetation being dense, it was deemed advisable to retire lest in looking for the nest it be trampled upon. That afternoon, we again visited the location, the male flushed and was collected and the nest, well built of dry grass with a well defined bowl, was found concealed in a tuft of high grass.

Tringa solitaria solitaria Wilson. EASTERN SOLITARY SANDPIPER.—Schmitt (1904) found this species rather rare. Brooks (1919) saw one near Ellis Bay on August 28. Lewis (1926) saw a single individual at Port Menier, May 28.

**Totanus melanoleucus* (Gmelin). GREATER YELLOW-LEGS.—We found this species common as did Verrill (1862a), Brewster (1884), and Dionne (1920). Schmitt (1904) states, "nests on the island." Lewis (1924), however, records this bird as "not common at Ellis Bay, June 10-16, 1922."

The Greater Yellow-legs were common over the entire area worked by our group, being observed inland about the muskeg lakes as well as along the seacoast. Small flocks fed along the seashore in the morning at low tide. During the day the Yellow-legs in pairs or singly could be seen or heard traveling inland or back to the sea. On June 25, Dr. McCullagh, while working a muskeg area 2 miles southeast of the Fox River camp, flushed a pair of Greater Yellow-legs from the deer moss and grass. The pair circled closely and dived and darted at the intruder with all the indication of having a nest or young in the immediate vicinity. Considerable time was consumed in an unsuccessful attempt to find the nest or young. This species doubtless breeds along the shores of the inland muskeg lakes. We collected several specimens at Fox Bay June 18 to 24.

Calidris canutus rufus (Wilson). AMERICAN KNOT.—Schmitt (1904) lists this species as rare.

Pisobia melanotos (Vieillot). PECTORAL SANDPIPER.—Schmitt (1904) reports it common in September. Dionne (1920) found it very common.

Pisobia fuscicollis (Vieillot). WHITE-RUMPED SANDPIPER.—Verrill (1862a) found this form in large flocks on August 14. Schmitt (1904) reports it fairly common in autumn. Dionne (1920) and Brooks (1919) both record it as abundant.

**Pisobia minutilla* (Vieillot). LEAST SANDPIPER.—We did not find this species as abundant in the Fox Bay region as have others elsewhere on the island. Verrill (1862a) states that "large numbers were seen on a large marshy heath near Ellis Bay where they appeared to be nesting." Brewster (1884) says, "few were observed daily along beaches at Fox Bay." Schmitt (1902) recorded it as "very common." Brooks (1919) says, "quite common along shores of Ellis Bay." Macoun (1909) is of the opinion that it breeds in small numbers on Anticosti Island.

We collected the female of a pair flushed from a muskeg area two miles southeast of Fox Bay camp on June 25.

Ereunetes pusillus (Linnaeus). SEMIPALMATED SANDPIPER.—Schmitt (1904) reports this sandpiper as fairly common.

Crocethia alba (Pallas). SANDERLING.—Schmitt (1904) found it common during autumn migration. Dionne (1920) lists it as very common.

Steganopus tricolor Vieillot. WILSON'S PHALAROPE.—Schmitt (1904) considered this species very rare, probably accidental.

Lobipes lobatus (Linnaeus). NORTHERN PHALAROPE.—Brewster (1884) saw a flock and collected specimens between Cape Rosier (Gaspé) and Anticosti. Schmitt (1904) found it, at first appearing irregularly, then rather commonly. One specimen was killed, June 9, 1902.

Stercorarius parasiticus (Linnaeus). PARASITIC JAEGER.—Verrill (1862a) saw it frequently in the gulf. Schmitt (1904) collected three specimens but lists it as rather rare, July to September.

Stercorarius longicaudus Vieillot. LONG-TAILED JAEGER.—Schmitt (1904) was in possession of a single specimen taken about 1900 and considered the species very rare.

Larus hyperboreus hyperboreus Gunnerus. GLAUCOUS GULL.—Schmitt (1904) found this big gull wintering on the island.

Larus leucopterus Vieillot. ICELAND GULL.—Schmitt (1904) says that this species occurs occasionally in winter. Lewis (1927) identified two individuals at Ellis Bay on May 21, 1927.

**Larus marinus* Linnaeus. GREAT BLACK-BACKED GULL.—Our observations are in accord with those of other authors who record that this big gull breeds rather commonly on Anticosti Island.

Austin (1932) says, "the Great Black-backed Gull is not a colonial breeder, though throughout the lower two-thirds of Labrador breeding pairs are thickly distributed, especially in districts where there are many small islets." This was the type of breeding locality selected on Anticosti Island. On June 18, we visited near Fox Bay a small shallow lake of but 2 or 3 acres which contained 10 or 12 small grassy islands. A small colony of Great Black-backed Gulls, probably 10 pairs, was nesting on the small islands. Nests of previous years were evident immediately adjacent to the nests then occupied with downy young or eggs with well advanced embryos. Downy young were observed partly hidden in the overhanging grasses along the small islands. One nest with a pipped egg and one downy young was found on an exposed knob not over 2 feet in diameter. The nest practically covered the tiny islet. Several other lakes in the immediate vicinity, containing similar island habitats, were explored in vain for indication of former nesting. Since the adjoinng lakes, some within 100 yards, offered similar habitats it is difficult to understand why this colony insisted upon the occupancy of this particular island lake year after year.

Larus kumlieni Brewster. KUMLIEN'S GULL.—Two individuals of this form, now supposed by many to be a hybrid between *Larus leucopterus* and *Larus argentatus thayeri,* were identified by Lewis (1927) in Ellis Bay on May 21, 1927.

**Larus argentatus smithsonianus* Coues. HERRING GULL.—All previous writers agree as to the abundance of this species on Anticost as well as most other localities in the Gulf of St. Lawrence.

We found the Herring Gull abundant all along the northeast shore of the island. Between Lobster Bay and Cape Henri a slight indentation in the cliff wall forms a snug little bay guarded on the east by a 400 foot perpendicular limestone cliff, at the foot of which were enormous triangular shaped fragments of the cliff deposited during an earthquake disturbance of some 7 years before. These fragments, while reaching elevations of 20 feet or more, could be scaled without the use of ladder equipment. There were small, comparatively flat areas along their sides and on their peaks which afforded nesting sites for a colony of Herring Gulls. The cavities and seams were occupied by a colony of Black Guillemots. Elsewhere along the high cliffs we had observed many downy young Herring Gulls, some in nests, others traversing the narrow limestone ledges, indicating early nesting of this species. In view of its known habit of early breeding, we were agreeably surprised to find 2 nests of 3 eggs, 5 nests of 2 eggs, and 11 nests containing but one egg, all eggs unincubated. Our French guides seeing our perplexities explained that coastal fisherman, desiring fresh eggs, oftimes land in small boats and augment their ship's fare with the fresh eggs from this colony of Herring Gulls and Guillemots. Doubtless these eggs were of a second laying as a result of earlier depredations. The nesting of this Anticosti colony was, as P. A. Taverner has expressed it, "on the ground or rocky ledges or flat tops of isolated rocks in nest of seaweed or vegetable matter."

Larus delawarensis Ord. RING-BILLED GULL.—Schmitt (1904) lists it as rather rare; specimen collected September 18, 1901. Lewis (1926) reports a number observed at Port Menier from May 20 to May 30.

Larus philadelphia (Ord). BONAPARTE'S GULL.—Verrill (1862a) found this little gull abundant at the Gut of Canso, August 21, but at no other time. Schmitt (1904) reports it as rather common in summer. Brooks (1919) saw a few on August 22 and 23 on the Gulf.

Pagophila alba (Gunnerus). IVORY GULL.—Schmitt (1904) reports it very rare. He collected a specimen October, 1902.

**Rissa tridactyla tridactyla* (Linnaeus). ATLANTIC KITTIWAKE.—As have apparently all other authors, we found this species the most abundant sea bird on the island, ranging along the entire north shore. Because of their great abundance, it was difficult to estimate the number of Kittiwakes observed during the day. On June 27, in the vicinity of Birds Bay, we estimated a total of 10,000 individuals, with thousands nesting along the cliffs. Kittiwakes in a continuous line were flying east along the cliff approximately 100 feet above the sea, while others in a continuous line returned flying west just above water line, giving the appearance of two well directed lines of traffic along a city street.

The ledges below the level of the Gannet nests at Birds Bay were occupied chiefly by the Kittiwakes. The ravages of wind and weather had worn away the lower four-fifths of these cliffs so as to produce an overhang of 10 to 20 feet. The nests of the Kittiwake were placed under this overhang and extended from 50 to 60 feet from the top to within 25 feet of the beach. Most of the nests were on small shelves of thin limestone.

The nests were neat structures, well built, chiefly of moderately fine grasses and moss with an occasional bit of seaweed. Most of the nests were of a rounded, low conical shape, the edges hanging over the ledge. Two or three eggs occupied the cup-shaped depressions which were 2 to 3 inches in depth.

**Sterna hirundo hirundo* Linnaeus. COMMON TERN.—We found the Common Tern all along the north shore and concur with Schmitt (1904), Dionne (1920),

and Brooks (1919), all of whom report this species as common. Lewis (1924) reports, "Terms, either Common or Arctic," occurring at Ellis Bay.

We found no indication of the breeding of this species, but Mr. Graham, Island Manager, informed us that the tern (probably the Common Tern) nested about the first of June on the stone reefs in Ellis Bay.

**Alca torda* Linnaeus. Razor-billed Auk.—There is some variance of opinion among earlier writers as to the abundance of this species. Verrill (1862a) reports, "common; breeds on the east and north shores." Brewster (1884) writes, "numerous at Wreck Bay." In contrast to these reports, Schmitt (1904) says, "found only in autumn, rather rare." Brooks (1919) "saw only single specimen near North Cape, Sept. 13, 1919." Lewis (1924) records "one seen near West Point, June 16, 1922." Macoun (1909) writes, "breeds, but not in large numbers on the Great Bird rock, Bryon island, Entry island and Magdalen islands, Gulf of St. Lawrence."

We found the Razor-billed Auk fairly common along the rocky cliffs of the north shore, nesting in the crevices and fissures of cliffs of 20 to 30 feet of elevation. Its numbers, apparently much depleted in the period following Brewster's visit, appear to have been somewhat restored.

We collected eggs from six nests (3 and 6 miles east of Fox Bay) on June 20 and 21. Some eggs were fresh but others were about to hatch.

**Uria aalge aalge* (Pontoppidan). Atlantic Murre.—Although Macoun (1909) records only two breeding locations for this species in the Gulf of St. Lawrence, not including Anticosti, most ornithologists who have worked on this island have recorded it as breeding.

We found this species rather abundant along the north shore, concentrating at Birds Bay, where the 300-foot cliffs afforded an ideal nesting area. On June 20 we visited this area and estimated 100 pairs of Murres nesting with the Gannets in the immediate vicinity of Birds Bay. On June 26, in the vicinity of Salmon River where cliffs attain a height of 370 feet, we estimated 75 nesting Murres.

At Birds Bay on the wider ledges of limestone, 30 to 50 feet from the top, sat groups of Murres in rows, chiefly with their backs to the sea, standing upright, bowing to each other, and solemnly pronouncing their names in low, hoarse voices. These nesting ledges were 4 to 12 feet wide, fairly level, with a slight slope to the sea. These ledges were covered with a wet slippery deposit of loam. The eggs lay scattered, some 3 feet from the cliff's edge, others but a few inches, their peculiar pyriform shape being their only protection against rolling off the edge. Eggs collected from six nests at Birds Bay on June 27 ranged from fresh eggs to those about to hatch.

Alle alle (Linnaeus). Dovekie.—Schmitt (1904) found the Dovekie common from September to May. Dionne (1920) says it is common in autumn and winter.

**Cepphus grylle grylle* (Linnaeus). Black Guillemot.—All former writers agree as to the abundance of the species on Anticosti Island. We found the Black Guillemot to be very abundant along the north coast. The natives call this bird "pigeon de mer," asserting that the flesh of the Black Guillemot, like that of the Puffin and Razor-billed Auk, is very palatable in the fall of the year and is sought after for food. The Black Guillemots are quite tame, permitting a closer approach than others of the sea birds. They nest in the seams and cavities found in the limestone cliffs, laying their one or two eggs 4 to 6 feet in from the entrance of the cavity. The eggs are deposited directly on the small crumbling fragments of limestone. The incubating birds often remain on the nest until lifted from it. We collected eggs 3 miles west of Fox Bay and 3 miles west of Salmon River on June 21 and 26 respectively.

**Fratercula arctica arctica* (Linnaeus). Atlantic Puffin.—We found this, as have other authors, an abundant bird in the cliff areas of the north shore. These odd little "old men of the sea," with their deep, thin bills of red, orange, and yellow, would sit on the sea in small flocks of four to a dozen, permitting our boat to pass within 10 yards without flying.

While it is common knowledge that the Puffin prefers an excavated burrow to a natural cavity as a nesting location, the Puffins along the north shore of Anticosti were found nesting in the natural crevices and cavities of the cliffs. This choice of nesting site may be due to the fact that little soil covers the rocky formation of the island, making burrowing difficult or impossible.

Their single eggs were deposited on the cold, wet, muddy stone floor of the small cave-like recesses in the cliffs, usually about 4 feet, though several were 6 to 8 feet from the entrance. In some instances an infertile egg of a previous year was still almost intact near this year's fresh egg.

Zenaidura macroura carolinensis (Linnaeus). MOURNING DOVE.—Schmitt (1904) reports this species found during October and November but only rarely. He submitted specimens to Dionne for identification.

Ectopistes canadensis (Linnaeus). PASSENGER PIGEON.—Verrill (1862a) reports having seen one at Heath Point. Schmitt (1904) states that a few individuals were seen after Verrill's time but none in the ten years before 1904.

Nyctea nyctea (Linnaeus). SNOWY OWL.—Combes (1896) reports that M. Malouin, keeper of West Point light, killed one. Schmitt (1904) records them as appearing irregularly in winter.

Surnia ulula caparoch (Müller). AMERICAN HAWK OWL.—Schmitt (1904) found this owl common except in summer. Dionne (1920) reported them as common in 1913.

Strix varia subsp. BARRED OWL.—Schmitt (1904) reports this species as rather rare.

Asio flammeus flammeus (Pontoppidan). SHORT-EARED OWL.—Schmitt (1904) lists this owl as fairly common.

Cryptoglaux funerea richardsoni (Bonaparte). RICHARDSON'S OWL.—Schmitt (1904) found them a rather rare permanent resident.

Cryptoglaux acadica acadica (Gmelin). SAW-WHET OWL.—Schmitt (1904) considered this species a rare permanent resident.

Chordeiles minor minor (Forster). EASTERN NIGHTHAWK.—Schmitt (1904) found them fairly common in summer. Brooks (1919) saw one at Ellis Bay. Dionne (1920) lists it as uncommon.

Chaetura pelagica (Linnaeus). CHIMNEY SWIFT.—Schmitt (1904) considered it rather rare and found in summer only.

Archilochus colubris (Linnaeus). RUBY-THROATED HUMMINGBIRD.—Schmitt (1904) records seeing but 2 of this species.

Megaceryle alcyon alcyon (Linnaeus). EASTERN BELTED KINGFISHER.—Verrill (1862a) writes, "seen, but not frequently." Combes (1896) recorded it on the Becscie River. Schmitt (1904) found it fairly common and says, "nests on the island." Dionne (1920) and Brooks (1919) both report it common. Lewis (1924) saw one at Ellis Bay, June 14.

This species was of rather rare occurrence, being seen but twice in widely separated areas. While exploring some 2 or 3 miles up-stream along the Fox River, on June 24, we saw a Kingfisher plunge from a dead spruce into a small pool of the river and emerge with what appeared to be a small trout. McCullagh observed 2 on June 30 in a small pool on Deep Bay River.

**Colaptes auratus borealis* Ridgway. BOREAL FLICKER.—Our experience with this species on Anticosti Island confirms the opinions of other writers that the Flicker is uncommon there. It was certainly not common around Fox Bay, although 3 individuals were seen on June 23, one mile south of our camp. A female collected June 29 at the Eel Falls Camp proved to be *Colaptes auratus borealis,* thus extending the range of that subspecies, as delineated by Ridgway (1914) and Oberholser (1938), southward from Labrador.

Phloeotomus pileatus abieticola (Bangs). NORTHERN PILEATED WOODPECKER.—We are unable to find any previous record of this species from Anticosti. However,

we saw one in a heavily wooded area just west of the Fox Bay camp on June 22, 1937.

**Sphyrapicus varius atrothorax* (Lesson). NORTHERN YELLOW-BELLIED SAPSUCKER.—Although Lewis (1926) found this to be the most common species of woodpecker on Anticosti Island in late May, 1926, we recorded but one. We collected a male June 20 on a spruce ridge one mile west of the Eel Falls camp in an area where several other forms of the family *Picidae* were collected.

Oberholser (1938) has shown that Yellow-bellied Sapsuckers from the northern United States and Canada are larger than breeding birds of the middle eastern United States and deserve recognition as a distinct subspecies for which Lesson's name *atrothorax* is available.

**Dryobates villosus septentrionalis* (Nuttall). NORTHERN HAIRY WOODPECKER.—The Hairy Woodpecker was observed in small numbers throughout the wooded areas explored, occurring as frequently along the timbered coast line as on the wooded ridges. Judging from our observations and the writings of others, particularly Schmitt (1904) and Dionne (1920), this species is fairly evenly distributed throughout the island.

It would seem from the writings of Macoun (1909), Cory (1878) and Austin (1932), that the Hairy Woodpecker is considered uncommon from the Magdalens northward except in Newfoundland, but our records show 11 birds and 2 nests observed during our stay on Anticosti. On June 24, one mile west of the Fox Bay camp, a Hairy Woodpecker was observed entering a cavity with food; while on June 29 another was observed to leave a cavity from which the buzz of the young could be heard. We collected 3 males and one female at Fox Bay June 19 to 25 and a female at Eel Falls on June 29.

Anticosti Island apparently marks the southeastern limit of the range of the big northern race, *septentrionalis,* since the A.O.U. Check List (1931) includes the Magdalen Islands in the range of *villosus* and Newfoundland is occupied by *terraenovae.*

**Dryobates pubescens microleucus* Oberholser. NEWFOUNDLAND DOWNY WOODPECKER.—A common species as found by Verrill (1862a). Brewster (1884) found "a pair with nest of young ready to fly, Fox Bay, July 11." Schmitt (1904) and Dionne (1920) both report this woodpecker "fairly common" while Lewis (1924) reported it as the "most common woodpecker" on Anticosti in mid June 1922.

We found this species most common along the wooded ridges in the vicinity of the Eel Falls camp, diminishing in numbers toward the coast line where only an occasional one was observed. Several nests with young ready to leave were found and other adult birds were observed carrying food. We collected 8 adults and 2 nestlings, principally at Eel Falls.

The discovery that the Downy Woodpecker of Anticosti Island belongs to the dark colored race, *microleucus,* formerly supposed to be confined to Newfoundland, was one of the more interesting results of our trip.

**Picoides arcticus* (Swainson). ARCTIC THREE-TOED WOODPECKER.—Schmitt (1904) lists this species as "fairly common." Dionne (1920), "apparently rare." Brooks (1919) collected a pair. Lewis (1924) "saw one near Ellis Bay."

We saw but one pair of this species. On a wooded ridge one mile east of the Eel Falls camp on June 29 we collected a male which was carrying a spider in his bill. We finally located the nest in the cavity 15 feet from the ground in a live spruce. From concealment we watched the female enter the cavity three times with food in spite of the loss of the male.

**Picoides tridactylus bacatus* Bangs. AMERICAN THREE-TOED WOODPECKER.—Dionne (1920) reports seeing "an old female and a brood of young at Ellis Bay." Brewster (1884) reports an adult female and young seen at Ellis Bay on July 24. Schmitt (1904) lists them as "fairly common," and Brooks (1919) collected a pair.

We found more of these woodpeckers than of *Picoides arcticus,* though both were uncommon. It was observed only in the vicinity of Eel Falls where on June

28 a nest of 4 well-feathered young were found in a cavity of a spruce. We collected three adults there.

Tyrannus tyrannus tyrannus (Linnaeus). Eastern Kingbird.—Schmitt (1904) lists 2 taken May 7, 1903 at English Bay. Lewis (1925, 1926) saw one at Ellis Bay on August 1, 1924 and one near Port Menier on May 30, 1926.

**Empidonax flaviventris* (Baird and Baird). Yellow-bellied Flycatcher.—Notwithstanding the fact that Chamberlain (1887), Brewster (1884), and Lewis (1924) all reported this species common, we noted it only on June 28 when we collected 3 and saw another in the wooded area a mile west of the Eel Falls camp.

Empidonax traillii traillii (Audubon). Alder Flycatcher.—Schmitt (1904) considered this flycatcher fairly common in summer. Lewis (1924) found it fairly common at Ellis Bay in June, 1922.

Empidonax minimus (Baird and Baird). Least Flycatcher.—Lewis (1924) saw a male on June 15, 1922, at Ellis Bay.

Nuttallornis borealis cooperi (Nuttall). Eastern Olive-sided Flycatcher.—Schmitt (1904) lists it as rare. Brooks (1919) saw one September 3, 1919.

Otocoris alpestris alpestris (Linnaeus). Northern Horned Lark.—Schmitt (1904) writes that this species occurs in flocks in May, September, and October. Dionne (1920) found it fairly common during migration. Lewis (1924) saw a caged bird that had been taken on the island.

**Iridoprocne bicolor* (Vieillot). Tree Swallow.—Most authorities list this species as common and we found it one of the most abundant birds on the island. The inhabitants of the island boasted a telephone system consisting of a single steel wire, attached to any available support, encircling the island along the shore line. Early each morning the Tree Swallows would assemble by the hundreds on this single wire, like clothes-pins on a wash line. We collected several at Fox Bay on June 18.

Riparia riparia maximiliani (Stejneger). American Bank Swallow.—Verrill (1862a) lists this species as common, but since there are no other records it seems likely that the species is now either very localized or greatly diminished in numbers on the island.

Hirundo rustica erythrogastra Boddaert. Barn Swallow.—Schmitt (1904) considered this swallow a summer resident. Dionne (1920) observed it rarely. Lewis (1938b) saw 2 on July 16 at Port Menier.

Petrochelidon albifrons albifrons (Rafinesque). Northern Cliff Swallow.—Verrill (1862a) found a large colony breeding on the cliffs at the entrance to Ellis Bay on July 15. Since there are no later records, that colony evidently no longer exists.

**Perisoreus canadensis barbouri* W. S. Brooks. Anticosti Jay; Canada Jay.—W. S. Brooks (1920) originally described this insular subspecies as *Perisoreus barbouri*. Most writers agree as to the abundance of this resident species. Lewis (1924) reports, "several observed at Ellis Bay, June 10-16, 1922." Schmitt (1904), "common throughout the year." Dionne (1920), "very common."

It was reported to us by the native guides as very abundant, occurring in rather large flocks during the winter months. The native trappers tell of leaving the door of their camps open during the winter months while they obtain water and upon returning to find a half dozen Canada Jays within the cabin feeding on the crumbs and other supplies. Contrary to the usual antagonistic feeling of Canadian trappers and woodsmen in general, the native Anticosti Islanders have a friendly attitude toward the bird. It seems that during the cold winter months when supplies are low on the mainland the "poachers" visit the island to obtain deer and trap mammals. The Canada Jays' characteristic habit of being a camp follower has often led the island game protectors to these "poacher" camps. We observed only 2 of these birds in the vicinity of Fox Bay camp and collected 5 and saw two others at the Eel Falls camp. Two of those collected were juveniles.

The native state that "la pie" disappears during the summer months. Lewis (1930) confirms this with the assertion that in most years not many Canada Jays are observed near the south coast of the Labrador Peninsula in spring and summer, although in August and September, 1929, he saw many there.

We believe that the fact that this abundant bird is not observed more during the summer months is probably due to its early spring nesting and the summer nesting of the great majority of the other birds. Young Canada Jays are apparently out of the nest in May, fully matured and flying with the adults by June, and they are driven into the interior of the island by the species nesting and defending their territories in the coastal area during the summer months. Both of the Canada Jays seen at Fox Bay camp were being pursued by angry nesting Robins.

Cyanocitta cristata bromia Oberholser. Northern Blue Jay.—Combes (1896) recorded this species. Schmitt (1904) found it common in some years from May to October.

Corvus corax principalis Ridgway. Northern Raven.—Brewster (1884) found the Raven rather evenly distributed but not abundant along the Gulf of St. Lawrence. Schmitt (1904) records it as common throughout the year on Anticosti Island. Combes (1896) records it without comment.

This species was seen by our party on 3 different occasions (June 20, 21, and 28), flying over the spruce forests.

**Corvus brachyrhynchos brachyrhynchos* Brehm. Eastern Crow.—This is a fairly common species on the island, but seemingly not as abundant as Verrill (1862a), Brewster (1884), and others reported it during their visits to the island. Cory (1878) lists this form as "very abundant" on the Magdalen Islands and notes that it is "quite tame in comparison with their usual shyness."

Crows were noted by us each day, usually a single bird or pair in flight. A few fed in the kelp and debris along the shore at ebb tide and appeared as shy as elsewhere. On June 24, 3 adult birds and 2 families of young were observed. We collected a female at Fox Bay on June 19.

Penthestes atricapillus aldrichi subsp. nov. Anticosti Black-capped Chickadee.

Sub-specific characters.—Similar to *Penthestes atricapillus atricapillus,* but decidedly larger, particularly the tail; the white wing edgings somewhat more conspicuous; upper surface averaging rather darker. Similar to *Penthestes atricapillus septentrionalis,* but upper parts darker and white wing edgings narrower.

Measurements: Adult male (2 specimens): wing, 67-67.5 (average 67.25) mm.; tail, 63-64.5 (63.75); exposed culmen, 9 (9); tarsus, 17.5 (17.5). Adult female (3 specimens): wing, 65-67 mm.; tail, 61.5-64 (62.83); exposed culmen, 9.5-10 (9.83); tarsus, 16.5-17 (16.83).

Type.—Adult male No. 38068, Cleveland Museum of Natural History; Eel Falls (altitude 250 feet), Fox Bay, Anticosti Island; June 29, 1937, Frank W. Braund and E. Perry McCullagh.

Range.—As far as we are aware, confined to Anticosti Island.

Remarks.—This new race of Black-capped Chickadee is geographically most closely associated with *P. a. anamesus* Todd (1938) which is said to extend south to the north shore of the Gulf of St. Lawrence. *P. a. aldrichi* is apparently an insular form separated by the waters of the Gulf of St. Lawrence from one subspecies to the north, and another (*atricapillus*) on the Gaspé Peninsula to the south.

This chickadee, while fairly common in the wooded areas, was less numerous than the Acadian Chickadee by a ratio of 1 to 2. Several families of young were observed in the vicinity of Eel Falls camp. On June 29 Braund flushed a chickadee of this species from a cavity of a spruce stump. Upon investigation, a newly

constructed nest without eggs was found, composed entirely of white hair of the white-tailed deer.

Specimens collected: 2♂, 3♀ Fox Bay and Eel Falls, June 22 to 29.

**Penthestes hudsonicus littoralis* (Bryant). ACADIAN CHICKADEE.—We found this bird much more common than *Penthestes atricapillus,* occurring in restless groups in the wooded and semi-wooded areas. Several families of young were noticed with adult birds. The song of this chickadee is similar to that of *Penthestes atricapillus,* though a little shorter and of higher pitch. We collected 6 males and 7 females at Fox Bay June 19 to 30.

**Sitta canadensis canadensis* Linnaeus. RED-BREASTED NUTHATCH.—Reported common by Verrill, Dionne, and Brooks, while Lewis (1924) reports, "Two observed at Ellis Bay on June 14 and again on June 15, 1922."

But 6 Red-breasted Nuthatches were observed by our group during the entire time spent on the island. They were noted both at the Fox Bay and Eel Falls camps.

Certhia familiaris anticostiensis subsp. nov. ANTICOSTI BROWN CREEPER.

Sub-specific characters.—Similar to *Certhia familiaris americana,* but adult above decidedly more grayish (less ochraceous), and averaging more whitish below; juvenile, much more grayish above than is the juvenile of *Certhia familiaris americana,* and also much more whitish below (less buffy or grayish). Similar to *Certhia familaris montana,* but smaller, especially the bill and wing; also averaging more whitish below, especially in juvenile plumage.

Measurements.—Adule male (1 specimen): Wing, 63.5; tail, 55; exposed culmen 14; tarsus, 15. Adult female (1 specimen): wing, 64; tail, 58; exposed culmen, 14; tarsus 14.5.

Type.—Adult female No. 38069, Cleveland Museum of Natural History, Eel Falls (altitude 250 feet), Fox Bay, Anticosti Island, June 28, 1937; Frank W. Braund and E. Perry McCullagh.

Range.—To the best of our knowledge, confined to Anticosti Island. Lewis (1926) reported this bird on Anticosti May 26, 1926 1¼ miles south of Port Menier.

We found the Brown Creeper uncommon and localized in places containing dead timber with decaying stumps. On June 28, while working an area one mile west of the Eel Falls camp, we observed 5 individuals about dead spruce stumps. The next day Moulthrop found 7 in a similar place, along a ridge 1½ miles east of Eel Falls. The only other Brown Creeper noted was a single bird in a fallen tree area along Deep Bay river.

Specimens collected: 1 ♂, 1 ♀, 1 juv. ♀, Eel Falls, June 28.

* *Nannus troglodytes hiemalis* (Vieillot) EASTERN WINTER WREN.—Although Lewis (1924) considered this wren "fairly common" at Ellis Bay in June, 1922, we found it rather rare. It was observed only in the vicinity of the Eel Falls camp. There we collected a male and saw another individual along the spruce ridges and heard a third singing in a densely foliaged spruce.

Mimus polyglottos polyglottos (Linnaeus). EASTERN MOCKINGBIRD.—Schmitt (1904) collected a single specimen at English Bay on August 8, 1902.

**Turdus migratorius migratorius* Linnaeus. EASTERN ROBIN.—All naturalists who have visited Anticosti Island agree about the abundance of this species. We found it extremely abundant all along the sea coast, diminishing in numbers inland to the first ridge where, at Eel Falls, none were seen or heard. We collected one adult female at Fox Bay June 19. While Robins usually are somewhat pugnacious, those on Anticosti seem especially resentful of having their territory invaded. In exploring along the sea coast one's progress was continually dogged by scolding, protesting Robins. Nests were observed at low elevations on dense horizontal

limbs of the spruce. A set of 4 eggs collected June 19 were about half incubated but a set of 3 taken on June 24 proved to be fresh.

Hylocichla guttata faxoni Bangs and Penard. EASTERN HERMIT THRUSH.—Verrill (1862a) and Dionne (1920) list this species as common. Brewster (1884) called it "abundant." Lewis (1924) saw 2 at Ellis Bay.

**Hylocichla ustulata almae* Oberholser. ALMA'S THRUSH.—One of the most interesting discoveries arising from the study of our collection was that the Olive-back Thrush of Anticosti Island belongs to the Rocky Mountain race. Here is another case like that of *Hylocichla fuscescens* and *Melospiza georgiana,* where the supposedly western subspecies has been found to occur also on the Atlantic Coast to the north of the eastern race. It will be interesting to see whether examination of specimens of *Hylocichla ustulata* from northern Ontario and Quebec will show that *H. u. almae* has an unbroken range across northern North America, from the Rocky Mountains to the Gulf of St. Lawrence.

This thrush appeared to be rather common inland in the more densely wooded areas. The extreme shyness of the birds made it almost impossible to approach near enough to make positive identification by sight. At the Eel Falls camp, on June 28, 20 singing males were heard during the early morning and late afternoon hours. We collected a female near Fox Bay on June 25 and a male at Eel Falls on June 29. A set of 3 eggs taken near Fox Bay on June 25 proved to be slightly incubated.

Hylocichla fuscescens subsp. VEERY.—Schmitt (1904) reports this species fairly common in summer. Brewster (1884) saw a pair at Ellis Bay on June 24.

Sialia sialis sialis (Linnaeus). EASTERN BLUEBIRD.—Schmitt (1904) found it rather rare.

**Regulus satrapa satrapa* (Lichtenstein) EASTERN GOLDEN-CROWNED KINGLET.—Schmitt (1904) reports this kinglet as rather rare. We collected a male at Eel Falls on June 29 as it was singing in the upper branches of a spruce at the edge of a muskeg.

**Corthylio calendula calendula* (Linnaeus). EASTERN RUBY-CROWNED KINGLET.—There seems to be a variance of opinion in regard to the abundance of this species. Schmitt (1904) records it as rare, Lewis (1924) writes, "not common at Ellis Bay, June 1922," while Dionne (1920) reports it as common. Brewster (1884) saw a female at Fox Bay July 11.

We found this kinglet rather common in the vicinity of the Fox Bay camp where on June 23, seventeen were reported as seen or heard singing. A few were noted at the Eel Falls camp along the wooded ridges. On the whole, they seemed to prefer the thinly wooded area to the larger and denser growths. We collected two males at Fox Bay (June 18 and 25).

Anthus spinoletta rubescens (Tunstall). AMERICAN PIPIT.—Schmitt (1904) found them fairly common in summer, while Dionne (1920) found them common especially in autumn. Brooks (1919) saw 2 flocks in September.

Bombycilla cedrorum Vieillot. CEDAR WAXWING.—Schmitt (1904) lists it as a rather rare summer visitor.

Lanius exubitor borealis Vieillot. NORTHERN SHRIKE.—Schmitt (1904) reports a few individuals seen in late April but more in autumn. Dionne (1920) lists it as common.

Vireosylva olivacea (Linnaeus). RED-EYED VIREO.—Verrill (1862a) seems to be the only naturalist to date to list this species for Anticosti Island. Although he considered it common, we saw but 2, evidently a pair, at Fox Bay on June 18.

Mniotilta varia (Linnaeus). BLACK AND WHITE WARBLER.—Brewster (1884) heard a male singing at Fox Bay on July 9, and collected one July 11. Dionne (1920) found it rather rare. Brooks (1919) saw several in September. Lewis (1924) found it rather common at Ellis Bay in June, 1922.

**Vermivora peregrina* (Wilson). TENNESSEE WARBLER.—Macoun (1909) quotes Brewster as writing, "The only specimen noticed was shot at Fox Bay, Anticosti, July 11." Lewis (1924) saw 2 individuals at Ellis Bay 1922.

We collected 5 males at Fox Bay June 18 to 27. This warbler was not as common as the number of specimens collected might indicate, being probably the least numerous of the warblers observed on the island. They preferred the sparse spruce woodlands of the soft mucky valleys, or the areas along the fast running brooks and streams.

Vermivora ruficapilla ruficapilla (Wilson). NASHVILLE WARBLER.—Lewis (1924 saw 2 individuals of this species at Ellis Bay June 13, 1922.

Compsothlypis americana pusilla (Wilson). NORTHERN PARULA WARBLER.—Brewster (1884) saw a single male at Fox Bay, July 11.

**Dendroica aestiva amnicola* Batchelder. NEWFOUNDLAND YELLOW WARBLER.—Yellow Warblers of Anticosti Island proved to belong to the same race as Newfoundland birds instead of *D. ae. aestiva,* the race common to most other sections of eastern North America.

Verrill (1862a) reports seeing a few; Lewis (1924) lists them as fairly common at Ellis Bay June, 1922. Brewster (1884) writes, "One of the most abundant of its family at Fox Bay."

We found Yellow Warblers uncommon. On June 23, while walking along the ridge, one mile west of the Fox Bay camp, and within 50 yards of a calm sea, we observed 5 of these birds in a hundred yard area. A diligent but unsuccessful search was made through the sapling spruce for possible nests. The following day, in same locality, 2 Yellow Warblers were observed, but no other individuals were encountered during our visit on the island. We collected 2 males and one female.

**Dendroica magnolia* (Wilson). MAGNOLIA WARBLER.—Brewster (1884) lists this species as "More abundant than any other species of its family at Fox and Ellis Bays." Verrill (1862a) collected a specimen at Ellis Bay. Dionne (1920) and Lewis (1924) found it common.

This was a common species in the cut-over areas and sapling growths along the coast. Magnolia Warblers were observed at the Fox Bay camp at Deep Bay and Salmon River locations, but none in the interior or in the vicinity of the Eel Falls camp. We collected 5 males at Fox Bay, June 19 to 26.

Dendroica caerulescens caerulescens (Gmelin), BLACK-THROATED BLUE WARBLER.—Although this species is apparently unrecorded by former students of Anticosti birds, on two occasions (June 18 and 22) we heard males singing in the dense spruce boughs. Each time a patient wait of about half an hour finally resulted in a view of the songster.

**Dendroica coronata coronata* (Linnaeus). MYRTLE WARBLER.—This species was reported by past writers as common on Anticosti, with which opinion we are in accord. The general habitat of the Myrtle was much more diversified than that of the Magnolia Warbler. It appeared commonly in the second-growth spruce groves along the coast, and equally in the wooded spruce forests, inland. During a half day's exploration of the upper waters of Fox River, 7 singing males were seen or heard. We collected 4 males and 4 females on Anticosti.

A nest with 3 fresh eggs found in this locality June 18 was composed of small spruce twig ends interwoven with medium sized dry grasses, lined with the white hair from the tail of the Virginia deer and a half dozen small feathers. The nest straddled a crotch of a densely foliaged sapling spruce limb, 3 feet from the ground, and was so well concealed that a stray protruding straw provided the only clue to its location.

**Dendroica virens virens* (Gmelin). BLACK-THROATED GREEN WARBLER.—Brewster (1884) saw this species at Fox and Ellis Bays. Dionne (1920) and Brooks (1919) also observed it on Anticosti. Lewis (1924) found it common at Ellis Bay in June, 1922.

We found this warbler very abundant throughout the areas explored, with a seeming concentration along the heavily wooded ridges in the vicinity of the Eel Falls camp, where on June 29, 36 individuals were seen or heard singing. The territory of the singing males averaged about 200 yards in diameter. Although the birds were concealed in the dense growth of spruce, their incessant insect-like song betrayed their presence as we walked for miles along the ridge. We collected 4 males at Fox Bay and 3 at Eel Falls.

**Dendroica breviunguis* (Spix). BLACK-POLL WARBLER.—Brewster (1884) records Black-poll Warblers as "Decidedly the most numerous of the warblers on the Magdalen islands, and fairly common at Anticosti as well." Lewis (1924) says "They are fairly common at Ellis Bay June, 1922." Dionne (1920), however, refers to this warbler as "rather rare."

In our experience this species proved to be one of the most abundant of the warbler group, outnumbered only by the American Redstart. While the Black-poll was observed throughout the area covered, its concentration appeared to be along the coast, where on June 23, 22 individuals were observed in the vicinity of the Fox River camp. We collected 4 males and 8 females there.

Seiurus aurocapillus (Linnaeus). OVEN-BIRD.—Verrill (1862a) obtained a specimen at Ellis Bay July 15. Brewster (1884) observed a single pair at Ellis Bay July 24. Schmitt (1904) and Dionne (1920) both list it as rather rare. Lewis (1924) saw two on June 13, 1922 and one on June 15.

We saw but one pair, and that on June 29, in a damp and boggy area bordering a muskeg. The male was heard and seen singing, and the female was shortly afterwards flushed from a dense growth of vegetation.

Seiurus noveboracensis noveboracensis (Gmelin) NORTHERN WATER-THRUSH.—Brooks (1919) saw several near Ellis Bay. Lewis (1924) saw one on June 13, and three on June 14, 1922. Lewis (1926) considered this species fairly common after May 28.

***Geothlypsis trichas pelagitis** subsp. nov. ANTICOSTI YELLOW-THROAT.

Sub-specific characters.—Similar to *Geothlypis trichas brachidactyla* but smaller, the upper surface duller and more grayish (less greenish or yellowish). Crissum duller.

Measurements.—Adult male (3 specimens): wing 52.5-58 (average 54.83) mm.; tail 47-52.5 (49.75); exposed culmen, 10.5-11 (10.83); tarsus, 19.5-21 (20.5).

Type.—Adult male, No. 38070, Cleveland Museum of Natural History; Eel Falls, altitude 250 feet, Fox Bay, Anticosti Island; June 28, 1937; Frank W. Braund and E. Perry McCullagh.

Geographic Distribution.—Apparently confined to Anticosti Island. Lewis (1924), Verrill (1862a), and Schmitt (1904) found Yellow-throats to be common on Anticosti Island, while Dionne (1920) found them rare, and Brooks (1919) saw only three.

We found this Yellow-throat common along the marshy borders of the muskeg areas in the vicinity of the Eel Falls camp, where on June 23, 17 were seen.

Specimens collected: 3 males, Fox Bay and Eel Falls, June 23 to 28.

Wilsonia pusilla pusilla (Wilson). WILSON'S WARBLER.—Schmitt (1904) found this species rather rare. Brooks (1919) saw them on August 24 at Ellis Bay. Brewster (1884) saw adults feeding young at Ellis Bay. Lewis (1924) found them common at Ellis Bay.

Wilsonia canadensis (Linnaeus). CANADA WARBLER.—Dionne (1920) saw but two. Lewis (1924) writes, "In a letter dated January 11, 1924, Mr. Willie La Brie has kindly furnished me with the following details concerning the observations, made by him, upon which Dionne's record, quoted above, was based: 'I found a pair of these birds, male and female, during the summer of 1917. I saw this pair several times, and I believe that they nested there, for I saw the female in June carrying

fibrous material in her beak. I saw the same pair again in July, at the same place, apparently much distressed at my presence, causing me to believe that their nest must be near. I saw only this pair.'"

**Setophaga ruticilla ruticilla* (Linnaeus). American Redstart.—Brewster (1884) found this bird not uncommon at Ellis and Fox Bays. Verrill (1862a) and Dionne (1920) reports them as common. Lewis (1924) found them "Very common at Ellis Bay in June, 1922."

We consider this warbler the most abundant of all the land birds occurring on the north shore of Anticosti. There appeared to be no variation in abundance in any of the areas visited except the muskegs. One forenoon Braund explored a group of small lakes situated 3 miles west and along the coast from the Fox River camp. The route to this location was along the wind-swept and storm-blown cliff summits where great areas of up-rooted, twisted spruces lay dead and bleached in windrows. The only bird observed in the 3 miles of travel was the Redstart. Our records show 42 Redstarts observed on June 24. We collected 8 males and 2 females at Fox Bay June 18 to 24.

On June 22, Braund heard what appeared to be a singing male in a spruce, and after establishing his location, he watched the bird through his glasses and took it to be a young male in immature plumage in full song. When he collected the bird it proved to be an adult female.

Passer domesticus domesticus (Linnaeus). English Sparrow.—Schmitt (1904) collected a male and a female and saw another female at Ellis Bay in December, 1901.

**Euphagus carolinus* (Müller). Rusty Blackbird.—The Rusty Blackbird is not a very common species, as is attested by Lewis (1926) who saw but one at Port Menier; Lewis (1938b), however, saw 12 near Port Menier on July 16. Dionne (1920) "observed a small flock."

A few pairs of Rusty Blackbirds were noted by our party in the vicinity of the salt water lagoons of Fox River and, from their actions, appeared to be nesting or attending young. At the wooded edge of a muskeg south of the Eel Falls camp a pair harried our progress with open beaks and out-spread wings but we failed to find the nest. We collected 2 males at Fox Bay, June 23 to 24.

**Quiscalus aeneus* (Ridgway). Bronzed Grackle.—Lewis (1926) frequently observed this bird at Port Menier, but Dionne (1920) says it is apparently rare.

We found this species a little more numerous than the Rusty Blackbird and occupying the same general habitat. We observed the Bronzed Grackle at Ellis Bay on the southwestern point of the island, as well as on the north shore. On June 24, a juvenile grackle, barely able to fly, was noticed at the Fox Bay camp. We collected a male and a female at Fox Bay June 18 to 19.

Molothrus ater ater (Boddaert). Eastern Cowbird.—Lewis (1924) saw a male in a cage at Ellis Bay, taken on the island.

Hedymeles ludovicianus (Linnaeus). Rose-breasted Grosbeak.—Schmitt (1904), verified by Dionne, collected this species on Anticosti and lists it as rare.

Spiza americana (Gmelin). Dickcissel.—We quote from Lewis (1924), "Dionne: Accidental. Mr. La Brie found a specimen dead on the island. This specimen was examined by Dionne. This specimen is now mounted and in Mr. La Brie's private collection, where I have seen it."

**Carpodacus purpureus purpureus* (Gmelin). Eastern Purple Finch.—Lewis (1924) observed two at Ellis Bay June 14, 1922 and saw other locally captured caged individuals. Although Lewis (1926) saw several daily at Ellis Bay in late May, 1926, we found it only in the second growth spruce in the vicinity of the Fox Bay camp. Our records show but 6 individuals seen or heard, 3 of which we collected.

Pinicola enucleator eschatosus Oberholser. Newfoundland Pine Grosbeak.—Schmitt (1904) lists this species as fairly common throughout the year. Dionne (1920) found it fairly common.

Spinus pinus pinus (Wilson). Northern Pine Siskin.—Brewster (1884) found it in flocks on July 24 at Ellis Bay. Schmitt (1904) considered it a fairly common permanent resident bird, breeding on the island. Brooks (1919) saw a large flock September 3. Lewis (1924) observed 3 at Ellis Bay on June 14.

**Spinus tristis tristis* (Linnaeus). Eastern Goldfinch.—Henry Mousley (1932) found this species common on August 23, near St. Lambert, Quebec, and states that many nest. Brewster (1884) found them common at Gaspé, Quebec, "but not common anywhere else on the Gulf of St. Lawrence." On Anticosti Island Dionne (1920) found it rare. Brooks (1919) "saw a small flock on September 3." Lewis (1924) saw two on June 14 and one June 15 at Ellis Bay.

Since the time of our visit on the island was a little ahead of the breeding season of this species, it may have been more abundant than our observations would indicate. On June 26 at Fox Bay a flock of 5 was noted and a female collected, while on June 28 a flock of approximately 40 was seen in the vicinity of Eel Falls camp.

Loxia leucoptera leucoptera (Gmelin). White-winged Crossbill.—Brewster (1884) saw a flock of 8 or 10 at Ellis Bay on July 24. Schmitt (1904) writes "fairly common throughout the year." Lewis (1924) says Taverner saw 2 at Ellis Bay July 13, 1915. Brooks (1919) saw a single bird at Ellis Bay August 28, 1919. Dionne (1920) says that these crossbills were fairly common.

**Passerculus sandwichensis labradorius* Howe. Labrador Savannah Sparrow.—The various observers of the avifauna of Anticosti agree on the abundance of this species. We found the Savannah Sparrow common inland, on the dryer areas surrounding the muskeg, as well as along the coast. In the vicinity of the Eel Falls camp on June 29 fifteen were observed, and in the numerous bogs bordering Fox River, several pairs were seen. On a low ridge between the sea and one of these bogs a nest with 3 fresh eggs was found, concealed in a tuft of grass. The nest was composed of coarse native grasses, becoming progressively finer inward, to the lining, which was composed of fine dry grasses. The outside dimensions of the nest were 6 inches across by 3 inches deep; the bowl had a diameter of 2¼ inches, and a depth of 1¼ inches. A nest found at Eel Falls June 29 contained 4 slightly incubated eggs. We collected 6 adult birds, 3 of each sex.

The discovery that the breeding Savannah Sparrows of Anticosti Island are *labradorius* extends the range of that form slightly southward from the Mingan Islands, where it was recorded by Peters and Griscom (1938).

**Junco hyemalis hyemalis* (Linnaeus). Slate-colored Junco.—Verrill (1862a) found this species common in summer. Dionne (1920) and Schmitt (1904) report them common, while Lewis (1924) writes "not common at Ellis Bay in June, 1922."

Juncos proved to be fairly common in the dryer, sparsely wooded areas visited by us, as well as the wooded ridges. While no nests were found, it was noticeable that when seen, the birds were paired. We collected 5 males and one female.

Spizella arborea arborea (Wilson). Eastern Tree Sparrow.—Verrill (1862a) found this species common and breeding; Brewster (1884) records one as collected. Dionne (1920) considers it rare. Lewis (1924) doubts that it breeds, though considers that it may to some extent.

Spizella passerina passerina (Bechstein). Eastern Chipping Sparrow.—Lewis (1924) heard and saw 2 males in song at Ellis Bay on June 14 and again on June 15, 1922. Lewis (1926) records one individual at Port Menier on May 30, 1926.

Zonotrichia leucophrys leucophrys (Forster). White-crowned Sparrow.—Schmitt (1904) and Dionne (1920) both list it as rather rare. In 1922 Lewis (1924) was shown a locally taken caged bird and on his later trip (1926) found the species in small numbers from May 20 to June 1.

**Zonotrichia albicollis* (Gmelin). White-throated Sparrow.—Verrill (1862a) writes of this species "By far the most common singing bird on Anticosti." All other writers agree as to its abundance.

We also found the White-throated Sparrow an abundant bird in the vicinity

of both our camps, occurring in the dry localities of the grassy, second growth spruce areas, as well as the dry grassy borders of the muskegs. Its nests were on the ground, well concealed in the high grass at the bases of spreading spruce saplings. A male sang continuously during the daylight hours scarcely a 100 feet south of our Fox River camp, and though we spent several hours from time to time attempting to discover a nest, we were unsuccessful. We took 5 specimens at Fox Bay, June 18 to 23.

**Passerella iliaca iliaca* (Merrem). Eastern Fox Sparrow.—A variance of opinion exists among the previous observers of Anticosti Island birds in regard to the abundance of this species. Verrill (1862a) reports it common and breeding; Brewster (1884) found it "Particularly abundant at Fox Bay"; Dionne (1920), Brooks (1919), and Lewis (1924), found it common. Schmitt (1904), on the other hand, considered it rather rare. We found the Fox Sparrow uncommon and observed it only in the vicinity of the Fox Bay camp and along the sea coast. Our records show a total of but 6 individuals seen or heard. On June 30, at Deep Bay (9 miles west of Fox River) a pair was seen feeding fully feathered young. We collected 2 adult males and a juvenile female at Fox Bay, June 23 to 26.

Verrill (1862b) described a new species of *Passerella* from Anticosti Island, but subsequent examination of the type by Bangs (1930) has shown it to be an immature specimen of *iliaca*.

Melospiza lincolni lincolni (Audubon). Lincoln's Sparrow.—Brooks (1919) collected a female September 6. Lewis (1926) saw one at Port Menier on May 23, and again on May 29; also he (1938b) heard two singing there July 16, 1938.

**Melospiza georgiana ericrypta* Oberholser. Western Swamp Sparrow.—Lewis (1924) found the Swamp Sparrow rather common at Ellis Bay in June, 1922. Brewster (1884) lists it as abundant. Schmitt (1904) reports it as rare in summer. Dionne (1920) writes "Fairly common." Brooks (1919) says, "Apparently rare. One taken at Ellis Bay September 5."

We found the Swamp Sparrow fairly common and in about equal numbers at the Eel Falls camp and the Fox Bay camp. It definitely preferred the wet grassy areas of the muskeg and the boggy marshlands along the coast line. We collected 5 males and 3 females at Fox Bay, June 18 to 28. Nests were situated 6 to 12 inches above the ground in the thick high grass, usually under dwarf spruces. A nest collected June 24 is similar in construction to that of the Savannah Sparrow and measured 4½ inches in diameter by 2¼ inches deep, with a bowl diameter of 2¼ inches and a depth of one inch. This nest contained 4 fresh eggs as did another nest found there June 19.

The discovery that the breeding swamp Sparrows of Anticosti Island are *Melospiza georgiana ericrypta* Oberholser (1938) extends the range of that supposedly western form from the prairie region of Canada to the Gulf of St. Lawrence, and is one more example of the discovery in northeastern America of subspecies first described from the west. It still remains to be demonstrated, however, that the ranges of these western forms across Canada to the Atlantic Coast are continuous.

Melospiza melodia melodia (Wilson). Eastern Song Sparrow.—Dionne (1920) records this bird as very rare. Lewis (1924) saw a singing male at Ellis Bay June 14 and 15, 1922. Lewis (1926) writes, "Remains rare in the vicinity of Port Menier. But three individuals recorded."

This bird proved an elusive species which defied our collecting. It was heard singing on two occasions and was seen on two others, between June 18 and 22.

Calcarius lapponicus lapponicus (Linnaeus). Lapland Longspur. Dionne (1920) lists it as common, presumably in migration only.

Plectrophenax nivalis nivalis (Linnaeus). Eastern Snow Bunting.—Schmitt (1904) and Dionne (1920) list this species as common during migration, spring and fall. Lewis (1926) saw a flock of thirteen on May 20, fifteen on May 21.

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Cleveland, Ohio

Ornithological News

During the month of April the American Museum of Natural History exhibited a "one-man show" of bird paintings by George Miksch Sutton.

Paul Geroudet, editor of *Nos Oiseaux,* has been mobilized and Alfred Mayor is assuming his duties for the present.

Dr. Stresemann writes that Dr. H. Sick is "still in eastern Brasil, unable to return from there and is making the best use of his time by studying the life history of various tropical birds, especially the Pipridae."

The program of the Eighth American Scientific Congress held in Washington May 10 to 21 included ornithological papers by Frank M. Chapman, I. N. Gabrielson, Ludlow Griscom, W. H. Phelps, Oliverio Pinto, and William Vogt.

Many of our readers will probably be surprised to learn that Florence M. Bailey's "Birds of New Mexico" is still available at the original price of $5.00 ($10.00 for the deluxe edition). Orders should be directed to the "Department of Game and Fish, Santa Fe, New Mexico."

GENERAL NOTES

Leach's Petrel in Ontario.—On July 19, 1939, A. Burrelle of Cornwall, Ontario, took the first Leach's petrel, *Oceanodroma l. leucorhoa,* to be recorded for the Province. Mr. Burrelle noted the bird as different, picked it up and mounted it for preservation. It was found about two miles below Cornwall, Stormont County, on the St. Lawrence river and the mount is now in the Royal Ontario Museum of Zoology.

Weather conditions, gales blowing inland from the seas, are supposed to be responsible for such oceanic strays. In this instance the weather had been fine for a number of days previously. A. J. Connor, Meteorological Division, Department of Transport, Canada, states in a letter: "For some days prior to the 19th there was a general tendency to north and northwest winds in the region of the Ottawa river, while about 8 A.M., on this date, the wind over Lake Ontario changed to a southerly direction for a few hours."—G. C. Toner, *Cataraqui, Ontario.*

European Widgeon at Pymatuning Lake, Pennsylvania.—On April 27, 1940, a male European Widgeon (*Mareca penelope*) was seen on the west shore of Pymatuning Lake by the writer, Vera Carrothers, Margarette Morse, and Mrs. Skaggs. The bird was viewed at about 80 feet in a good light and was in company with about 35 Baldpates. All of the ducks were in a little puddle in a field about 150 yards from the Ohio state line and were observed from our auto on U.S. highway No. 322.—M. B. Skaggs, *Julian Road, South Euclid, Ohio.*

Crow Depredation on Heron Nesting Colonies.—In April 1939, a large colony of Little Blue Herons (*Florida caerulea*) and Snowy Egrets (*Egretta thula*) was found nesting in an "island" of timber known as the "Live Oaks" on the coastal prairie 9 miles south of Waller in Waller County, Texas. Within the woods, which covers about 300 acres, the land is low and poorly drained, and a creek which flows through the area spreads out to form several meanders. The birds were first observed on April 4 by Valgene W. Lehmann and the writer, and by April 10, approximately 1,500 Little Blue Herons and 3,000 Snowy Egrets were breeding. Their nests were concentrated in an area covering less than one acre. Nests were constructed in trees and shrubs from 6 to 30 feet above ground.

Crows (*Corvus brachyrhynchos*) discovered the nests before egg laying was completed, and by April 17 every nest containing heron and egret eggs had been destroyed. The only evidence remaining of their attempt to nest was empty nests and broken shells covering the ground. Most of the birds lingered about the area for some time; on April 20 many were seen congregated at ponds and along the winding creek. By April 30, however, 90 per cent of the herons and egrets had left the place.

Approximately 750 Black-crowned Night Herons (*Nycticorax naevius*) and 1,000 Yellow-crowned Night Herons (*Nyctanassa violacea*) also were observed nesting at the "Live Oaks." The Night Herons began nesting shortly before the Blue Herons and Egrets, and by April 20 most of the birds had been incubating eggs for some time. They were not nesting in a concentrated group. The nests, usually 30 feet or more above the ground, were spread throughout the area with never more than three or four in a single tree or group of trees. Crows were seen to attack Night Heron nests as early as April 20, although remains of from one to four eggs which were found beneath trees containing Night Heron nests gave evidence that predation had been going on prior to that date. The herons paid little attention to the Crows and permitted as many as two at one time to raid a nest and carry off eggs in their beaks. Several hours of observation on April 26

showed that Night Heron nests were not being molested seriously, and later observations indicated that many of the nests were escaping the ravages of the Crows.

The total number of Crows inhabiting the "Live Oaks" was estimated at less than 40. These apparently were breeding at the time of the nesting of the herons; one nest was found. Crows were observed to carry off eggs of the herons in their beaks and also to eat their contents at the victim's nest. Observations and broken shells examined indicated that the damage was done almost entirely by Crows. Several hundred Turkey and Black Vultures roosted at the area, but they were not seen to take part in the destruction. Blue Jays were common in the woods too, but none was observed at heron nests and two stomachs examined revealed no evidence of eggs. Mammals were probably responsible for some damage, since droppings (thought to be those of either racoon or opossum) containing heron egg shells were found in the fork of a live oak tree.

It appears, then, that Crows may be destructive to concentrated nesting colonies of Little Blue Herons and Snowy Egrets whose eggs form a readily available food supply for the young, but considerably less destructive to Night Herons whose breeding habits do not limit them to such small areas.—Rollin H. Baker, *Texas Cooperative Wildlife Research Unit, College Station, Texas.*

English Sparrow with an Abnormal Bill.—After seeing a notice in the "Martinsburg Journal" of the finding of a strange bird which appeared to be "a cross between a starling and a sparrow," I went to Mr. Clowser who had kept the "hybrid" in a glass jar outside the window of his barber shop. The bird proved

Figure 1. Sickle-billed English Sparrow.

to be an adult male English Sparrow, *Passer domesticus.*

The bird was caught in the Central Theater, in Martinsburg, West Virginia, on the morning of January 16, 1940, and it was thought to have gotten into the building through a ventilator fan. Mr. Clowser took the bird to his shop, hoping that it would survive. It was fed that day and Mr. Clowser stated that the sparrow turned its head sideways while eating. The next day it died.

In the picture there is noticeable the head of a pin which was run through the orbits to hold the bird to the backboard while it was photographed. The curved length of the upper mandible measured 36 mm. The lower mandible seemed to be somewhat atrophied. Unfortunately, I was unable to obtain the bird for a more complete examination and dissection. Aside from the deformed beak it appeared to be quite normal. J. Lloyd Poland, *Department of Botany and Zoology, West Virginia University, Morgantown, West Virginia.*

Mississippi Bird Records.—I wish to thank Dr. Alexander Wetmore, U.S. National Museum, Washington, D.C., for these subspecific identifications and for confirming my identification of the Swainson's Warbler.

Sanderling, *Crocethia alba.* A specimen was collected August 17, 1939, at Legion Lake, two miles south of Rosedale, and is probably the first one collected in this section of the state.

Northern Carolina Chickadee, *Penthestes carolinensis extimus.* This form has not heretofore been reported from the state. A bird was found dead on the highway just south of Columbus, Mississippi, April 29, 1932, and proved to be *extimus.*

Swainson's Warbler, *Limnothlypis swainsoni.* A bird collected July 17, 1939, a male, was this species. A pair was noted at the time. The specimen was in partial moult and probably nested in the small woods where collected. It was taken one-half mile south of Moorhead, Sunflower County.

Labrador Savannah Sparrow, *Passerculus sandwichensis labradorius.* A bird taken January 7, 1937, a female, at Legion Lake, two miles south of Rosedale was identified as this form. I find no record of this race having been taken in the state.—M. Gordon Vaiden, *Rosedale, Bolivar County, Mississippi.*

Wilson Ornithological Club Library

The following gifts have been received:
Herbert Brandt—"Texas Bird Adventures."
Ducks Unlimited—"1938–1939 Census and Record Book."
James C. Greenway—1 reprint.
R. A. Johnson—8 reprints.
Leon Kelso—1 reprint.
Margaret M. Nice—complete set of own reprints.
Frank A. Pitelka—8 reprints.
Dayton Stoner—1 bulletin
E. L. Sumner, Jr.—1 reprint.
Texas Game, Fish and Oyster Commission—4 pamphlets.
W. J. Willis—50 magazines.

EDITORIAL

Our Associate Editor, Margaret Nice, reminds us that many Wilson Club members are in a position to gather important bits of missing data on the breeding habits of American birds but are often failing to do so because they overlook the need.

Some of the chief lacks in our knowledge of even common species are accurate records on: size and method of choosing and defending territory; exact share of the sexes in nest-building, incubation, and in care of the young; length of incubation period; time of laying individual eggs; length of time young stay in the nest; age when young become independent; and number of broods raised.

Many of these points are not known for species that are very familiar to most of us. Even if someone has already published on some of these items for the species you are studying, it will be well to check to confirm or correct that data.

The utmost accuracy and attention to detail is essential when gathering such data. For example, the incubation period should be counted from the laying of the last egg to the hatching of that egg. Or it may be counted from the laying to the hatching of a given marked egg, provided there is exact information on the time when incubation began. As soon as each egg is laid it can be marked with India ink, using a grass stalk as a pen.

We are indebted to Frank W. Braund and E. Perry McCullagh for assistance which enables us to print more pages this month without extra strain on the Club's slender resources.

The Local Committee on Arrangements for the Annual Meeting in Minneapolis next fall has been holding preliminary meetings and reports that headquarters will be next to the Museum of Natural History in a building known as the "Center for Continuation Study." Rooms and meals will be available there at reasonable rates.

The meeting promises to be an unusually interesting one and members should begin to make plans to attend this, our first Minnesota meeting.

OBITUARY

Dr. Wilfred A. Welter of Morehead, Kentucky, was killed in an automobile accident near Chicago on December 20, 1939. He was Professor of Biology at Teachers College, Morehead, and had published several ornithological papers in *The Wilson Bulletin* and other journals.

Albert R. Brand of Cornell University died March 28, 1940, at his home in Ithaca after a long illness. He was formerly a banker and stock broker in New York City and after retiring from business at the age of 40, had become an outstanding authority on the recording and study of bird song by means of sound film.

The Rev. F. C. R. Jourdain, the eminent authority on the life histories of European birds, died in England on February 27, 1940.

Henrik Grönvold, the celebrated bird artist, died in England on March 22, 1940, at the age of 81. Although born and trained in Denmark, he had lived in England since 1892.

ORNITHOLOGICAL LITERATURE [1]

FALCONRY. A HANDBOOK FOR HUNTERS. By William F. Russell, Jr. Drawings by W. D. Sargent and photographs by the author. Charles Scribner's Sons, New York, 1940: 6 x 9 in., ix + 180 pp., 6 pls., 12 figs. $2.50.

With the ever increasing interest in birds as a source of recreation and study, it is quite likely that the ancient sport of falconry will again come into its own. In fact, if this inspiring book on falconry reaches the hands of bird-lovers and sportsmen with ample leisure time, it is safe to say that it will come into its own very soon.

Mr. Russell has written this book for the beginner. After considering in his first chapter the four problems with which the prospective falconer is faced, namely, leisure time, what to catch, where the sport may be practiced, and learning how to train and hunt with falcons, he presents a series of chapters dealing with an orientation in the field of hawks, methods of trapping, "manning," and training hawks, the various techniques in hunting such birds as crows, magpies, and game, and the care and management of hawks. He devotes his final chapter to a description of implements and to a glossary. The beginner will find this glossary indispensable since the author faithfully uses the traditional terminology of the sport.

Ornithologists and bird-lovers who are skeptical of falconry, thinking it a cruel sport or a subversive influence in the conservation of hawks, must read this book. They will find that the successful falconer has a deep affection for his birds and gives tireless consideration for their well-being and comfort. Furthermore, they will find that falconry indirectly encourages hawk conservation. A falconer must obtain his hawks alive, either by trapping (a tedious and difficult task in itself), or by taking "eyases" from the nests. Consequently there must be a constant supply of them. Ruthless shooting of hawks decreases his chances of successfully trapping a few individuals; taking all young from nests discourages renesting on succeeding years. In other words, a falconer is interested in perpetuating hawks rather than in wiping them out!

This book contributes considerable interesting information to our knowledge of hawks, particularly their behavior and feeding habits. Ornithologists, however, will be likely to question a number of statements made by the author. For instance, he intimates (p. 13) that "old hawks" in the wild lose their fear of man Accipiters (p. 23) soar in the air only to cool themselves. The tooth on the upper mandible of the falcon's bill (p. 22) is used to sever the spinal cord in the neck of their prey, thus bringing about a quick and painless death, whereas the Accipiters (p. 23), whose beaks are not adapted for severing the spinal cords of their prey, must kill by the pressure which their powerful feet and talons can produce.

The most important treatises on falconry are listed in a brief bibliography. As the author states elsewhere in his text, all of them are either out of print or difficult of access. The well-known article by Louis Agassiz Fuertes, "Falconry, the Sport of Kings," (*Nat. Geogr. Mag.*, 38, 1920), is not included. This article together with the present book constitute the only two important treatises on falconry yet published in America. There is an adequate index.—O. S. Pettingill, Jr.

BIRDS OF THE UPPER PENINSULA OF MICHIGAN. By Leonard Wing. Research Studies of State College of Washington, 7, No. 4, Dec., 1939 [published about Apr. 1, 1940] :163–98, map.

The birds of the Upper Peninsula of Michigan are but poorly known and the present paper is a much needed contribution to the subject. Its title is perhaps slightly mis-leading for there is no attempt to list all species known in that area.

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[1] For additional review see page 90.

This is purely a combined report on the author's five trips, totaling about 82 days in the 16,000 square mile area.

Dr. Wing has been too modest in refraining from indicating the significance of some of his records. They include for example, the first Sharp-tailed Grouse specimen from the mainland of Michigan, the first Brewer's Blackbird record for Michigan, and the first Michigan breeding records of Blue-headed Vireo and Western Meadowlark.

Unfortunately the many signs of failure to check proof on the paper weaken our confidence in any given piece of data. Fourteen errors in 131 scientific names are too many. Also in Table 4, Tree Swallow appears as "Tree Sparrow"; and in Table 6, for the first "Black-throated Green Warbler listed (4d) one should read Black-throated Blue Warbler. On page 174, Blue-winged Teal is called *Nettion carolinense*. The second quarter of page 197 duplicates the first quarter. "Wilson's Thrush" of Tables 3, 4, 6, and 8 is apparently the equivalent of Willow Thrush of page 188.

The author has made a praiseworthy attempt to give in tabular form exact data on relative abundance of birds but his tables are inadequately labeled and those based on as little as six days' observation do not seem very significant.

In his discussion of geographical variation in *Dryobates villosus* Dr. Wing gives us nothing new except the strange and wholly unauthorized use of the word "intermediation" as a synonym for "intergradation."

It is regrettable that the author does not indicate which records are based on specimens collected.

The section on the Canada Jay is based entirely on second-hand data from untrained observers, and the taxonomic discussion of Michigan ravens loses much significance when we know that all of the specimens examined were of immature birds.

When we add to the above a count of a dozen additional misprints, we must conclude that even after seven years' delay Dr. Wing has published this paper a little too hastily.—J. Van Tyne.

SHORT PAPERS

Bissonnette, T. H. The Relation of Mating or Breeding Times of Animals to Light or Length of Day. *Amer. Biol. Teacher,* **2,** No. 3, Dec, 1939: 63–7, 74–5.

Bond, Richard M. A Goshawk Nest in the Upper Sonoran Life-Zone. *Condor,* **42,** No. 2, Mar., 1940: 100–103, 3 photos. (In Lincoln County, Nevada).

Boulton, Rudyerd and J. T. Nichols. A List of the Birds of Oyster Bay and Vicinity, Long Island. *Birds of Long Island,* No. 2, Feb., 1940: 21–54.

Chapman, F. M. The Birdman. *Nat. Hist.,* **45,** No. 3, Mar., 1940: 147–50. (An excellent discussion of the qualifications and training needed by a would-be ornithologist).

———. Further Studies of the Genus *Quiscalus*. *Auk,* **57,** No. 2, April, 1940: 225-233.

Cooke, May Thacher. Suggestions for Bird Field Study. *U.S. Biol. Surv. Wildlife Leaflet,* **BS–150,** Jan., 1940. 7 pp. (Mimeo.).

Davis, David Edward. Social Nesting Habits of the Smooth-billed Ani. *Auk,* **57,** No. 2, April, 1940: 179–218.

Davison, Verne E. A Field Method of Analyzing Game Bird Foods. *Jour. Wildlife Management,* **4,** No. 2, April, 1940: 105–116.

Deignan, H. G. Bird Study in European Museums. *Explor. and Field Work of Smiths. Inst. in 1939,* 1940: 41–4, figs. 41–44.

DeMay, Ida S. A Study of the Pterylosis and Pneumaticity of the Screamer. *Condor,* **42,** No. 2, Mar., 1940: 112–18, 3 figs. (*Chauna chavaria,* Anhimidae).

ENGSTROM, HUGH R. 1939 Minnesota Nesting Records. *Flicker,* 12, Nos. 1–2, May, 1940: 9–15.

GANIER, A. F. Notes on Tennessee Birds of Prey. *Migrant,* 11, No. 1, Mar., 1940: 1–4.

GLADING, BEN, HAROLD H. BISWELL, and CLARENCE F. SMITH. Studies on the Food of the California Quail in 1937. *Jour. Wildlife Management,* 4, No. 2, April, 1940: 128–144.

GREEN, HORACE O. Horned Larks. *Oölogist,* 57, No. 1, Jan., 1940: 8–9. (*Otocoris alpestris atlantica* subsp. nov. based on "a mated pair" collected at Revere, Mass., on April 16, 1932).

GREEN, WYMAN R. Banding of Chimney Swifts (*Chaetura pelagica*) in the Region of Chattanooga, Tennessee. *Bird Banding,* 11, No. 2, Apr., 1940: 37–57, figs. 1–7.

GRIFFIN, WM. W. Nesting Extremes for Birds Breeding in the Atlanta Region. *Oriole,* 5, No. 1, March, 1940: 1–6. (Georgia).

GRISCOM, LUDLOW. New England Migration Flyways. *Bird Lore,* 42, No. 2, Mar.-Apr., 1940: 161–8, illus.

HARRISON, B. GUY. A Visit to the Magdalen Islands. *Bull. Brit. Ornith. Club,* 60, May 3, 1940: 75–80.

HAWBECKER, ALBERT C. The Nesting of the White-tailed Kite in Southern Santa Cruz County, California. *Condor,* 42, No. 2, Mar., 1940: 106–11, 2 photos.

INGLES, LLOYD C. Some Observations and Experiments Bearing upon the Predation of the Sparrow Hawk. *Condor,* 42, No. 2, Mar., 1940: 104–5.

JONES, JOHN C. Birds Observed at Lake Vermilion, Minnesota from December 1931 to December 1933. *Amer. Midl. Nat.,* 23, No. 2, Mar., 1940: 404–20.

LACK, DAVID. The Behaviour of the Robin. Population Changes over Four Years. *Ibis,* 1940: 299–324. (*Erithacus rubecula melophilus*).

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MCCARTNEY, EUGENE S. Greek and Roman References to the Netting of Quail Migrating Across the Mediterranean Sea. *Papers Mich. Acad. Sci., Arts, and Letters,* 25, 1940: 543–552, pls. 1–3. (Modern Italian bird-netting practices figured).

MCILHENNY, EDWARD A. An Early Experiment in the Homing Ability of Waterfowl. *Bird Banding,* 11, No. 2, Apr., 1940: 58–60.

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MILLER, ALDEN H. Field Technique in Collecting for a Research Museum. *Museum News,* 17, No. 17, Mar., 1940:6–8.

———. A Transition Island in the Mohave Desert. *Condor,* 42, No. 3, May, 1940: 161–3.

MONK, HARRY C. The Upland Plover at Nashville. *Migrant,* 11, No. 1, Mar., 1940: 10–11. (Also on page 9 are listed by the editor all past references to this species in *The Migrant*).

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Solyom, Val. The Chukar Partridge in Tennessee. *Migrant,* 11, No. 1, Mar., 1940: 11–12.

Stanley, Allen J. and Emil Witschi. Germ Cell Migration in Relation to Asymmetry in the Sex Glands of Hawks. *Anat. Rec.,* 76, No. 3, Mar., 1940: 329–42.

Stiles, Bruce F. The Blue Goose as a Migrant Through Western Iowa. *Iowa Bird Life,* 10, No. 1, Mar., 1940: 5–6, illus.

Sutton, George M. Bird Notes from West Virginia. *Cardinal,* 5, No. 3, Jan., 1940: 65–7.

——— and Thomas D. Burleigh. Birds of Las Vigas, Veracruz. *Auk,* 57, No. 2, April, 1940: 234–243.

Swanson, G. and Kenneth Carlander. Summer Bird Observations at Lake of the Woods. *Flicker,* 12, Nos. 1–2, May, 1940: 1–5.

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van Rossem, A. J. The Status of Du Bus' Type of *Granatellus venustus. Proc. Biol. Soc. Wash.,* 53, Feb. 16, 1940: 13–14. (*Granatellus venustus melanotis* subsp. nov. from San Blas, Tepic).

———. A Race of the Warbling Vireo from Guerrero, Mexico. *Trans. San Diego Soc. Nat. Hist.,* 9, No. 16, April 30, 1940: 77–8. (*Vireo gilvus connectens* subsp. nov. from Chilpancingo, Guerrero).

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Woodruff, Nathan H. Mathematics Used in Biology. *Jour. Tenn. Acad. Sci.,* 15, No. 2, Apr., 1940: 177–266.

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Strong, Dr. Reuben Myron, 5840 Stoney Island Ave., Chicago, Illinois....Founder

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Bretsch, Clarence, 690 Broadway, Gary, Indiana 1925
Ellis, Ralph, Jr., 2420 Ridge Rd., Berkeley, California 1926
Hicks, Dr. Lawrence Emerson, Ohio Wildlife Research Station, Columbus, Ohio 1925
Jones, Dr. Lynds, 352 W. College St., Oberlin, Ohio 1929
McIlhenny, Edward Avery, Avery Island, Louisiana 1910
Rogers, Charles Henry, Princeton Museum of Zoology, Princeton, New Jersey 1903
Sherman, Miss Althea Rosina, National via McGregor, Iowa 1902
Taylor, Dr. Arthur Chandler, Washburn, Wisconsin 1929
Taylor, Mrs. H. J., 900 Santa Barbara Rd., Berkeley, California 1916
Tucker, Mrs. Carll, Penwood, Mount Kisco, New York 1928

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Bailey, Harold H[arris], 820 Alhambra Circle, Coral Gables, Florida 1908
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Barnes, Ventura, Jr., % William H. Phelps, Almacen Americano, Caracas, Venezuela, South America 1938
Bishop, Dr. Louis Bennett, 450 Bradford St., Pasadena, California 1903
Brandreth, Courtenay, Ossining, New York 1939
Cahn, Dr. Alvin Robert, Forestry Bldg., Norris, Tennessee 1914
Chambers, Willie Lee, 2068 Escarpa Dr., Eagle Rock, Los Angeles, California..1934
Coursen, Charles Blair, 761 E. 69th Pl., Chicago, Illinois 1927

[1] This list is complete to May 1, 1940. The Secretary would appreciate immediate notification of any omission of names and changes in address, or any errors in the spelling of names, the use of titles, and the exact years of first election to membership. The Secretary wishes to have the *full* names of all members.

Davis, John, % George P. Davis, Jr., The Ivanhoe, Durant Ave., Berkeley, California 1939
Fargo, William G., 506 Union St., Jackson, Michigan 1923
Ganier, Albert Franklin, 2112 Woodlawn Ave., Nashville, Tennessee 1915
Goetz, Christian John, 3503 Middleton Ave., Cincinnati, Ohio 1930
Greene, Albert E., 1841 Cambridge Rd., Ann Arbor, Michigan 1939
Harper, Harry F., 1408 Cambridge Rd., Lansing, Michigan 1938
Harriot, Samuel Carman, 200 W. 58th St., New York, New York 1934
Harris, Dr. Arthur Trevenning, 700 Van Buren St., Gary, Indiana 1930
Havemeyer, Henry Osborne, Mahwah, New Jersey 1930
Mitchell, Dr. Walton Iungerich, 398 Vassar Ave., Berkeley, California 1893
Mudge, Edmund W., Jr., 811 Gulf States Bldg., Dallas, Texas 1939
Nelson, Dr. Theodora, 2695 Heath Ave., New York, New York 1928
Philipp, Philip Barnard, 27 West 44th St., New York, New York 1914
Procter, William, 430 Park Ave., New York, New York 1937
Roberts, Dr. Thomas Sadler, Museum of Natural History, University of Minnnesota, Minneapolis, Minnesota 1914
Shearer, Dr. Amon Robert, Mont Belvieu, Chambers Co., Texas 1893
Stoddard, Herbert Lee, Route 5, Sherwood Plantation, Thomasville, Georgia..1916
Sutton, Dr. George Miksch, Laboratory of Ornithology, Cornell University, Ithaca, New York 1920
Swenk, Myron Harmon, 1410 N. 37th St., Lincoln, Nebraska 1914
Todd, Walter Edmond Clyde, Carnegie Museum, Pittsburgh, Pennsylvania....1911
Uhrig, Mrs. A. B., 425 E. Water St., Oconomowoc, Wisconsin 1926
Vandervort, Charles Champion, Laceyville, Pennsylvania 1937
Van Tyne, Mrs. C. H., 5017 Blackstone Ave., Chicago, Illinois 1939
Welsh, William W., 76 Norfolk Rd., Clarendon Hills, Illinois 1939
Wineman, Andrew, 150 Michigan Ave., Detroit, Michigan 1934
Young, Colonel John Paul, No. 1 Grove Place, Ithaca, New York 1913

Active Members

Abbott, Dr. Cyril Edward, Harding College, Searcy, Arkansas 1937
Aldrich, Dr. John Warren, Cleveland Museum of Natural History, Cleveland, Ohio 1930
Allen, Dr. Arthur Augustus, Laboratory of Ornithology, Cornell University, Ithaca, New York 1914
Alperin, Irwin, 1100 E. 19th St., Brooklyn, New York 1939
Armstrong, Miss Virginia, Musketaquid Rd., Concord, Massachusetts 1939
Bailey, Alfred Marshall, Colorado Museum of Natural History, Denver, Colorado 1928
Ballard, Mrs. Rosamond Lockett, Avery Island, Louisiana 1939
Barber, Dr. Bertram Alpha, 350 West St., Hillsdale, Michigan 1923
Bartel, Karl [Emil] Edgar, 2528 W. Collins St., Blue Island, Illinois 1934
Bartlett, Guy, Rosendale Rd., Route 1, Schenectady, New York 1938
Bartlett, Wesley Hamilton, Primghar High School, Primghar, Iowa 1936
Bartsch, Dr. Paul, U. S. National Museum, Washington, D.C. 1894
Beckhart, Carleton A[llen], Box 83, Barrington, Illinois 1939
Bennett, Miss Mary Allison, 623 E. Carroll St., Macomb, Illinois 1933
Bennitt, Dr. Rudolf, Department of Zoology, University of Missouri, Columbia, Missouri 1932
Bent, Arthur Cleveland, 140 High St., Taunton, Massachusetts 1893
Berthel, Russell M[essner], 501 Portland Ave., St. Paul, Minnesota 1939
Billington, Cecil, 21060 Thirteen Mile Rd., Birmingham, Michigan 1939
Blain, Dr. Alexander Willis, 2201 Jefferson Ave., E., Detroit, Michigan 1902
Blake, Emmet R[eid], Field Museum of Natural History, Chicago, Illinois...1939

Boggs, J. B., Morgantown, West Virginia 1938
Bole, Benjamin Patterson, Jr., 2717 Euclid Ave., Cleveland, Ohio 1938
Bowman, Lawrence Lincoln, Orchard Hills, Route 7, North Canton, Ohio.... 1935
Brant, Irving, 630 F St. N.E., Washington, D.C. 1932
Breckenridge, Walter John, Museum of Natural History, University of Minnesota, Minneapolis, Minnesota 1929
Brodkorb, Dr. [William] Pierce, Museum of Zoology, Ann Arbor, Michigan.. 1936
Brooks, Earle Amos, 166 Plymouth Rd., Newton Highlands, Massachusetts... 1933
Brooks, Maurice [Graham], Division of Forestry, West Virginia University, Morgantown, West Virginia 1934
Bryens, Oscar McKinley, McMillan, Luce Co., Michigan 1924
Burch, Mrs. Jessie Kate [Mrs. George D.], 75 Woolnough Ave., Battle Creek, Michigan 1938
Burleigh, Thomas Dearborn, Oakhurst Route, Gulfport, Mississippi 1922
Burtch, Verdi, Branchport, New York 1924
Carpenter, F. S., 2402 Longest Ave., Louisville, Kentucky 1934
Chapman, Dr. Frank Michler, American Museum of Natural History, New York, New York 1910
Chase, Henry B., Jr., So. Biological Supply Co., New Orleans, Louisiana..... 1932
Chatham, Richard Thurmond, Jr., 112 Stratford Rd., Winston-Salem, North Carolina 1939
Christy, Bayard Henderson, % Christy and Wharton, 2203 7th Farmers Bank Bldg., Pittsburgh, Pennsylvania 1932
Clark, W. Kimball, Jr., Wildlife Conservation Bldg., University of Missouri, Columbia, Missouri 1939
Coffey, Ben Barry, Jr., Inspection Bureau, 1434 Bank of Commerce Bldg., Memphis, Tennessee 1927
Cole, Dr. Leon Jacob, University of Wisconsin, College of Agriculture, Agriculture Hall, Department of Genetics, Madison, Wisconsin 1921
Cook, Miss Fannye Addine, State Game and Fish Commission, Jackson, Mississippi 1925
Cottam, Dr. Clarence, Bureau of Biological Survey, Washington, D.C..... 1929
Cox, William Thomas, 2186 Doswell Ave., St. Paul, Minnesota 1936
Cruickshank, Allan Dudley, National Association of Audubon Societies, 1006 Fifth Ave., New York, New York 1939
Deaderick, Dr. William Heiskell, 36 Circle Dr., Hot Springs, Arkansas..... 1936
Decker, C. O., 6450 Kenwood Ave., Chicago, Illinois 1938
Dickinson, Francis Reynolds, 1518 Astor St., Chicago, Illinois 1931
Dodge, Victor Kenney, 137 Bell Court W., Lexington, Kentucky 1935
DuMont, Philip Atkinson, 405 N. Cleavland St., Arlington, Virginia 1928
Duncan, Donald Pendleton, Forest Service, Meade, Kansas 1936
Edeburn, Dr. R[alph] M[ilton], 1015 2nd St., Beaver, Pennsylvania 1939
Edge, Mrs. Charles Noel, 1200 5th Ave., New York, New York 1931
Edge, Peter, 1200 5th Ave., New York, New York 1939
Eifrig, Prof. Charles William Gustave, 1029 Monroe Ave., River Forest, Illinois 1907
Ekblaw, Dr. George Elbert, 511 W. Main St., Urbana, Illinois 1914
Ekblaw, Dr. Walter Elmer, Clark University, Worcester, Massachusetts 1910
Emerson, Guy, 16 Wall St., New York, New York 1938
Emilio, Shepard Gilbert, 7 Winter St., Salem, Massachusetts 1929
English, Dr. Pennoyer Francis, Department of Zoology, Pennsylvania State College, State College, Pennsylvania 1934
Errington, Dr. Paul L[ester], Iowa State College, Ames, Iowa 1932
Feeney, W. S., Westmorland, Madison, Wisconsin 1937
Fleming, James Henry, 267 Rusholme Rd., Toronto 4, Ontario, Canada..... 1906

Floyd, Judge Joseph Larke, 1009-11 George D. Harter Bank Bldg., Canton, Ohio 1903
Fredine, C[larence] Gordon, 1807 Wesley Ave., St. Paul, Minnesota 1938
Gabrielson, Dr. Ira Noel, Bureau of Biological Survey, Washington, D.C....1913
Gault, Benjamin True, 413 Hill Ave., Glen Ellyn, Illinois 1895
Gray, William Arthur, Room 690, 508 S. Dearborn St., Chicago, Illinois....1938
Gregory, Stephen Strong, Jr., Box N, Winnetka, Illinois 1922
Grimm, William C[arey], 101 Climax St., Pittsburgh 10, Pennsylvania 1939
Griscom, Ludlow, Museum of Comparative Zoology, Cambridge, Massachusetts 1937
Haecker, Frederick Woods, 506 S. 52nd St., Omaha, Nebraska 1938
Hamerstrom, Frederick N., Jr., Plainfield, Wisconsin 1934
Hand, Ralph Levi, 543 S. 5th St. W., Missoula, Montana 1933
Handlan, John Welty, 91 Lynwood Ave., Wheeling, West Virginia 1932
Handley, Charles Overton, Virginia Polytechnic Institute, Blacksburg, Virginia.1925
Hann, Dr. Harry Wilbur, Department of Zoology, University of Michigan, Ann Arbor, Michigan 1930
Hartshorne, Charles, Faculty Exchange, 5750 Ellis Ave., University of Chicago, Chicago, Illinois 1938
Hendrickson, Dr. George Oscar, Department of Zoology, Iowa State College, Ames, Iowa 1933
Herrick, Dr. Francis Hobart, 2863 Noble Rd., Cleveland Heights, Ohio 1917
Heston, Dr. Walter Enoch, Jackson Memorial Laboratory, Bar Harbor, Maine.1936
Himmel, Dr. Walter J., 1326 Idylwild Dr., Iowa City, Iowa 1915
Hinds, Frank J., Department of Biology, Western State Teachers College, Kalamazoo, Michigan 1935
Hinshaw, Thomas Doane, 1908 Scottwood Ave., Ann Arbor, Michigan 1926
Howell, Arthur Holmes, 2919 S. Dakota Ave., Washington, D.C. 1921
Hunt, Ormond Edson, 14-133 General Motors Bldg., Detroit, Michigan....1937
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Jackson, Cicero Floyd, University of New Hampshire, Durham, New Hampshire 1936
Jamison, Conrad Haston, 2811 Acklen Ave., Nashville, Tennessee 1940
Jenner, William Alexander, 806 W. Davis St., Fayette, Missouri 1933
Johnson, Robert Anthony, 150 East St., Oneonta, New York 1930
Jones, Harold Charles, Thomas Berry College, Mount Berry, Georgia 1929
Jung, Clarence Schram, Station F, Route 9, Box 670, Milwaukee, Wisconsin..1921
Kalmbach, Edwin Richard, 527 Custom House, Denver, Colorado 1926
Kase, John Charles, The Union Club, Purdue Memorial Union, Lafayette, Indiana 1937
Kelker, George Hills, School of Forestry, U.S.A.C., Logan, Utah 1938
Kelso, Leon, 1370 Taylor St. N.W., Washington, D.C. 1930
Kendeigh, Dr. S[amuel] Charles, Vivarium Bldg., Wright and Healey Sts., University of Illinois, Champaign, Illinois 1923
Knappen, Miss Phoebe Malura, 2925 Tilden St. N.W., Washington, D.C.....1926
Komarek, Roy Vance, Florida Commission of Game and Fresh Water Fish, Tallahassee, Florida 1935
Kutz, Harry Leon, Laboratory of Ornithology, Cornell University, Ithaca, New York 1939
Lambert, Bert, Allenville, Michigan 1936
Larrabee, Prof. Austin Park, Yankton College, Yankton, South Dakota 1921
Laskey, Mrs. Amelia Rudolph (Mrs. Frederick Charles), Graybar Lane, Nashville, Tennessee 1928

Leopold, Prof. Aldo, 424 University Farm Place, University of Wisconsin, Madison, Wisconsin 1928
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Ludwig, Claud Charles, 506 Wilson Bldg., Lansing, Michigan 1938
Magee, Michael Jarden, 603 South St., Sault Ste Marie, Michigan....1919
Mailliard, Joseph, 1815 Vallijo St., San Francisco, California 1930
Manweiler, J[ack], Soil Conservation Service, Baudette, Minnesota 1939
Mayfield, Dr. George Radford, Vanderbilt University, Nashville, Tennessee..1917
McAtee, Waldo Lee, Bureau of Biological Survey, Washington, D.C. 1911
McCracken, Dr. Isabel, Box 1545, Stanford University, California 1936
McCreary, Otto, Agricultural Hall, University of Wyoming, Laramie, Wyoming 1930
McCullagh, Dr. E[rnest] Perry, 2020 E. 93rd St., Cleveland, Ohio 1937
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McMath, Robert R., Route 4, Pontiac, Michigan 1934
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Metcalf, Dr. Zeno Payne, State College, West Raleigh, North Carolina 1900
Meyer, Henry, Zoology Department, University of Tennessee, Knoxville, Tennessee 1939
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Moser, Dr. R[euben] Allyn, Suite 612, 1504 Dodge St., Omaha, Nebraska....1940
Musgrave, Dr. John Knox, 350 Parkway Dr., Pittsburgh 16, Pennsylvania....1937
Neely, William W., 149 W. End St., Chester, South Carolina 1939
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Newth, Donald Jennings, 480 W. Kirby St., Detroit, Michigan 1939
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Osgood, Dr. Wilfred Hudson, Field Museum of Natural History, Chicago, Illinois 1910
Otis, Dr. Charles Herbert, Department of Biology, Bowling Green State University, Bowling Green, Ohio 1937
Palcich, Edward A[ndrew], Hawley High School, Hawley, Minnesota 1939
Palmer, Dr. Theodore Sherman, 1939 Biltmore St. N.W., Washington, D.C. ..1914
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Van Tyne, Dr. Josselyn, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1922
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Walker, Dr. Charles F., Stone Laboratory, Put-in-Bay, Ohio 1939
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Warren, Edward Royal, 1511 Wood Ave., Colorado Springs, Colorado 1911
Weber, Orlando Franklin, Jr., Mt. Kisco, New York 1936
Wetmore, Dr. Alexander, U. S. National Museum, Washington, D.C. 1903
Weydemeyer, Winton, Fortine, Montana 1930
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Wilson, Archie Francis, 1921 Lake Ave., Whiting, Indiana 1937
Wilson, Gordon, 1434 Chestnut St., Bowling Green, Kentucky 1925
Wing, Leonard William, Washington State College, Pullman, Washington.... 1924
Wood, Dr. Casey Albert, Wood Library of Ornithology, McGill University, Montreal, Canada 1924
Worth, Dr. C[harles] Brooke, Department of Zoology, Swarthmore College, Swarthmore, Pennsylvania 1938
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Allen, Durward Leon, Rose Lake Wildlife Experiment Station, R.R. No. 1, East Lansing, Michigan 1933
Allen, Parks, Route 3, Ithaca, Michigan 1939
Allen, Robert Ward, Museum of Zoology, Ann Arbor, Michigan 1936
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Anderson, John M., Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1938
Anderson, Dr. Rudolph Martin, Division of Biology, Department of Mines and Resources, National Museum of Canada, Ottawa, Ontario, Canada.. 1937
Anderson, Wallace L[owell], 223 7th St., Baraboo, Wisconsin 1939
Anthes, Clarence A., 713 Hamilton Ave., Waukesha, Wisconsin 1939
Appleton, John Sparhawk, Simi, California 1936
Atwood, Earl L. [Jr.], Lacassine Migratory Waterfowl Refuge, Lake Arthur, Louisiana 1939

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Baillie, James Little, Jr., Royal Ontario Museum of Zoology, Queens Park at Bloor St., Toronto, Ontario, Canada 1938
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Baker, Rollin Harold, Department of Geology, College Station, Texas 1938
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Bates, Miss Clara, Fort Pierce, Florida 1939
Baumgartner, Dr. Frederick Milton, Department of Entomology, A. & M. College, Stillwater, Oklahoma 1935
Baumgartner, Luther M., Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1936
Baumgartner, Dr. Milton D., 430 Buckingham Dr., Indianapolis, Indiana.....1938
Bay, J. C., % John Crerar Library, Chicago, Illinois 1939
Beatty, Harry Andrew, Christiansted, St. Croix, Virgin Islands, U.S.A.....1936
Becker, Miss Edna E[lizabeth], Hollins College, Virginia 1939
Beebe, Ralph, 353 Salliotte St., Ecorse, Michigan 1924
Beeghly, James Leon, 46 Woodview Ave., Youngstown, Ohio 1933
Behle, William Harroun, Department of Biology, University of Utah, Salt Lake City, Utah 1935
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Bellrose, Frank, Jr., 1220 W. Madison St., Ottawa, Illinois 1935
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Bennett, Logan Johnson, 1-A Horticulture Bldg., Pennsylvania State College, State College, Pennsylvania 1934
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Birkeland, Henry, Roland, Iowa 1934
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Bissonnette, T[homas] Hume, Trinity College, Hartford, Connecticut 1939
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Bordner, Mrs. Frances Comfort, Hudson, Iowa 1930
Borell, A. E., Soil Conservation Service, Albuquerque, New Mexico 1936
Borror, Dr. Donald Joyce, Department of Zoology and Entomology, Ohio State University, Columbus, Ohio 1927
Bowdish, Beecher Scoville, Demarest, New Jersey 1924

Bradley, Homer L., Chautauqua Refuge, Havanna, Illinois 1939
Braun, Howard Wylie, 1413 Louisiana Ave. N.W., Canton, Ohio 1937
Braund, Frank William, 1022 Central Ave., Cleveland, Ohio 1935
Brecher, Leonard C[harles], 1900 Spring Dr., Louisville, Kentucky 1939
Brigham, Edward Morris, Jr., Kingman Memorial Museum,
Battle Creek, Michigan 1938
Brignac, Miss Rita, Forest, Mississippi 1939
Brooks, Alonzo Beecher, Oglebay Park, Wheeling, West Virginia 1931
Broun, Maurice, Rt. 1, Orwigsburg, Pennsylvania 1935
Brown, Clarence D., 222 Valley Rd., Montclair, New Jersey 1938
Buchanan, Borden Campbell, 100 S. Cecilia St., Sioux City, Iowa 1937
Bujak, Boleslaus Joseph, Museum of Zoology, Ann Arbor, Michigan 1936
Burland, Lee J[ohnson], Ballston Lake, New York.....1939
Burt, Dr. William Henry, Museum of Zoology, Ann Arbor, Michigan 1928
Buss, Irven Otto, 316 N. Mills St., Madison, Wisconsin 1936
Cahalane, Victor Harrison, Wildlife Division, National Park Service,
Washington, D.C. 1933
Calhoun, John Bumpass, Zoology Laboratory, Northwestern University,
Evanston, Illinois 1935
Calvert, Earl Wellington, Haliburton P. O., Ontario, Canada 1937
Campbell, Louis Walter, 848 Toronto Ave., Toledo, Ohio 1926
Campbell, Miss Mildred Florence, 29 N. Hawthorne Lane,
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Capps, Beryl F[ranklin], 4921 Euclid, Kansas City, Missouri 1939
Carlson, Carl Olof, Department of Biology, Doane College, Crete, Nebraska..1923
Carpenter, John Richard, 2670 N. Alpine Rd., Grand Rapids, Michigan 1934
Carrothers, Miss Vera, 14704 Alder Ave., E. Cleveland, Ohio 1938
Carter, John Darlington, Lansdowne, Pennsylvania 1930
Cartwright, Bertram William, 238 Guilford St., Deer Lodge, Winnipeg, Canada.1930
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Chamberlain, Glen David, 22 Academy St., Presque Isle, Maine 1930
Chapman, Floyd Barton, 1944 Denune Ave., Columbus, Ohio 1932
Chutter, Miss Mildred C., Box 229, Athens, Ohio 1936
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Clark, Sheldon, Rainbow Farm, Barrington, Illinois 1939
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Mines and Geology Branch, National Museum of Canada, Ottawa,
Ontario, Canada 1932
Clay, Miss Marcia Barnes, Bristolville, Ohio 1924
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Cole, Harry Maurice, 3016 Capitol Ave., Cheyenne, Wyoming 1935
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Conway, Albert E., Box 135, West Chester, Pennsylvania.....1939
Cooley, Miss Eleanor Graham, R.F.D., Berwyn, Maryland 1936
Cooney, Robert F., U. S. Forest Service, Augusta, Montana 1940
Counce, Howard, Counce, Tennessee 1940
Crabb, Wilfred D[ayton], Salix, Iowa 1937
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Davidson, William Mark, National Research Center, Beltsville, Maryland....1933
Davis, George, State Teachers College, Murfreesboro, Tennessee 1936
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Davis, Dr. William B., Department of Wild Game, College Station, Texas....1938
Davison, Verne E[lbert], 531 Poplar St., Spartanburg, South Carolina 1939
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Empey, Miller, Freeland, Michigan 1939
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George, John L[othar], % J. Van Tyne, Museum of Zoology,
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Groskin, Horace, 210 Glenn Rd., Ardmore, Pennsylvania 1937

Gross, Dr. Alfred Otto, Bowdoin College, Brunswick, Maine 1927
Gross, Miss Margaret Edith, Route 5, Grand Rapids, Michigan 1937
Guthrie, Frank Keller, Keuka Park, New York 1938
Haak, A[drion], 437 Eugenie St., St. Boniface, Manitoba, Canada 1939
Hadley, Miss Theodosia Hamilton, Western State Teachers College, Kalamazoo, Michigan 1938
Hagar, Mrs. Jack, Rockport, Texas 1930
Hague, Dr. Florence S., Sweet Briar College, Sweet Briar, Virginia 1931
Hainsworth, William Pickard, 214 Railroad Ave., North Andover, Massachusetts 1930
Hairston, Nelson G[eorge], Zoology Department, Northwestern University, Evanston, Illinois 1940
Haller, Frank D[enver], Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1940
Haller, Karl William, Route 1, Short Creek, West Virginia 1934
Hallman, Roy Cline, Box 826, Panama City, Florida 1928
Hamilton, Dr. William John, Jr., Department of Zoology, Cornell University, Ithaca, New York 1933
Hammond, Merrill C[lyde], Lower Souris Refuge, Upham, North Dakota..1939
Hanna, Wilson Creal, 141 E. F St., Colton, California 1936
Hanson, Harold C[arsten], 3658 N. Harding Ave., Chicago, Illinois 1939
Harford, Dr. Henry Minor, 1034 Argyle Bldg., Kansas City, Missouri 1938
Harper, Dr. Francis, 224 S. Chester Rd., Swarthmore, Pennsylvania 1930
Harris, Mrs. Hugh H., Emory University, Atlanta, Georgia 1939
Hatton, Adrian B[ernard], 100 College Ave., Columbia, Missouri 1940
Hausler, Mrs. M., 7348 Paxton Ave., Chicago, Illinois 1936
Hawkins, Arthur S., Illinois Natural History Survey, Urbana, Illinois 1936
Hawkins, B. L., Hamline University, St. Paul, Minnesota 1936
Hay, Alan Gene, 432 N. 3rd St., Douglas, Wyoming 1939
Hayward, C. Lynn, Department of Entomology and Zoology, Brigham Young University, Provo, Utah 1933
Hedges, R. Frank, Box 1348, Soil Conservation Service, Albuquerque, New Mexico 1939
Heiser, J[oseph] M[atthew], Jr., 1724 Kipling St., Houston, Texas.....1939
Helfer, Miss Louise, 111 9th St., Watkins Glenn, New York 1937
Hellwig, Miss Isabelle, 3080 Essex Rd., Cleveland Heights, Ohio 1936
Henderson, Walter Cleaveland, 8 Magnolia Parkway, Chevy Chase, Maryland.1928
Henderson, [William] Grant, Route 6, Greensburg, Indiana 1930
Henika, Franklin S., 2212 A 17th St., Lubbock, Texas 1936
Henry, Cordia John, Box 37, Upham, North Dakota 1933
Herrick, Miss Eleanor Elizabeth, 935 Smith Lane, Woodmere, Long Island, New York 1935
Hickey, Joseph J., % The Edison Co., 4 Irving Place, New York, New York.1940
Hiett, Lawrence Davison, 2134 Parkwood Ave., Toledo, Ohio 1929
Hill, Herbert Oliver, 329 Summitt Ave., Redlands, California 1938
Hill, Julian Werner, 1106 Greenhill Ave., Wilmington, Delaware 1935
Hillmer, Davis B., 448 W. Ferry Ave., Detroit, Michigan 1926
Hilton, Dr. David Clark, 305 Richards Bldg., Lincoln, Nebraska 1918
Hinchman, Richard May, 75 Fairbanks Rd., Milton, Massachusetts 1931
Hobson, Mrs. L. G., 1512 N. Meridan St., Route 9, Indianapolis, Indiana....1935
Hochbaum, Hans Albert, Delta, Manitoba, Canada 1940
Hoffmeister, Linus C[hristian], 3700 Hoffmeister Ave., Lemay, Missouri....1939
Holland, Harold May, Box 615, Galesburg, Illinois 1915
Holt, Ernest Goslan, 2000 F. St. N.W., Washington, D.C. 1926
Hostetter, D. Ralph, Eastern Mennonite School, Harrisonburg, Virginia.....1937

Howell, Joseph Corwin, Laboratory of Ornithology, Cornell University, Ithaca, New York 1938
Howell, Louis Moffitt, Route 1, Box 433, Jacksonville, Florida 1938
Hoyt, John Southgate Yeston, 5 Lewis St., Lexington, Virginia 1936
Hubbard, Hugh W[ells], American Board Mission, Paoting, Hopei, China....1939
Huggins, Russell Arno, Biology Department, Western Reserve University, Cleveland, Ohio 1937
Huggitt, Floyd C., Bellevue, Michigan 1933
Hughes, George Thomas, Box 153, Plainfield, New Jersey 1929
Hulbert, Lloyd Claire, 529 W. Grand River Ave., East Lansing, Michigan...1938
Hull, Allan M., University of Colorado, Boulder, Colorado 1939
Hunter, Lawrence E., Hanna City, Illinois 1934
Hurley, John Beatty, 401 S. 17th Ave., Yakima, Washington 1937
Hutchens, Lynn H., 536 N. Harlem Ave., River Forest, Illinois 1939
Hyde, A. Sidney, Eastern Oregon College of Education, La Grande, Oregon..1939
Ijams, Henry Pearle, % News-Sentinel, Knoxville, Tennessee 1924
Ingersoll, Albert Mills, 908 F St., San Diego, California 1921
Jaques, F[rancis] L[ee], American Museum of Natural History, New York, New York 1939
Jelier, Franciscus Peter, Groote Visscherystraat 19[A], Rotterdam, Holland....1931
Jenkins, James H[obart], Wildlife Research Station, Ohio State University, Columbus, Ohio 1939
Jensen, Miss [Ellen] Irene, 3539 22nd Ave. S., Minneapolis, Minnesota....1939
Jensen, Jesse Peter, Box 364, Dassel, Minnesota 1926
Jessman, Miss Lena M., 1250 Hubbard St., Detroit, Michigan 1935
Johnson, Frank, Y.M.C.A., South Bend, Indiana 1935
Johnson, Mrs. Irene W., 38 Portland Place, St. Louis, Missouri 1931
Johnson, Paul H., Soil Conservation Service, Bethany, Missouri 1936
Johnson, William M[cNutt], 108 E. Depot St., Knoxville, Tennessee....1939
Jones, Howard A., Route 3, Fenton, Michigan 1938
Jones, John Courts, 3224 19th St. N.W., Washington, D.C. 1931
Jones, Paul F., Route 7, Box 443, Toledo, Ohio 1937
Jones, Solomon Paul, 509 West Ave. N., Waukesha, Wisconsin 1921
Jones, Victor Emmons, University of Idaho, Southern Branch, Pocatello, Idaho 1938
Jurica, E., Lisle, Illinois 1940
Kahn, David C[urry], 1122 Michigan Ave., Ann Arbor, Michigan 1938
Kahn, Mrs. Dina Hope, 1122 Michigan Ave., Ann Arbor, Michigan 1938
Kain, Allan, 3611 Shaw Ave., Cincinnati, Ohio 1939
Kamm, Mrs. Oliver, 365 Lake Shore Dr., Grosse Pointe Farms, Michigan....1934
Katz, David, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1938
Kellogg, Dale Cosnett, Box 343, Norwalk, Ohio 1932
Kelly, Mrs. George A., 2300 La Salle Gardens N., Detroit, Michigan 1935
Kennedy, H. N., Box 294, Rosslyn Station, Arlington, Virginia 1924
Kindler, Mrs. Grace Emma, Sheridan Dr., Lancaster, Ohio 1937
Kinslow, Miss Hazel K., Sans Souci, Apt. D, Paducah, Kentucky 1939
Kirk, Allan D[ixon], 14 Forest Hill Rd., Wilkinsburg, Pennsylvania 1939
Knapp, Elmer Leslie, Route 2, Troy, Pennsylvania 1930
Knight, Charles Harold, 4157 E. 113th St., Cleveland, Ohio 1939
Knox, Miss Margaret Richardson, 4030 Park Ave., Indianapolis, Indiana....1937
Kobes, Karl George, Bureau of Biological Survey, Holt, Minnesota 1938
Koch, Peter, Terrace Park, Ohio 1939
Koestner, E. J., 203 Vivarium Bldg., University of Illinois, Champaign, Illinois 1938

Kolb, Charles Haven, Jr., 5210 Catalpha Rd., Baltimore, Maryland 1937
Kosten, John Leonard, 967 Pine Ave. N.W., Grand Rapids, Michigan 1939
Kramer, Theodore Christian, Department of Anatomy, East Medical Bldg., Ann Arbor, Michigan 1939
Kriebel, Ralph Meschter, 1111 N. St., Bedford, Indiana 1935
Kuitert, Louis Cornelius, 1134 Ohio St., Lawrence, Kansas 1938
Lacey, Miss Mifton H., No. 9 Ling Bldg., Canton, Ohio 1939
LaFollette, James E[dmund], 1122 Barret Ave., Louisville, Kentucky 1939
Laidlaw, A[lan] F., Soil Conservation Service, Eau Claire, Wisconsin 1939
Laird, Miss Lonnie, 3664 Washington St., St. Louis, Missouri 1935
Lay, Daniel Wayne, Box 1056, Lufkin, Texas 1939
Lay, George Balch, 1140 Park Square Bldg., Boston, Massachusetts 1938
Lea, Robert B., Carleton College, Northfield, Minnesota 1940
Lee, Robert E., Soil Conservation Service, Shenandoah, Iowa 1936
Leedy, Charles A., 343 Falls Ave., Youngstown, Ohio 1927
Leedy, Daniel L., Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio 1936
Legg, William C[larence], Mt. Lookout, West Virginia 1939
Lehmer, Clayton B[ruce], Utah Cooperative Wildlife Research Unit, Logan, Utah 1939
Lewis, Dr. Harrison Flint, Lands, Parks and Forest Branch, Department of Mines and Resources, Ottawa, Ontario, Canada 1939
Lewis, Merriam Garretson, Box 549, Salem, Virginia 1930
Lindsey, Dr. Alton Anthony, Department of Biology, American University, Washington, D.C. 1936
Link, Rev. George M., Grafton, Illinois 1939
Linsdale, Dr. Jean Myron, Jamesburg Route, Monterey, California.....1928
Little, Dr. Ethel Esther, State Teachers College, Minot, North Dakota 1937
Lloyd, C. K., 11 N. Elm St., Oxford, Ohio 1925
Lloyd, Hoyes, 582 Mariposa Ave., Rockcliffe Park, Ottawa, Ontario, Canada..1922
Lodge, William Ralph, Silver Lake Estates, Route 2, Cuyahoga Falls, Ohio..1935
Long, Wilbur Stuart, U. S. Soil Conservation Service, Salt Lake City, Utah..1936
Long, William H., Department of Poultry Husbandry, Cornell University, Ithaca, New York 1939
Lord, Dr. Frederic P[omeroy], 39 College St., Hanover, New Hampshire....1939
Lovell, Harvey B., 3011 Meade Ave., Route 3, Box 216, Louisville, Kentucky.1936
Low, Seth Haskell, Des Lacs Waterfowl Refuge, Kenmore, North Dakota ...1931
Lowery, George Hines, Jr., Museum of Zoology, Louisiana State University, University, Louisiana 1937
Lubin, Seymour I., 101 Chestnut St., Binghampton, New York 1934
Lum, Miss Elizabeth C[aroline], Cincinnatus, New York 1940
Lunk, William, Jr., Fleming Ave., Edgemont, Fairmont, West Virginia.....1937
Luthy, Ferd, Jr., 306 N. Institute, Peoria, Illinois 1937
Lynes, Miss Florence A., Cook Station, Missouri 1937
Mack, Horace Gordon, % Gilson Mfg. Co. Ltd., Guelph, Ontario, Canada....1937
Maclean, Miss Dorothy W[illiams], 21 Ashley St., Hartford, Connecticut 1939
MacLulich, Dr. Duncan Alexander, 144 Mavety St., Toronto, Ontario, Canada 1933
Magath, Dr. Thomas B., Mayo Clinic, Rochester, Minnesota 1935
Magney, Mrs. G. R., 5329 Washburn Ave. S., Minneapolis, Minnesota 1940
Maguire, Walter Stanley, Y.M.C.A., New Westminster, British Columbia ..1937
Main, John Smith, 2210 Van Hise Ave., Madison, Wisconsin 1936
Malley, Philip Patrick, Box B, Munhall, Pennsylvania 1935
Malley, Mrs. R. B., 418 W. 3rd St., Corsicona, Texas 1930
Malloy, Dr. James Patrick, Castalia, Iowa 1937
Manz, Frank J., Jr., 609 S. Water St., Northfield, Minnesota 1938

Markle, Dr. Millard S., 528 National Ave., Richmond, Indiana 1938
Marsh, Vernon L., Johnson Hall, University of Washington,
Seattle, Washington 1934
Maslowski, Karl Herbert, 1034 Maycliff Rd., Cincinnati, Ohio 1934
Mason, Robert French, Jr., 2415 California St. N.W., Washington, D.C.....1937
Mayer, Mrs. John N., 103 S. Miller St., Cynthiana, Kentucky 1935
Mayfield, Harold F[ord], 3311 Parkwood Ave., Toledo, Ohio 1940
Mayr, Dr. Ernst, American Museum of Natural History,
New York, New York 1933
McBeath, Donald Young, Midland Game Refuge, Sanford, Michigan 1936
McCann, Lester J., 3743 Emerson Ave. N., Minneapolis, Minnesota 1939
McConnell, Miss Mary Lou[ise], 151 Center Ave., Emsworth, Pennsylvania..1940
McCullough, George W., 4858 Lyndale Ave., Minneapolis, Minnesota 1937
McGraw, Harry A., 1600 5th Ave., Altoona, Pennsylvania 1936
McMurray, Arthur, 2110 Jones Ave., Nashville, Tennessee 1939
McMurry, Frank B[ailey], Wichita Mountains Wildlife Refuge,
Cache, Oklahoma 1939
McNeil, Dr. Charles Andrew, 111 W. 4th St., Sedalia, Missouri 1914
McNish, Edgar Mann, Madison, Tennessee 1940
Means, Amos Isaiah, Atwood, Illinois 1938
Meier, Henry Adams, 17 S. Normal St., Ypsilanti, Michigan 1940
Mellinger, E. O., North Lima, Ohio 1939
Meltvedt, Burton W., Paullina, Iowa 1930
Mendall, Howard L., 28 Pendlton St., Brewer, Maine 1936
Mendenhall, Eugene W., 97 Brighton Rd., Columbus, Ohio 1932
Merriam, Dr. Clinton Hart, 2590 Cedar St., Berkeley, California 1937
Michaud, Howard H[enry], 1205 Kensington Blvd., Fort Wayne, Indiana...1938
Michener, Harold, 418 N. Hudson Ave., Pasadena, California 1926
Miller, Dr. Alden Holmes, Museum of Vertebrate Zoology,
Berkeley, California 1930
Miller, Douglas Scott, 122 Lawrence Ave. E., Toronto, Ontario, Canada.....1939
Miller, Henry C., 29 Sheridan Dr., Monroe, Michigan 1938
Miller, Dr. Loye Holmes, University of California at Los Angeles,
Los Angeles, California 1939
Miller, Robert Cunningham, California Academy of Sciences,
San Francisco, California 1935
Milnes, Miss Harriet Kernahan, 331 Gowen Ave., Philadelphia, Pennsylvania..1935
Mitchell, Harold Dies, 378 Crescent Ave., Buffalo, New York 1936
Moeran, E. H., 541 Brant River Rd., Yonkers, New York 1940
Mohr, Dr. Carl Otto, Illinois Natural History Survey, Urbana, Illinois.....1936
Monson, Gale, 1410 E. Helen, Tucson, Arizona 1933
Montagna, William [Guglielmo Trono], Cornell University, Laboratory of
Ornithology, Ithaca, New York 1937
Moore, Miss Dora, 60 E. Mulberry St., Athens, Ohio 1934
Moore, George A., Route 3, Stillwater, Oklahoma 1938
Moore, Mrs. Jeanette K., 106 Highland Ave., Ithaca, New York 1940
Moore, Robert Thomas, Route 1, Box 28A, Pasadena, California 1938
Moos, Louis M., 311 Wyoming St., Billings, Montana 1939
Morrill, Ralph E., 1217 Olivia Ave., Ann Arbor, Michigan 1936
Morrison, Kenneth Douglas, 3544 Colfax Ave. S., Minneapolis, Minnesota....1937
Morrissey, Thomas J[ustin], 921 Mississippi Ave., Davenport, Iowa 1939
Morse, Marius, 4031 40th Ave., Robbinsdale, Minnesota 1938
Mosby, Henry S., 922 Harrison St., Lynchburg, Virginia 1937
Mousley, William Henry, 4073 Tupper St., Westmount, Montreal,
Quebec, Canada 1922
Mueller, Walter Josef, 3043 N. Prospect Ave., Milwaukee, Wisconsin 1936

Mullin, Miss Elizabeth, 203 S. Zitter Ave., Indianapolis, Indiana 1938
Munro, James Alexander, Okanagan Landing, British Columbia 1935
Munter, Capt. William Henry, U. S. Coast Guard, 550 Federal Bldg., Seattle, Washington 1933
Murie, Olaus Johan, Jackson, Wyoming 1934
Murphey, Dr. Eugene Edmund, 432 Telfair St., Augusta, Georgia 1935
Murray, Rev. Joseph James, Lexington Presbyterian Church, Lexington, Virginia 1931
Murray, Robert Bruce, 130 Ave. G., Weirton, West Virginia 1939
Nattinger, Mrs. Maude C., 405 S. Holden St., Warrensburg, Missouri 1938
Nelson, Arnold Lars, Bureau of Biological Survey, Washington, D.C. 1932
Nelson, Charles Ellsworth, Jr., 124 Oxford Rd., Waukesha, Wisconsin 1937
Nelson, Edwin L[ewis], 77 Adelaide Ave., New Brunswick, New Jersey 1939
Nelson, Miss Fredericka, 110 White St., East Boston, Massachusetts 1939
Nelson, Urban C., U. S. Soil Conservation Service, Chillicothe, Missouri 1939
Neptune, Ralph W[illis], 1496 Indianola Ave., Columbus, Ohio 1940
Nessle, James P., 1823 Barrows St., Toledo, Ohio 1936
Newcomb, Hugh Ross, General Delivery, Port Townsend, Washington 1939
Newton, Earl T[homas], 5500 College St., Kansas City, Missouri 1939
Nichols, L[eon] Nelson, 315 E. 68th St., New York, New York 1937
Nicholson, Dr. A[rnold] J[seph], Game, Fish & Oyster Commission, Austin, Texas 1939
Norris, Russell T[aplin], 1-A Horticulture Bldg., State College, Pennsylvania.1939
Norton, Arthur Herbert, Portland Society of Natural History, 22 Elm St., Portland, Maine 1934
Oberhansley, Frank Reid, Sequoia National Park, California 1939
Odum, Eugene Pleasants, Biological Research Division, Edmund Niles Huyck Preserve Inc., Rensselaerville, Albany Co., New York 1930
Oliver, Miss Mary Clara, Silver City, New Mexico 1934
Orr, Ellison, Waukon, Iowa 1936
Osborne, Ben Orville, 4104 Bunting St., Ft. Worth, Texas 1937
Osmer, Thomas Lewis Gregory, 2901 Upton Ave. S., Minneapolis, Minnesota..1939
Overing, Robert, Weaverville, North Carolina 1930
Owre, Oscar, Jr., 2625 Newton Ave. S., Minneapolis, Minnesota 1935
Packard, Stanley E., Troy, Pennsylvania 1936
Painton, Dr. Harry R., 1000 Cowper Ave., Palo Alto, California 1939
Palmer, Ralph Simon, Laboratory of Ornithology, Cornell University, Ithaca, New York 1934
Parker, Lansing A[rthur], Soil Conservation Service, Faribault, Minnesota...1939
Partch, Max L[orenzo], 815 Prairie St., Columbus, Wisconsin 1940
Peasley, Mrs. Harold Raymond, 2001 Nash Dr., Des Moines, Iowa 1934
Peattie, Dr. Donald Culross, 224 Buena Vista Rd., Santa Barbara, California..1938
Peavey, Mrs. Leonore Gastineau, 4222 Carrollton St., Indianapolis, Indiana..1937
Peet, Dr. Max Minor, 2030 Hill St., Ann Arbor, Michigan 1935
Peguske, Miss Ruth [Elizabeth], 7087 W. Lafayette Blvd., Detroit, Michigan.1939
Pennell, Miss Edna, 503 N. Main St., Mount Vernon, Ohio 1931
Penner, Lawrence R., Department of Zoology, University of Minnesota, Minneapolis, Minnesota 1940
Pennington, James E., Webville, Kentucky 1939
Peters, Dr. Harold S., Route 1, Box 171, Charleston, South Carolina 1936
Peterson, Alfred, Box 201, Brandt, South Dakota 1931
Peterson, Mrs. Charles Emil, Madison, Minnesota 1936
Pickens, Dr. Andrew Lee, Paducah Junior College Library, Paducah, Kentucky 1927
Pinto, Herman T., Box 297, State College, New Mexico 1939

Pitelka, Frank Alois, Department of Zoology, University of California, Berkeley, California 1938
Pomerat, Charles Marc, Box 2047, Department of Biology, University of Alabama, University, Alabama 1939
Poncy, Robert, Lachenal 19, Geneva, Switzerland....1939
Porter, Thomas Wayne, 327 W. Water St., Oak Harbor, Ohio 1938
Potter, Julian Kent, 437 Park Ave., Collingswood, New Jersey 1915
Pratt, Delbert Randall, McKinley High School, Canton, Ohio 1932
Pratt, Harold Parker, U. S. Soil Conservation Service, Box 899, Grand Junction, Colorado 1939
Prescott, Kenneth Wade, 409 Stuart Ave., Kalamazoo, Michigan 1939
Price, Dr. John Basye, University of Oregon, Medical School, Department of Anatomy, Portland, Oregon 1931
Quay, Thomas L[arelle], Department of Zoology, North Carolina State College, Raleigh, North Carolina 1939
Ragusin, Anthony Vincent, Box 496, Biloxi, Mississippi 1937
Rahe, Carl W., 4666 Turney Rd., Cleveland, Ohio 1931
Ramsden, Dr. Charles Theodore, 8 & 19, Vista Alegre, Santiago de Cuba, Cuba 1914
Randall, Pierce E., 1-A Horticulture Bldg., State College, Pennsylvania....1939
Randall, Robert N[eal], Georgetown, Colorado 1939
Randel, Mrs. Janet B[elknap], 2115 Gordon Ave., St. Paul, Minnesota 1940
Rapp, Frederick William, Vicksburg, Michigan 1926
Rea, Gene, 2378 Neil Ave., Columbus, Ohio 1936
Reed, Mrs. Carlos Isaac, 448 S. Villa Ave., Villa Park, Illinois 1937
Reed, Miss Willie Ruth, Route 1, Greenville, Tennessee 1939
Reuss, Alfred Henry, Jr., 12910 S. Mozart St., Blue Island, Illinois 1936
Rhodes, W. L., 4805 Chevy Chase Blvd., Chevy Chase, Maryland 1939
Rice, Mrs. Harry Wilson, 3940 Richfield Rd., Minneapolis, Minnesota 1940
Rich, Dr. Guy C., 1820 El Cerrito Place, Hollywood, California 1914
Richards, Miss Lucille Rhodes, 718 S. Elm St., Hope, Arkansas 1940
Richardson, Mrs. William Devrick, 4215 Prairie Ave., Chicago, Illinois 1938
Ricks, Jesse J., 30 E. 42nd St., New York, New York 1931
Riley, Dr. Gardiner M., Parkbelt House No. 6, Greenbelt, Maryland 1938
Riner, Miss Alice, 503 S. Millwood, Wichita, Kansas 1939
Roads, Miss Katie Myra, 436 Vine St., Hillsboro, Ohio 1914
Rogers, Irl, 402 Alturas Ave., Modesto, California 1937
Rorimer, Mrs. Irene Turk, 22275 Parnell Rd., Shaker Heights, Ohio 1938
Rosene, Walter Melvin, Ogden, Iowa 1923
Rosewall, Dr. Oscar Waldemar, Department of Zoology, Louisiana State University, Baton Rouge, Louisiana 1931
Ross, C[harles] Chandler, 7924 Lincoln Dr., Chestnut Hill, Pennsylvania....1937
Rowe, Kenneth Christopher, 513 Third St., Boonville, Missouri 1938
Royer, Milton Larimore, Columbia Station, Ohio 1937
Rudd, R. L., 345 West St., Salinas, California 1939
Rushton, Walter A., Plainfield, Indiana 1940
Russell, Dr. Henry Norris, Jr., Babies & Children's Hospital, Cleveland, Ohio.1932
Russell, Dr. Whitfield Leggett, Box 22, Rhome, Texas 1935
Ruyle, Miss Alene E[mily], Route 3, Palmyra, Illinois 1940
Sargent, Dr. William Dunlap, The College of the City of New York, New York, New York 1931
Saugstad, N[els] Stanley, Box 531, Bismarck, North Dakota 1939
Saunders, Aretas Andrews, 361 Crestwood Rd., Fairfield, Connecticut 1934
Sawyer, Miss Dorothy, Route 1, Unadilla, New York 1937
Schantz, William Edward, 1532 Aberdeen Ave., Columbus, Ohio 1938
Schaub, Miss Mary Hall, 1040 Isabella St., Wilmette, Illinois 1939

Schlenker, Miss Lydia, Mercereau Apts., 208 19th St., Toledo, Ohio 1937
Schneider, A[lbert] J[ohn], 206 E. 33rd St., Indianapolis, Indiana 1940
Schneider, Miss Evelyn, 2207 Alta Ave., Louisville, Kentucky 1935
Schroeder, Miss Clara, 684 W. Market St., Lima, Ohio 1937
Schultz, Miss Helen, Box 105, Mary Washington College,
Fredericksburg, Virginia 1929
Scotland, Dr. Minnie Brink, 42 Continental Ave., Cohoes, New York 1938
Scott, David Maxwell, Apt. 11, 3615 Prud'homme Ave., Montreal,
Quebec, Canada 1937
Scott, Walter Edwin, Refuge Section, Wisconsin Conservation Department,
Madison, Wisconsin 1938
Seamans, Roger A[lbert], Fish & Game Service, Montpelier, Vermont 1940
Sebring, Miss Emma Goodeve, 358 W. Sanborn St., Winona, Minnesota 1939
Semple, John Bonner, Linden Place, Sewickley, Pennsylvania 1938
Serbousek, Miss Lillian, 1226 2nd St. S.W., Cedar Rapids, Iowa 1935
Shadle, Albert Ray, Department of Biology, University of Buffalo,
Buffalo, New York 1930
Shaftesbury, Dr. Archie Davis, N.C.C.W., Greensboro, North Carolina.....1930
Shaver, Dr. Jesse Milton, Peabody Teachers College, Nashville, Tennessee....1922
Sheppard, Roy Watson, 1805 Mouland Ave., Niagara Falls, Ontario, Canada.1933
Silliman, Oscar Perry, 225 W. Alisal St., Salinas, California 1939
Sime, P. R., 2015 A Broadway, Lubbock, Texas 1939
Skaggs, Merit Bryan, Julian Rd., South Euclid, Ohio 1934
Slack, Miss Mabel, 1004 Everett Ave., Louisville, Kentucky 1934
Smiley, Daniel, Jr., Lake Mohonk Mountain House, Mohonk Lake, New York.1939
Smith, Dr. Arthur Francis, Manning, Iowa 1934
Smith, J. Donald, 222 Laurel Ave., Stillwater, Minnesota 1939
Smith, [Sylvan] Leeon, 414 Price Ave., Columbia, Missouri 1939
Smith, Lewis MacCuen, 26 Benezet St., Chestnut Hill,
Philadelphia, Pennsylvania 1931
Smith, Orion O., Dept. 11, Barber Colman Co., Rockford, Illinois 1936
Smith, Wendell Phillips, Wells River, Vermont 1921
Snyder, Lester Lynne, Royal Ontario Museum of Zoology, Bloor St. and
Avenue Rd., Toronto 5, Ontario, Canada 1929
Snyder, Richard Craine, Sigma Chi, Bucknell University,
Lewisburg, Pennsylvania 1940
Soper, J[oseph] Dewey, 827 Riverwood Ave., Fort Garry, Winnipeg,
Manitoba, Canada 1937
Spangler, Miss Iva M., 128 E. Foster Parkway, Fort Wayne, Indiana.....1939
Speirs, John Murray, 204 Vivarium Bldg., Wright & Healy Sts.,
Champaign, Illinois 1931
Speirs, Mrs. J. Murray, 705 W. Elm St., Urbana, Illinois 1938
Spencer, Miss O. Ruth, 1031 25th Ave., Moline, Illinois 1938
Sperry, Charles Carlisle, Bureau of Biological Survey, Denver, Colorado 1931
Stabler, Robert M[iller], Wallingford Ave., Wallingford, Pennsylvania 1939
Staebler, Arthur Eugene, Route 5, 2105 Dhu Varren Rd., Ann Arbor, Michigan.1937
Stark, Miss Wilma R[uth], Golf Rd., Midland, Michigan 1939
Starrett, William Charles, 105 Glen Oak Ct., Peoria, Illinois 1933
Steib, Peter, 1749 N. 17th St., Milwaukee, Wisconsin 1940
Stephens, Dr. Thomas Calderwood, Morningside College, Sioux City, Iowa....1911
Stevens, O. A., State College Station, Fargo, North Dakota 1926
Stevenson, H[orace] Godwin, Jr., 301 College Ave., Ithaca, New York 1939
Stevenson, James Osborne, Arkansas Waterfowl Refuge, Austwell,
Refugio County, Texas 1931
Stewart, Paul Alva, Leetonia, Ohio 1925
Stewart, Robert Earl, 4117-3rd Road N., Apt. 1, Arlington, Virginia.....1939

Stiles, Bruce F., 111 Angle Ave., Council Bluffs, Iowa 1935
Stine, Miss Perna M., State Teachers College, Minot, North Dakota 1931
Stonehouse, Miss Lucille B., Box 2002, Juneau, Alaska 1939
Stophlet, John J., 2612 Maplewood Ave., Toledo, Ohio 1934
Storer, John Humphreys, 579 Beaver St., Waltham, Massachusetts 1939
Storer, Robert Winthrop, 522 Vose Ave., South Orange, New Jersey 1938
Storer, Dr. Tracy Irwin, Division of Zoology, University Farm,
Davis, California 1928
Street, Thomas M., Bottineau, North Dakota 1940
Studholme, Allan Taylor, 1-A Horticulture Bldg., State College, Pennsylvania. 1939
Stupka, Arthur, Great Smoky Mountains National Park,
Gatlinburg, Tennessee 1935
Sturgeon, Myron T., Michigan State Normal College, Ypsilanti, Michigan.... 1934
Sumner, Eustace Lowell, 2537 Rose Walk, Berkeley, California 1931
Sumner, Eustace Lowell, Jr., Box 188, Menlo Park, California 1929
Swan, Kenneth D[upee], Box 778, Missoula, Montana..... 1939
Swanson, Miss Hedvig L. E., Mason Hospital, Macon, Georgia 1939
Swedenborg, Ernie David, 4905 Vincent Ave. S., Minneapolis, Minnesota 1929
Taber, Wendell, 3 Mercer Circle, Cambridge, Massachusetts 1936
Tallman, William S[weet], Jr., 4 Linden Place, Sewickley, Pennsylvania 1940
Tanner, James Taylor, 67 Greenbush St., Cortland, New York 1937
Tanner, Orey, 5019 Constance St., New Orleans, Louisiana 1933
Taverner, Percy Algernon, National Museum of Canada, Ottawa,
Ontario, Canada 1925
Teachenor, Dix, 1020 W. 61st St., Kansas City, Missouri 1923
Terres, J[ohn] Kenneth, U. S. Soil Conservation Service, Federal Bldg.,
Utica, New York 1939
Terrill, Harold V[ernon], 109 Wildlife Conservation Bldg.,
Columbia, Missouri 1939
Test, Dr. Frederick H., 511 Russell St., West Lafayette, Indiana 1931
Thabes, Mrs. Daisy Adelaide, 417 Holly St., Brainerd, Minnesota 1938
Thomas, Judge Otho S., 205 S. Greene St., Rock Rapids, Iowa 1932
Thorp, George Boulton, Carnegie Institute of Technology,
Pittsburgh, Pennsylvania 1935
Tice, Wayne [E.], 49 Emerald St., Battle Creek, Michigan 1939
Todd, Henry Oliver, Jr., Woodbury Rd., Murfreesboro, Tennessee 1938
Todd, Miss Mabel Sellers, 1622 Kensington St., Houston, Texas 1940
Tome, Miss Ann, Cooperstown, New York 1940
Toner, G[eorge] C[live], Cataraqui, Ontario, Canada 1939
Tonkin, George, 207 Federal Office Bldg., Des Moines, Iowa 1935
Trautman, Milton Bernhard, Stone Laboratory, Put-in-Bay, Ohio 1932
Travis, Bernard V., Box 655, New Smyrna Beach, Florida 1935
Trimble, Miss Ruth, Carnegie Museum, Pittsburgh, Pennsylvania 1935
Tubbs, Farley F., Game Division, Department of Conservation,
Lansing, Michigan 1935
Twomey, Dr. Arthur Cornelius, Carnegie Museum, Pittsburgh, Pennsylvania.. 1936
Uhler, Francis Morey, Bureau of Biological Survey, Washington, D.C. 1931
Vaiden, Meredith Gordon, Rosedale, Mississippi 1937
Vesall, David Bernard, Carlos Avery Nursery, Forest Lake, Minnesota 1940
Vetter, Dr. Charles, Grand View, Nyack, New York 1931
Vogt, William, % Mrs. F. V. Brown, 32 Cunningham Ave.,
Floral Park, New York 1935
Vonnegut, Miss Pauline, 1804 Park Ave., Indianapolis, Indiana 1939
Wade, Douglas E., Beavertown, Pennsylvania 1936
Wagner, Miss Esther Elizabeth, 13 Locust Ave., Danbury, Connecticut 1937

Walker, W. M., Jr., 201 E. Peachtree, Route 9, Knoxville, Tennessee 1925
Wallace, George John, Pleasant Valley Sanctuary, Lenox, Massachusetts.....1937
Warner, Mrs. Carmen Hambleton, 117 W. Hubbard Ave., Columbus, Ohio ..1939
Watson, Don, Mesa Verde National Park, Colorado 1940
Watson, Frank Graham, 2433 Haste St., Berkeley, California 1937
Watson, Lucius H., 4103 Sheridan Blvd., Lincoln, Nebraska 1925
Watters, Robinson C., Box 298, Cambridge, Maryland 1935
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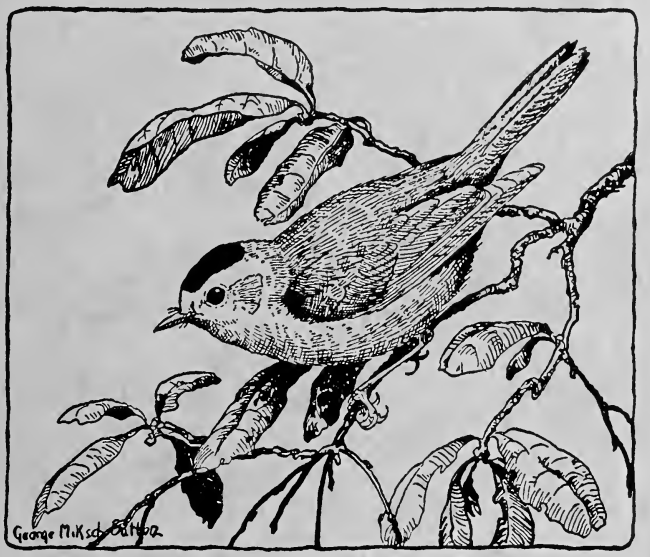

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PRODUCTION OF THE REDHEAD (*NYROCA AMERICANA*) IN IOWA[1]

BY JESSOP B. LOW

NESTING of waterfowl on the outer edges of breeding ranges has not in the past received as much attention from game administrators as that in the central or optimum portions of the same breeding ranges. Because of certain conditions, both known and unknown, the peripheries of breeding ranges do not provide the most favorable conditions for nesting waterfowl. However, as management practices bring existing optimum breeding grounds near the limit of production, other areas of lower productive capacities must be recognized and brought under management. We realized at the inception of this investigation that Iowa marshes and lakes lay on the southern boundary of the Redhead breeding range and that we could not expect such nesting concentrations of ducks as have been reported from areas like the Lower Souris Refuge, North Dakota (Kalmbach, 1938) and the Bear River Refuge, Utah (Williams and Marshall, 1938).

This investigation had a two fold objective: (1) to ascertain the degree to which Redheads nested in Iowa, and (2) to make a nesting study of those Redheads breeding in Iowa. A definite unit area was chosen on which to carry out the nesting investigation, and an intensive search was made on this area for nests. The intensive search within a given area, although limiting the number of nests brought under observation, permitted a thorough investigation of all the available plant cover types, a procedure ordinarily not possible in the extensive search method.

The data for this paper were gathered during the spring and summer of 1938 as part of the waterfowl program of the Iowa Cooperative Wildlife Research Unit under the direction of Dr. George O. Hendrickson, Iowa State College, and Thomas G. Scott, U.S. Biological Survey. The investigation centered in northwest Iowa in the vicinity of Lost Island Lake, Clay and Palo Alto counties. Within a radius of five miles of Lost Island Lake lie six lakes and numerous marshes and

[1] Journal paper No. J-747 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project 496. Iowa State College, Iowa Conservation Commission, and the U. S. Bureau of Biological Survey cooperating with the American Wildlife Institute.

sloughs constituting the largest remnant of duck breeding grounds now found in Iowa.

Nesting Habits

In contrast to the dry ground nesting habits of the puddle ducks in general and of many of the diving ducks, the nesting of the Redhead in Iowa is confined exclusively to stands of emergent vegetation within the shallow-water lakes and marshes. The nesting data for this paper were secured while wading or pushing a small boat through the marshes and sloughs. A periodic and methodic search was made of the nesting habitats during the months of May, June, and July to locate nests and to take data on nests already under observation. During the 1938 nesting season 42 nests were observed. In the five-year period of 1933 to 1937 Bennett (1938a) obtained data on 22 Redhead nests incidental to other work in this marsh area of Clay and Palo Alto counties. Two other nesting investigations in which the Redhead was considered were on the Bear River Refuge, Utah (Williams and Marshall, 1938), and on the Prince Albert district, central Saskatchewan (Furniss, 1938).

The nesting data on the Redhead in Clay and Palo Alto counties for the 1938 season were presented in Table 1. The height of the nest-building and egg-laying period was June 19 to 25, during which period one-third of the total nests observed were constructed. Of the 42 Redhead nests 23 (54.74 per cent) successfully produced young, and 19 (45.26 per cent) were unsuccessfully terminated. This nesting success for the Redhead is 13 per cent above that given earlier by Bennett (1938a). Kalmbach (1939) recorded the average nesting success of waterfowl as 60 per cent, which is 6 per cent above that obtained in this investigation of the Redhead.

Sixty-eight days (May 10 to July 16) elapsed from the time the first nest was located until eggs in the last nest under observation hatched. However, the first nest located contained 10 eggs, which at the rate of one egg a day indicated May 1 or earlier as the date on which egg-laying was begun. Bennett (1938a) reported a 59-day inclusive nesting season for the 22 nests under his observation. There were 384 eggs in 39 of the 42 nests under observation. The clutches averaged 9.85 eggs to a nest. Williams and Marshall (1938) found an average of 12.5 eggs to a clutch in Utah, while Furniss (1938) reported an average clutch of 9.33 eggs in Saskatchewan. Bent (1923) concluded that the Redhead deposits between 10 and 15 eggs in a clutch. There was a gradual tapering off in the number of eggs to a clutch as the end of the season approached. A total of 38.29 per cent (147 eggs) of the eggs hatched.

The size of the individual clutches appeared to have a definite relationship to the success and failure of the clutches. A greater per-

centage of smaller than larger clutches terminated successfully. This fact was borne out particularly by observations during periods of rapid rise in water level which showed that the larger clutches of eggs were not raised as rapidly as smaller clutches through the placing of new nesting materials under them by the female. It appeared probable that some of the smaller clutches were re-nesting attempts, since they were more prevalent later in the season; however, from data at hand this cannot be definitely shown. Smaller clutches toward the end of

Figure 1. Redhead nesting cover in Mud Lake, Clay County, Iowa. Hardstem bulrush is shown in the background; cattail, giant bur reed, sweet flag, and sedges in the foreground.

the nesting season indicative of re-nesting were also noted in the Blue-winged Teal (*Qucrquedula discors*) (Bennett, 1938b), in the Ring-necked Pheasant (*Phasianus colchicus torquatus*) (Errington and Hamerstrom, 1937), and in many other species.

The hatching period of the Redhead extended over 45 days (June 2 to July 16). The week in which most hatching took place was July 10 to 16, which was approximately 4 weeks after the period of heaviest

egg-laying (June 19 to 25). Bent (1923) recorded 22, 23, or 24 days as the incubation period of the Redhead.

Failure of eggs to hatch was attributed to the following causes: (1) destruction by flooding from heavy rain storms, (2) desertion, (3) the female leaving the nest before all the eggs had hatched, (4) infertility, and (5) predation. The instability of the water levels in the nesting habitats was the most destructive factor in 1938. Ten (52.6 per cent) of the 19 unsuccessful nests were flooded. Two very severe rain storms during the latter part of June raised the water in the lakes and sloughs 6 to 24 inches, depending on the size of the territory drained by the lakes and sloughs.

Nest desertion by the Redheads was relatively high. Eight nests (19.04 per cent) were deserted. The greatest single factor contributing to nest desertion was the deposition of eggs by several Redhead females in one nest. These compound sets were made at the beginning of the nesting season, presumably before some of the females had constructed their own nests. Although the nests of the 4 compound sets were well constructed and well filled with eggs, none were incubated. One other nest was deserted several weeks before it was located. One deserted nest containing one egg may have been abandoned as a result of human interference at too early a period in the history of the nest. Redheads under observation were fairly tolerant of human trespassing on the nesting habitat. Visits were made to some nest sites as many as six times for purposes of observation, and during the study no desertion from such interference was detected with the possible exception of the one nest cited above. It should be mentioned, however, that all possible precautions were taken to avoid any drastic disturbances that would give reason for desertion.

Another factor in the desertion of nests appeared to be the intolerance of the Redhead female of the Ruddy Duck (*Erismatura jamaicensis rubida*) and Mallard (*Anas platyrhynchos platyrhynchos*) eggs which were deposited in the Redhead nests. Ruddy Duck eggs were removed from 5 Redhead nests, presumably by the female Redhead. However, in 2 other Redhead nests Ruddy Duck and Mallard eggs were incubated with the Redhead eggs. None of these parasite eggs hatched, probably because of the difference in time in which the incubation of the eggs began.

Redheads, in common with other water birds, deposit their eggs in other birds' nests, including those of the Ruddy Duck, American Coot (*Fulica americana americana*), and the American Bittern (*Botaurus lentiginosus*). Two Redhead eggs deposited in an American Bittern nest hatched, but the young died soon after hatching.

When once begun, the egg-laying usually continued rather uniformly until incubation of the clutch started. In some nests, however, additional eggs were deposited from one to several days after incuba-

tion began, with the result that often the last deposited eggs were deserted in the nests when the female ducks left the nests with the juveniles which were first hatched. Occasionally eggs were deposited in nests after incubation had proceeded two or three weeks. In some cases it may have been the owners of the nests that laid additional eggs shortly after incubation began, but much later additions to the clutch were probably laid by other ducks. The length of time the embryo remained alive after incubation stopped apparently depended upon the stage of development of the embryo and upon weather conditions. By macroscopic examination of the eggs it was determined that some embryos were alive as long as four days after the female had left the nest. Of the total of 47 eggs left in the nests after the female Redheads had departed with their juveniles, 30 (64 per cent) contained either living or dead embryos.

Infertile eggs did not appear to be a matter of earliness or lateness in the nesting season. Seventeen eggs (4.42 per cent) from 9 nests were infertile. Evidence of eggs laid promiscuously before the nesting season began, as reported in the case of the Blue-winged Teal (Bennett, 1938b), was not observed in this study of the Redhead.

Considerable predation on nests and juveniles has been reported in waterfowl studies in some parts of the country (Kalmbach, 1938). Very little predation occurred on the Redhead nests and juveniles of the marsh area under study in 1938. The choice of nesting habitat of the Redhead in a large degree rendered the Redhead populations inaccessible to the common terrestrial predators. As discussed later in more detail, the nests of the Redhead were constructed above the water in emergent vegetation, and as a result the only predation possible was from bird and swimming predators. Of the former, the Eastern Crow (*Corvus brachyrhynchos brachyrhynchos*) was the most abundant bird predator, although the Marsh Hawk (*Circus hudsonius*) and the Great Horned Owl (*Bubo virginianus virginianus*) were also present. Errington and Breckenridge (1936) found the remains of only one duck, probably a young Blue-winged Teal, in 557 food items of the Marsh Hawk in the Ruthven, Iowa, area. Mink (*Mustela vison*) and the snapping turtle (*Chelydra serpentina*) were the only swimming predators capable of reaching the nests or juveniles of the Redhead. Question has arisen as to the possible predation habits of the muskrat (*Ondatra zibethica*) on the Redhead, but so far we have found no evidence of it. Pond turtles (*Chrysemys picta*) observed resting on Redhead nests did not molest the eggs or nests. In addition, mammal predators frequenting the land adjoining the marshes and potholes were the northern plains red fox (*Vulpes regalis*), common badger (*Taxidea taxus taxus*), long-tailed weasel (*Mustela frenata spadix*), prairie spotted skunk (*Spilogale interrupta*), striped skunk (*Mephitis*

mephitis), the domestic dog (*Canis familiaris*) and the domestic cat (*Felis domestica*).

Nesting Cover

The nesting cover of the Redhead in northwest Iowa was composed principally of hardstem bulrush (*Scirpus acutus*), river-bank sedge (*Carex riparia*) and cattail (*Typha* sp.). The preferred habitat consisted of emergent vegetation in the proportion of 40 per cent hardstem bulrush, 33 per cent river-bank sedge, and a number of minor plants comprising the remainder. Approximately 10 per cent of the total water acreage of the better habitat was free of emergent vegetation. More important among the minor plants were reed (*Phragmites communis*), giant bur reed (*Sparganium eurycarpum*), sweet flag

Figure 2. Redhead young one hour after hatching. Nest constructed of hardstem bulrush.

(*Acorus calamus*), river bulrush (*Scirpus fluviatilis*), smartweed (*Polygonum* sp.), arrowhead (*Sagittaria latifolia*), giant bulrush (*Scirpus validus*), and slender bulrush (*Scirpus heterochaetus*).

Thirty-eight per cent of the nests were located in stands of vegetation composed of both hardstem bulrush and river-bank sedge. These two plant species, composing over 70 per cent of the nesting cover,

held 60 per cent of the nests. The importance of the hardstem bulrush to nesting Redheads is further attested by the findings of Williams and Marshall (1938) in which 65 per cent of the Redhead nests on the Bear River marshes, Utah, were located in this type of vegetation.

Nest Construction

The Redhead nests were constructed in the emergent vegetation out in the water, and the eggs were maintained, in most instances, a safe distance above the water level by the constant addition of new building materials. A variety of different plants, depending largely upon the vegetative type in which the ducks located their nests, was used as nesting material. Redheads constructed their nests principally of 11 plant species. Some nests were composed entirely of one species, while

Figure 3. Cattail provides excellent nesting cover for Redheads. Round Lake, Clay County, Iowa.

others consisted of a mixture of plants. Dead, dry vegetation of the year previous constituted the largest percentage of nesting materials.

A consideration of the vegetation as it affected the productivity of the Redheads involved, among others, two important factors: (1) the availability of the vegetative cover, and (2) the use made of the available vegetative cover. The availability of the vegetative cover was ex-

pressed in acreage of each plant species present. The use made of the available vegetation was determined by estimation of the percentage of each plant species built into the nest and the numbers of nests located within each plant cover type. Based on the above factors the vegetation in order of importance to the Redheads was as follows: hardstem bulrush, riverbank sedge, bur reed, cattail, sweet flag, reed, and slough grass.

Detailed measurement of each nest under observation showed that the water depth preferred for nest construction was about 15 inches, although nests were located in water varying from 1 to 36 inches. The top of the nest was above the soil an average of 22 inches. In agreement with measurements given by Bent (1923), the nests averaged 16 inches in outside diameter and 7 inches inside diameter. While the depth of the cup or bowl of the nest varied considerably, the average of measurements were 3 inches.

The nests were constructed in the emergent vegetation out in the marshes an average of 70 yards from the high water mark. Nests varied from one yard to 250 yards, with an average of 60 yards, from large bodies of open water.

Redheads selected nesting sites having open accessible water either naturally or artificially supplied. The average distance to open water bodies over 10 feet in diameter was 35 yards. Sixty-four per cent of the nesting population under observation used the water provided by the clearings around muskrat lodges as the focal point for their nesting activities. In the duck-nesting investigations on the Bear River Refuge Williams and Marshall (1938) showed the greater number of Redhead nests was located within a few feet of open channels of water.

Sixty per cent of the nests were located in very dense vegetation containing above an average of 100 stalks of the cover plant to one-half square meter, and 40 per cent of the nests were located in medium dense vegetation containing between 50 and 100 stalks of the cover plant to one-half square meter.

The Redhead nests were built in the matted emergent vegetation or in clumps of the plants. Often the nest had no solid foundation other than the stalks of the plants, but more frequently, even though the nest was constructed in dense plant growth, the foundation of the nest went down to the soil. An interesting observation was the manner in which the Redheads added nearby vegetation to their nests in their attempts to raise the eggs above the rising water resulting from a heavy rain. The success or failure of the nest at this critical period depended largely upon the type of vegetation in which the nest was constructed. Hardstem bulrush appeared to be the most successful building material for these emergencies, probably because of the rapid rate at which nests could be constructed of it. Where the female had broken off the vegetation to add to her nest it was not an uncommon sight to

see nests, following a severe storm, situated in the middle of clearings six to ten feet in diameter.

The Redheads did not appear to be affected by other birds nesting in the immediate vicinity of their nests. American Coot and Pied-billed Grebe (*Podilymbus podiceps*) nests were located within a yard of Redhead nests without causing nest failure to any of the birds. The shortest distance between Redhead nests was 5 yards, although Rockwell (1911: 192) records 2 nests within 2 feet of each other.

Sixty per cent of the Redhead nests possessed an overhead covering. These cupolas were constructed by bending the vegetation down over the nest, or the nest was located in vegetation dense enough to provide such a covering without assistance from the ducks. Sixty-six per cent of the nests observed were constructed with 1 to 4 ramps or paths of piled vegetation leading from different sides of the nests to the water.

Figure 4. Protected bays as pictured above are favorite feeding haunts for both adult and juvenile Redheads. *Lemna* spp. form the principal floating plants; sago pondweed (*Potamogeton pectinatus*) and coontail (*Ceratophyllum dimersum*) are the most important submerged plants.

Juvenile Rearing Cover

The Redhead females reared their young in vegetation similar to that used as nesting cover. The broods were kept close to the tall bulrush, cattail, reeds, and other protective cover while feeding or playing. Rarely were juveniles observed over 50 yards from protective vegetative cover.

TABLE 1

1938 Nesting Data on the Redhead in Clay and Palo Alto Counties, Iowa

Vegetation in which the nests were located	Total nests	Successful nests	Unsuccessful Nests		Total eggs	Hatched eggs	Infertile eggs	Dead embryos	Eggs in unsuccessful nests
			Destroyed	Deserted					
Scirpus acutus	3 *(7.14)	3 (7.14)			32 (8.32)	25 (6.51)	1 (0.26)	6 (1.56)	
Scirpus acutus, *Carex riparia*	16 (38.09)	8 (19.04)	4 (9.52)	4 (9.52)	139 (36.20)	66 (17.19)	10 (2.60)	14 (3.65)	49 (12.76)
Scirpus acutus, *Scirpus fluviatilis*, *Carex riparia*	4 (9.52)	2 (4.76)	1 (2.38)	1 (2.38)	39 (10.15)	12 (3.13)		5 (1.30)	22 (5.72)
Scirpus acutus, Carex riparia, Sparganium eurycarpum	2 (4.76)	2 (4.76)			15 (3.91)	12 (3.13)	3 (0.78)		
Scirpus acutus, Carex riparia, Acorus calamus	3 (7.14)		2 (4.76)	1 (2.38)	27 (7.03)				27 (7.03)
Carex riparia	6 (14.28)	1 (2.38)	4 (9.52)	1 (2.38)	84 (21.87)	2 (0.52)	1 (0.26)	2 (0.52)	79 (20.58)
Carex riparia, *Phragmites communis*	2 (4.76)	1 (2.38)		1 (2.38)	13 (3.39)				13 (3.39)
Typha sp.	2 (4.76)	2 (4.76)			9 (2.35)	9 (2.35)			
Phragmites communis	3 (7.14)	3 (7.14)			14 (3.64)	10 (2.60)	1 (0.26)	3 (0.78)	
Spartina pectinata	1 (2.38)	1 (2.38)			12 (3.13)	11 (2.86)	1 (0.26)		
Totals	42 (100)	23 (54.74)	11 (26.18)	8 (19.04)	384 (100)	147 (38.29)	17 (4.42)	30 (7.81)	190 (49.48)

* Numbers in parentheses are percentages.

Plant species making up the most important rearing cover were located throughout the area of study in four plant communities. Hardstem bulrush and river bulrush growing together were used more extensively than other cover types. These plants grew best in water up to three feet deep and were found farther from shore than the remaining emergent plant species. A plant community consisting of river bulrush, giant bur reed, and sweet flag was second in importance as rearing cover and occupied a strip near the edge of potholes and marshes. Cattail and reed which grew in the same habitat were used to some extent as juvenile rearing cover. Sedges (*Carex riparia, C. atherodes*) growing with sweet flag and giant bur reed in the shallow water on the edges of potholes and marshes were used less extensively as a juvenile rearing cover.

Brood Counts and Production

In order to arrive at the number of young Redheads produced to a brood in 1938 it was necessary to determine the loss of juvenile ducks from predation and other mortality causes. This loss was determined by counting the numbers of juveniles to a brood observed throughout the rearing period. The average size brood of Redheads as determined from brood counts made throughout August was seven juveniles. From these brood counts it appeared that of the average clutch of 8.4 eggs in the successful nests 7 juveniles reached maturity and apparently entered the fall migration.

It was calculated by checking the numbers of pairs of Redheads on the area under study during the height of the nesting season and by counting the number of broods on the same area that not over 45 per cent of the nests were located. On this basis it was further calculated that on the total marshes and lakes about 90 Redhead nests were constructed. This represented an average of one nest to 16 acres of vegetation-covered marsh land. Since 54.74 per cent of the nests (49 nests) were successful and of each successful clutch 7 juveniles reached maturity, the total number of Redheads reared in the marshes and lakes of Clay and Palo Alto Counties in 1938 was about 340, or an average of approximately 3.8 young for each breeding pair of Redhead.

Summary

The investigation presents the available data on the extent and success to which the Redhead (*Nyroca americana*) nested in Clay and Palo Alto counties, Iowa, in 1938.

This investigation showed that the nesting season extended from May 1 to July 16 and that of the 42 nests under observation, 23 (54.74 per cent) were successful. Instability of the water levels, resulting in flooded nests, was the most destructive factor in the production of the Redhead. Of the 19 (45.26 per cent) unsuccessful nests 10 (52.63 per

cent) were flooded; 1 (5.26 per cent) was destroyed by Crows, and 8 (42.11 per cent) were deserted. Infertile eggs numbered 17 (4.42 per cent), while embryos were contained in a total of 30 (7.81 per cent) eggs left in the nests after the female had led the hatched ducklings away. Although 54.74 per cent of the nests were successful, only 38.29 per cent of the eggs successfully produced juveniles. As affecting the productivity of the Redhead, the most important plant species determined from this study were: hardstem bulrush, river-bank sedge, giant bur reed, cattail, sweet flag, reed, river bulrush, and slough grass.

Approximately 340 Redhead were reared in the water areas under observation and entered into the 1938 fall migration flight. This number represented an average of 3.8 juveniles reared to a breeding pair of Redheads, and an average of one nest to 16 acres of vegetation-covered marsh land.

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SEASONAL FOOD HABITS OF THE MARSH HAWK IN PENNSYLVANIA[1]

BY PIERCE E. RANDALL

THROUGHOUT the course of a management study of the Ring-necked Pheasant (*Phasianus colchicus*) in Pennsylvania, considerable attention was devoted to the determination of the relationships of birds of prey to the pheasant populations. As a means of ascertaining these relationships, the food habits of several species of raptors were investigated. This paper presents the information now available from this study on the food habits of the Marsh Hawk (*Circus hudsonius*).

This research was pursued under the supervision of Dr. Logan J. Bennett, Biologist, U. S. Bureau of Biological Survey, and Dr. P. F. English, Associate Professor of Wildlife Management, Department of Zoology and Entomology, The Pennsylvania State College.

The pheasant study was conducted on a 1,675-acre sample tract in Lehigh County in southeastern Pennsylvania. The study area is in the heart of first-class pheasant range and is also situated in the most productive agricultural section of the Commonwealth.

Despite the absence of marshes or swales Marsh Hawks were common on the study area throughout the year. From late in summer until spring, they utilized weedy grain stubblefields as roosting sites. During the spring the Marsh Hawks sometimes roosted in waste areas that maintained a luxuriant growth of weeds from the previous year. Three of the four nests located during this study were in wheatfields, and the fourth was in a dense stand of reed canary grass (*Phalaris arundinacea*).

Pellets were collected weekly from the roosts. Between August 15, 1938, and September 15, 1939, a total of 598 pellets, containing 762 items of prey, were collected and analyzed. The pellets cast by Marsh Hawks are fairly good for quantitative work, especially in fall and winter. The technique described by Errington (1930, 1932) was followed in the analysis, and only bones of vertebrates and skeletal parts of insects were used in the determination of numbers of prey.

In the following discussion the material will first be presented by seasons and will then be summarized for the year.

Fall Food Habits

During the fall (September, October, and November, 1938) the diet of the Marsh Hawks ran largely to mice (Table 1). Birds were of some importance as food, making up 18.4 per cent of the fall food items.

[1] Paper No. 12 from the Pennsylvania Cooperative Wildlife Research Unit. The Pennsylvania State College and the Pennsylvania Game Commission, cooperating with the U.S. Bureau of Biological Survey.

Authorized for publication on Feb. 20, 1940 as Paper No. 957 in the journal series of the Pennsylvania Agricultural Experiment Station.

The only game bird taken during these months was an immature Ring-necked Pheasant, occurring in an early September pellet. Smaller birds identified in the fall pellets included 15 Flickers (*Colaptes auratus*), 2 Song Sparrows (*Melospiza melodia*), and 2 Starlings (*Sturnus vulgaris*).

It is conceivable that the common skunk (*Mephitis nigra*) and the domestic cat (*Felis domestica*) in the fall pellets may have been carrion, for a relatively weak-clawed raptor like the Marsh Hawk would certainly have considerable trouble in capturing and killing adults of these species.

Winter Food Habits

As the weather became colder, mice became even more important as a Marsh Hawk food; birds were only infrequently represented in the pellets (Table 1). No game birds occurred in the winter (December, 1938, to March, 1939) pellets. Small birds included 5 Song Sparrows, 2 Tree Sparrows (*Spizella arborea*), and 1 Junco (*Junco hyemalis*). Seven songbirds were not identified.

Cottontails (*Sylvilagus* spp.) seemed to be the only game species eaten by the hawks during the winter. Remains of these animals were found in nine pellets and represented 4.7 per cent of the winter prey.

The winter diet of the Marsh Hawk was greatly influenced by the weather (Randall, 1939). A period of deep snow made mice difficult to obtain. The hawks were then forced to depend to a larger extent on cottontails and small birds for food. It was interesting to note that five of the nine cottontails represented in the winter pellets were taken during a 10-day period when the snow was more than a foot deep.

Spring Food Habits

With the coming of spring, the emergence of certain mammals from hibernation and the northward migration of hordes of small birds made food easier for the Marsh Hawks to obtain. Although the spring (April and May, 1939) data are fewer than those for the other seasons, they indicate that birds again became an important Marsh Hawk food at this season of the year. Avian prey in the spring pellets included 1 Rock Dove (*Columba livia*), 16 Flickers, 4 Starlings, 1 Redwing (*Agelaius phoeniceus*), and 8 unidentified small birds.

Despite the increase of birds in the hawk's diet, mice were the most important source of food. The spring foods are also summarized in Table 1.

Summer Food Habits

In the summer of 1939 a great variety of prey was available to the raptors. Easily captured juveniles, both avian and mammalian, abounded. Reptiles and amphibians were also numerous and could easily be obtained by an alert hawk.

TABLE 1

SEASONAL FOODS OF THE MARSH HAWK, 1938–39

Season of year	Fall		Winter		Spring		Summer	
Number of pellets examined	177		156		80		185	
Kind of prey	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Mice (*Microtus* spp., *Peromyscus* spp., *Pitymys* sp., and *Zapus* spp.)	179	76.5	159	83.7	46	52.9	99	39.6
Shrews (*Sorex* sp. and *Blarina* sp.)	2	0.8	1	0.5	2	2.3	4	1.6
Chipmunks (*Tamias striatus*)	...	...	...	...	3	3.4	2	0.8
Red squirrel (*Sciurus hudsonicus*)	1	0.4	...	...	...	...	...	...
Cottontails (*Sylvilagus* spp.)	4	1.7	9	4.7	4	4.6	21	8.4
Skunks (*Mephitis nigra*)	1	0.4	...	...	...	...	1	0.4
House cat (*Felis domestica*)	1	0.4	...	...	...	...	...	...
Weasel (*Mustela* sp.)	1	0.4	3	1.6	...	...	...	...
Muskrat (*Ondatra zibethica*)	...	...	1	0.5	...	...	...	...
Unidentified mammals	1	0.4	1	0.5	...	...	...	...
Ring-necked Pheasants (*Phasianus colchicus*)	1	0.4	...	...	...	...	6	2.4
Mourning Doves (*Zenaidura macroura*)	...	...	...	...	...	...	4	1.6
Picidae (mostly Flickers)	15	6.4	...	...	16	17.8	31	12.4
Other birds (mostly passerines)	27	11.6	15	7.9	14	16.7	66	26.4
Domestic fowl	...	...	...	...	...	...	2	0.8
Snakes (*Thamnophis* spp.)	1	0.4	...	...	2	2.3	6	2.4
Frogs (*Rana* sp.)	...	...	1	0.5	...	...	8	3.2
Insects	...	...	trace	trace	trace	trace	trace	trace
TOTALS	234	99.8	190	99.9	87	100.0	250	100.0

(a) Number of individuals.
(b) Percent of total.

Despite the abundance of other prey, mice were the most important food of the hawks (Table 1). These rodents were eaten most extensively late in summer after the harvest. The standing grain early in summer protected the mice and made them difficult for the hawks to obtain.

Early in summer (June and early in July, 1939) juvenile birds were the most important food of the hawks. The new-mown hayfields were an excellent hunting ground. Many Eastern Meadowlark (*Sturnella magna*), Redwing, Bobolink (*Dolichonyx oryzivorus*), and Field Sparrow (*Spizella pusilla*) nests were on the ground or on the weeds in the hay. After the mowing these nests lay on the ground with the young exposed to the elements and to any predator that happened along. Marsh Hawks were apparently aware of this easy source of food, for they were frequently observed cruising over recently mown hayfields. A large proportion of the young ground-nesting passerine birds in the summer food items were secured in this manner.

To obtain as many quantitative data as possible on the early summer food habits, juvenile Marsh Hawks were tethered at the nests in the manner described by Errington (1932). Three young hawks were held captive and fed by the parents for several weeks after they would ordinarily have been fending for themselves. The gullets of the juveniles were emptied daily or twice daily by squeezing, and the contents were analyzed. Sixty-one gullet collections were obtained by this method. After the gullets were robbed, the young hawks were sometimes force-fed natural foods so that they would not suffer from a lack of proper nourishment.

The foods brought to the nest are listed in Table 2. These data were procured between June 20 and July 23. Juvenile birds of ground-nesting passerines were the most important items of food.

TABLE 2

FOODS BROUGHT TO THE NEST, 1939

Kind of prey	Number of individuals	Per cent of total
Mice (*Microtus* spp.)	14	20.9
Young cottontails	7	10.4
Young Ring-necked Pheasants	2	3.0
Young Mourning Doves	2	3.0
Flickers	5	7.5
Young Killdeers	2	3.0
Young passerine birds (Meadowlarks, Redwings, Bobolinks, Robins, Sparrows, and Grackles)	30	44.9
Domestic chickens	2	3.0
Frogs	2	3.0
Garter snake	1	1.5
TOTAL	67	100.2

Representatives of game species found among the summer foods (specimens brought to the nest and items found in pellets) included 8

Ring-necked Pheasants, 6 Mourning Doves (*Zenaidura macroura*), and 28 cottonails. Most of these were juveniles.

Other miscellaneous summer foods included shrews, chipmunks, snakes, frogs, and insects. The reptiles, amphibians, and invertebrates were most numerous in the late summer pellets.

Late in summer the parent hawks gradually ceased feeding their offspring, and the latter learned to hunt for themselves. The young had considerable difficulty in obtaining enough to eat when they began to hunt for themselves. Although no quantitative data are available on the food habits of the young after leaving the nest, observations indicate that they fed on fresh carrion, insects, snakes, and other slow-moving prey. Errington and Breckenridge (1936) reached somewhat similar conclusions regarding the food habits of juveniles during their first weeks of hunting.

English (1933) related an instance in which young Marsh Hawks, forced by circumstances to begin hunting unusually early in life, became serious predators of pheasants and had to be killed. He believed this to be an unusual case, however, rather than a normal one.

Relation to Game and Economic Status

As a prelude to discussion of the economic status of the Marsh Hawk in the Pennsylvania pheasant range, the foods for the year were totaled in Table 3. There was a slight preponderance of data from the summer season and a smaller amount of spring data. This condition tended to overemphasize the importance of birds in the yearly diet, as summer was the time when most of the avian prey was taken.

Nine Ring-necked Pheasants, apparently all juveniles, were taken by Marsh Hawks on the study area during the summer. The pheasant

TABLE 3

Foods for the Year, 1938–39

Kind of prey	Number of individuals	Per cent of total
Mice	500	60.3
Shrews	9	1.1
Cottontails	45	5.4
Chipmunks	5	0.6
Red squirrel	1	0.1
Weasels	4	0.5
Skunks	2	0.2
Muskrat	1	0.1
House cat	1	0.1
Unidentified mammals	2	0.2
Domestic fowl	4	0.5
Ring-necked Pheasants	9	1.1
Mourning Doves	6	0.7
Flickers	66	8.0
Other birds (mostly small passerines)	154	18.6
Frogs	11	1.4
Garter snakes	9	1.1
Total	829	100.0

population studies revealed that 776 young Ring-necked Pheasants were hatched on the study area during the summer of 1939. Although the nine young birds captured by Marsh Hawks represented 9.4 per cent of the juvenile mortality, they made up only 1.2 per cent of the juvenile population. This was a very slight loss and was of particular interest because of the high pheasant population maintained on the study area. The sample tract supported in fall a pheasant density of about one bird to 2 acres.

Errington and Hamerstrom (1937) reported that pheasant broods in areas heavily hunted by Marsh Hawks shrank in size at the same rate as did broods in areas where these hawks were rare. They found no perceptible relation between the conspicuous preying of local Marsh Hawks and the seasonal shrinkage in the size of pheasant broods. Apparently mortality from other causes occurred when Marsh Hawks were absent.

Neither pellet analyses nor careful field observations revealed any depredations on adult pheasants by Marsh Hawks. Adult Ring-necked Pheasants exhibited little fear of this species of hawk. It was not uncommon for a flock of pheasants in the open to feed unconcernedly while a Marsh Hawk flew past a few feet overhead.

Remains of four young Mourning Doves were found in adult summer pellets, and two others were fed to nestlings. In view of the large nesting population of doves on the area, this was a comparatively small loss. At least 40 pairs of doves—probably many more—nested on the study tract. As a rule, Morning Dove nests were too well concealed from above for the nestlings to be discovered by Marsh Hawks.

Traces of cottontails appeared 45 times in the yearly diet of the hawks, but 28 of these were taken during the summer. Some of the rabbits were probably eaten as carrion. Marsh Hawks were frequently observed feeding on the carcasses of rabbits killed by automobiles. The victims of haying or harvesting were another source of carrion cottontails utilized by the hawks. Many cottontails, especially juveniles, were struck and killed by the mowing-machines or grain binders. On one occasion a Marsh Hawk was seen carrying the carcass of a half-grown rabbit that had been killed by a binder. Unfortunately, it was impossible to determine how many of the cottontails eaten by the hawks represented carrion. Even if all the rabbits occurring in the pellets were considered kills (which they certainly were not), the Marsh Hawk could hardly be thought a limiting factor on the cottontail population of the study area. Although cover was sparse in parts of the study tract, a good cottontail population persisted. The kill by hunters in the fall of 1938 was about one rabbit to 5 acres, and an adequate breeding stock was left.

When determining the economic status of the Marsh Hawk, one must recall that a large part of the avian prey listed in Table 3 was pro-

cured by the hawks as carrion or after the young birds had been exposed by the activities of man.

Among the birds, only the Flicker seemed to have a steady place in the Marsh Hawks' diet. This woodpecker was taken during all seasons except winter and represented 8 per cent of the yearly food. The Flicker, a relatively slow flyer and often found in the open, probably was an easy prey for the hawks. This preying upon Flickers causes some economic loss, as their general food habits are quite beneficial to man (Beal, 1911).

Mice were the staple food of the hawks in all months of the year except June and July. More than 60 per cent of the total yearly food items consisted of these animals. These rodents are injurious to crops, and the destruction of these mice is a decided benefit to man. Other so-called destructive mammals in the hawks' diet included chipmunks, red squirrels, and weasels.

The general food habits studies by Fisher (1893) and McAtee (1935), based on stomachs collected throughout the year from all parts of the United States, indicated that mice and other injurious rodents were staple Marsh Hawk foods. In both studies more than 40 per cent of the stomachs contained the remains of one or more rodents. Stoddard (1931) found the skeletal parts of cotton rats (*Sigmodon hispidus*) in 925 of the 1,098 pellets examined from roosts on Marsh Hawk wintering grounds in Leon County, Florida. Cotton rats were serious competitors of quail for food and destroyers of quail eggs, and Stoddard concluded that by destroying these rats the Marsh Hawks were important benefactors of the Bob-white in that region.

Summary

Mice formed the staple food of the Marsh Hawk during 10 months of the year. During June and July juvenile birds were the most important items of food. Many young birds were easily obtained at this season because of their exposure by mowing and harvesting.

The effect of Marsh Hawks upon the pheasant population was negligible. There was no reason to believe that the hawks were a limiting factor on the other game species on the study area.

The general food habits of the Marsh Hawk are beneficial to man, and this hawk is a decided asset to an agricultural community.

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DEPARTMENT OF ZOOLOGY AND ENTOMOLOGY, THE PENNSYLVANIA STATE COLLEGE

BIBLIOGRAPHY OF CALIFORNIA ORNITHOLOGY. THIRD INSTALLMENT. TO END OF 1938. By Joseph Grinnell. Pacific Coast Avifauna No. 26. Dec. 8, 1939. (235 pp.). $4.00.

As Joseph Grinnell himself once said, "It is only through the laborious activities of indexers and bibliographers that the working ornithologist can gain access to, and keep track of, the huge literature in his field." In this important branch of ornithological work Dr. Grinnell was long a leader, and with the publication of this volume he had completed the gigantic task of recording 6,840 scientific references to California birds which appeared in print before 1939. The thoroughness of his search can be attested by all ornithologists who have used his earlier volumes of bibliography. They know how rare it is to find an over-looked title.

If anyone thinks that a book made up principally of 2,769 references must be dull, he will be surprised by the exciting reading to be found in this volume. A large proportion of the references are annotated by Grinnell, and these critical or explanatory comments greatly increase the value of the bibliography. His precise use of a large vocabulary gives a most refreshing and characteristic flavor to many of the notes.

In addition to the list of titles there is an index to the 612 authors, an index to local lists, and an index to bird names, both common and scientific.

We are not yet wholly convinced that a chronological grouping of titles is the best possible arrangement of such a bibliography but, perhaps, once begun it must be continued. The format of this volume follows that of the earlier ones, including the rather extravagant spacing of titles on the page and the inconvenient and space-consuming use of Roman numerals for volume numbers.

This is not just another reference work to be filed away for possible use; it is a book to be *read* by all serious ornithologists. It brings to us a sharp realization of how much we are going to miss Joseph Grinnell.—J. VAN TYNE.

DU BUS' TYPE OF THE COLLARED TOWHEE, *PIPILO TORQUATUS*

BY A. J. VAN ROSSEM

IN 1847,[1] Du Bus published the description of a Collared Towhee from "Mexico" under the name of *Pipilo torquatus* and later, in 1851, pictured the individual in plate 36 (livr. 7) of his "Exquisses Ornithologique." About twenty years later Lawrence described[2] *Buarremon ocai* from Jalapa, Vera Cruz, but in accordance with the opinions of Salvin[3] and of Salvin and Godman[4] this latter name has rested peacefully in the synonymy of *Pipilo torquatus*. It must now be revived for the reasons given below.

Du Bus' original diagnosis and plate by no means describe or picture the collared towhee which for so many years has passed as *torquatus*, in fact they are so at variance that it is difficult to understand why they were ever confused. The type of *torquatus* is still extant in the Musée Royale d'Histoire Naturelle in Brussels, where I examined it in July, 1939, and verified the characters originally ascribed. Briefly, it is an obvious hybrid between what has currently been called *torquatus* and some other *Pipilo*, probably *maculatus*. Notes made at the time are as follows:

"No. 7391 Brussels Museum, marked as "♂"; no locality (other than "Mexique"), nor is there any indication of the original source either in the register or on the stand. It is apparently fully adult. Measurements are: wing 86; tail, 103; exposed culmen, 14.5; depth at base, 10.3; tarsus, 30.7; middle toe minus claw, 19.2; hind toe with claw, 19.0 mm. Plumage fresh, though showing slight abrasion as though collected, perhaps, in midwinter. The specimen may have faded somewhat, though obviously in no great degree. It is mounted on a small, conventional, bar perch and is in good condition.

"Forehead solidly black to a line at posterior corners of eyes, with no trace of median crown stripe; hind part of crown rufous brown, heavily variegated with black tipping and bounded laterally with broad stripes of black [in other words the chestnut patch is obsolescent]; superciliary stripes very narrow and solidly white only on the supra-loral region, with about equal amounts of black and white posterior to the eyes; pectoral collar brownish black and 10–12 mm. broad; sides, flanks, and under tail coverts grayish brown [originally described as "rufis"]; black grayish green, the feathers with broad (1–2 mm.), central streaks of dull black; rump and upper tail coverts with a distinct brownish tinge; lateral rectrices with an irregular creamy white spot (12 mm.) on inner webs; next pair with only the tip of the inner webs white."

[1] *Bull. Acad. Roy. Sci. Belgique*, 14, pt. 2, 1847 (séance of Aug. 7): 105.
[2] *Ann. Lyc. Nat. Hist. New York*, 8, 1863–1867 (read May 1, 1865): 126.
[3] *Ibis*, 1874: 315.
[4] *Biologia Cent.-Amer., Aves*, 1, 1886: 399.

Since *torquatus* is not available as a specific name for the typical Collared Towhees, *ocai* will have to replace it. Thanks to the courtesy of Mr. John T. Zimmer of the American Museum of Natural History, I am able to examine one of Lawrence's two cotypes, both of which (*fide* Zimmer) are practically identical in all particulars. Both were collected by Rafael Montes de Oca at Jalapa, Vera Cruz, but further data are lacking. A comparison of the specimen forwarded (Amer. Mus. No. 41, 669) with the original description indicates little or no post-mortem color change. In characters it exhibits the relatively dark brown sides and under tail coverts typical of the race which inhabits the mountains of Vera Cruz and eastern Puebla.

The final solution to the whole complex problem of the relationships of the *ocai—macronyx—maculatus* group of towhees will come only after a long study of all available material combined with competent field observation. It is not impossible, though improbable, that the numerous intermediate specimens, some of which have received names, will prove to be, in some instances, valid connecting forms. At present it seems safest to regard them as hybrids. Undiluted *ocai* apparently has at least four recognisable races. These are:

Pipilo ocai ocai (Lawrence)
Mountains of central Vera Cruz and eastern Puebla.

Pipilo ocai brunnescens van Rossem [5]
Mountains of central and northern Oaxaca

Pipilo ocai alticola (Salvin and Godman)
Mountains of Colima and Michoacan

Pipilo ocai guerrerensis van Rossem
Sierra Madre del Sur, Guerrero

Dickey Collections, California Institute of Technology, Pasadena, California

[5] The differences between *ocai* and *brunnescens*, described in 1938 (*Bull. Brit. Orn. Club*, 58, July, 1938: 131) are readily recognizable in the British Museum series, but less so in American material more recently examined. More specimens are needed for final disposition of the case. A series of five *guerrerensis* in the Biological Survey collection confirms the validity of that race, originally named in the paper cited above on the basis of six specimens in the British Museum.

THE INLAND BIRD BANDING ASSOCIATION

BY O. A. STEVENS, SECRETARY

Organization and Early History

THE Inland Bird Banding Association was organized at Chicago, Illinois in October, 1922, during a meeting of the American Ornithologists' Union. Organization was brought about largely through the efforts of William I. Lyon of Waukegan, Illinois, who had previously sent out letters to about seventy-five people whom he thought would be interested in the project. Dr. S. Prentiss Baldwin [1] was chosen the first president and Mr. Lyon, secretary. The history of the Association continued to center around the work of Mr. Lyon, who later became president and, until his death on June 13, 1938, was always its chief promoter.

In March, 1922, a few months before the Association was organized, Mr. Lyon began editing the "Bird Banding Department" of *The Wilson Bulletin* and continued to do so until June, 1928, with two to eight pages in nearly every number. In the first issue there was an account of the organization of the New England Bird Banding Association in January of that year. In the December number of 1922 (pp. 226–33) "a copy of the minutes of the first activities of the Inland Bird Banding Association" appeared, telling of the organization as described in the above paragraph.[2] In September of the following year it reported the organization of the Eastern Bird Banding Association. In the same number Mr. Lyon presented a list of birds banded in the Inland district, of interest in comparison with the many thousands of birds banded annually at the present time. Fifty-one people had banded 5818 birds, of which 2481 were by Mr. Lyon, Mr. W. S. McCrea of Chicago, and Mr. M. J. Magee of Sault Ste Marie, Michigan.

The December number of 1923 reported a convention held in Indianapolis with the Indiana Audubon Society and the Nature Study Club of Indiana on November 2. In this report is a "Bibliography of Bird Banding in America" (more important papers only) by Dr. Baldwin, with the comment that he had supplied copies of most of them to the United States Biological Survey in sufficient quantity to distribute to all people holding banding permits. Included also is a list of the regional associations with their officers and territories.

In June, 1929 the Association began the publication of *Inland Bird Banding News,* a quarterly mimeographed publication. The first two volumes contained only three numbers each. Mr. Lyon was president and Professor J. W. Stack, secretary. The December, 1929 issue reported upon a meeting held in St. Louis, Missouri, November 9–10. The next meeting was held at Cleveland, Ohio, December 30, 1930, at

[1] See an account of Dr. Baldwin by Kendeigh, *Auk,* 57: 1-2, 1940.
[2] The writer still has on hand a few separates of this article.

which time Edward R. Ford was elected secretary. Mr. Ford continued in this capacity until November, 1938, when he was succeeded by the present Secretary.

The tenth annual meeting was held in Chicago with the Chicago Ornithological Society and the Illinois Audubon Society on November 27–28, 1931. Meetings continued to be held in Chicago until 1937. Business meetings without special programs were held in conjunction with the meetings of the Wilson Club in 1938 and 1939. For the 1934 meeting, the present Secretary prepared a map of the 297 banding stations in the United States and Canada at which had been banded more than 100 birds during the preceding year. This was published in the January, 1935 number of *Bird-Banding*.

W. I. Lyon and the Inland Association

The history of the Association up to 1938 is largely a story of the tireless efforts of Mr. Lyon to extend and develop the study of birds by means of banding. He contributed extensively of his time and funds to this end. His annual tours, covering many states, always included visits to other banding stations. He had a form printed on which the number of birds of a species banded each month in the year could be recorded for many years, and repeatedly urged the use of this to systematize station records. He also undertook to furnish traps and other supplies for banders (*I. B. B. News,* 4, No. 1: 12), and we suspect that he was responsible for an extensive distribution of publications by the Association (*Ibid.,* p. 14). Reports of his summer banding expeditions appeared regularly from 1931 onward, though the one for that year, on which 4657 birds were banded, was said to be the eighth expedition (*Ibid.,* 3 No. 3: 7). In later years his Cowbird studies occupied much of his attention (*Ibid.,* 7, No. 1: 7; 9, No. 2: 9; 10, No. 2: 3).

One of Mr. Lyon's largest projects was one to develop interest in bird banding in the Latin American countries. We find a statement (*Ibid.,* June, 1929: 5) that forty volumes of collected papers on bird banding had been bound and distributed by Dr. Baldwin to as many museums of the principal countries of South America. An illustrated three page article was prepared and published in the January, 1936 issue of *Revista Rotaria,* the Spanish magazine published for Rotary International. A similar article previously appeared in *The Rotarian.* Another appeared in the Spanish and Portuguese editions of the *Bulletin of the Pan-American Union* for February, 1938.

Other Active Members

Among others who were specially active in the early work of the Association mention should be made of M. J. Magee, J. W. Stack, and E. R. Ford. Mr. Magee has completed ten years of service as its treasurer, and many others have been faithful contributors. Of the fifty-two

persons who assembled for the meeting in 1922, seven are still among the members. Present available records show at least the following thirty persons have been members for ten years:

J. F. Brenckle
Oscar M. Bryens
K. Christofferson
Miss Marion Clow
Leon J. Cole
E. R. Ford
Christian J. Goetz
Mrs. Marjorie Lee Guest
H. H. Hayes
F. H. Herrick
Paul Wm. Hoffman
Geo. W. Luther
M. J. Magee
E. A. McIlhenny
Arthur D. Moore
Mrs. Blanche L. Morton
Mrs. B. F. Myers (Mrs. F. W. Commons)
Samuel E. Perkins, III
T. S. Roberts
Frank W. Robl
A. F. Satterthwait
Mrs. Elizabeth A. Satterthwait
A. R. Shearer
Frank Smith
J. W. Stack
O. A. Stevens
H. L. Stoddard
Mrs. John A. Thompson
George Wagner
George Stewart Wolfram

Territorial Scope and Aims of the Inland Association

The Inland Association's territory is a large one, reaching from Saskatchewan, Michigan, and Ohio on the north to Alabama and Texas on the south. Both the Inland and Western Associations have claimed Alberta, which lies in migration routes of both regions. Of the total number of banding permits held at the end of 1938, slightly less than half were in the Inland territory. Of this number 48 per cent were in the four states, Illinois, Ohio, Michigan and Wisconsin, which also had 60 per cent of the present Inland membership according to figures of 1939. The prairie states and southern states are poorly represented in numbers, but the southern states have some of our most active stations.

Mr. Lyon's plan was to have in each state and province a councilor who would keep in touch with the banders of that area, an excellent plan when a suitable person can be found who will give his time to the work. Professor Stack promoted state meetings, which seem to have been successful and are still continuing in Michigan.

In general the aims of the Association are to increase the extent and efficiency of banding work in the Inland district. The Association serves as a clearing house for information regarding methods and results of trapping, supplementing the work of the Fish and Wild Life Service (formerly called the U.S. Bureau of Biological Survey) in circulating such material. The *Inland Bird Banding News* is intended to carry items of current interest and also to help bring together material for ultimate publication.

The design and operation of traps are always major problems. The nature of the surroundings of the stations is important, and a study

of these in respect to bird behavior is not only essential to the success of the station, but also is a contribution to our general knowledge. Thus descriptions of individual stations are always of interest to other workers, and any of them may contain something of definite value. Types of bait used and method of keeping records are essential details.

Many people begin banding as an early interest in ornithology and have, perhaps, no other literature available than that which they receive as cooperators with the Fish and Wildlife Service. The present writer feels that it is this group of people which the regional associations should help particularly. The beginner needs suggestions and aid of many kinds. References to other work and to other publications help lead him into an appreciation of the possibilities contained in bird study. The individual stations are widely scattered, but often a group will develop in a locality as a result of the interest aroused by the first one. Such a group increases both interest and efficiency. A larger proportion of the entire population of the locality is banded, and birds banded at one station frequently are retaken at one of the others.

The data furnished by the banding and recovery of individual birds comprise only a small part of the contributions of this method of study to ornithology. Large numbers of birds are handled, but many of them for only a few minutes or even seconds. Methods of study during this brief interval are as yet little developed but are of great importance. Failure to capture birds banded at other stations has been a disappointment to many operators, and the other possibilities of interesting and useful studies continually need to be brought to their attention. The frequent daily visits to the traps make possible observations upon behavior. Most of the large numbers banded during migration may not be heard of again, but their banding has furnished definite statistical evidence upon distribution and migration.

The Inland Association is composed of banders located in the area crossed by two of the major flyways as outlined by Frederick C. Lincoln, namely, the Mississippi and Central Flyways. It has great possibilities of aiding the study of birds in this large region. It aims to help collect and correlate the information secured at the different stations, and call attention to study projects which are under way, or to other problems which should be undertaken. The educational values of banding operations are tremendous, and cooperation among the workers of a region will help to develop these. Bird banding is one of our largest cooperative programs, and effective regional cooperation is essential to its usefulness.

Fargo, North Dakota

SUMMER FOOD OF THE ROBIN DETERMINED BY FECAL ANALYSES

BY W. J. HAMILTON, JR.

THE food habits of North American birds have been the object of much study. The methods usually employed have been those of stomach analyses or direct observation of the feeding birds. These practices have been proved most useful and a voluminous literature has resulted. Little attention has been directed to the possibilities of determining avian food habits through a study of their fecal remains, although such methods are often employed when studying the dietary of predatory mammals.

W. L. McAtee (1908:23) writing of the nestlings of the Cardinal says:

> The character of the food could not be determined by observation, but it was learned in another way. None of the excrement was removed from the box, whereas the nest in which the youngsters had been was kept perfectly clean. The fecal matter was dried and examined, and while by no means all of its constituents could be identified, enough was learned to indicate that the study of excreta is a very satisfactory method of determining the food of nestling birds. The nest of any fairly bold bird may be kept under surveillance and the waste matter collected before the parents remove it. The extent of the information as to the food eaten by the young to be obtained in this way is astonishing.

From a single casting of a young Cardinal, McAtee recovered one insect egg, the leg and scutellum of a scarabeid beetle, head and other remains of a leaf hopper, bits of snail and 11 seeds and the core of a mulberry. Dalke (1935) has found that droppings provide a valuable source of information on the feeding habits of pheasants.

Several investigators have studied the food habits of the Robin (*Turdus migratorius*). The most detailed of these studies have been by several members of the U. S. Biological Survey. Beal (1915) reported on 1236 stomachs secured at various times of the year, the results of which indicate that 42 per cent of the Robin's food is animal matter, chiefly insects, while the remainder is composed principally of fruits and berries. Forbes (1903:96-115) examined 114 Illinois birds taken from February to December. The food consisted almost entirely of insects from February to May inclusive, but from that time forward these constitute but little over a third of its food, the remainder (64 per cent) being composed of wild and tame fruits. Taken as a whole, however, insects comprise almost precisely two-thirds of the food for the year. Earl Brooks (1939) has summarized well our present knowledge of this subject, listing 76 published references. From his report we find there is still a paucity of data on the summer food of the Robin. Forbes (*loc. cit.*) reported on 47 stomachs for June, July and August and found during this period that Robins were feeding principally upon caterpillars, Coleoptera, cutworms and fruit.

During the dry summer of 1939 I had an excellent opportunity to

study the feeding habits of Robins about my home at Ithaca, New York. These birds were attracted to a hedgerow of wild cherry (*Prunus virginiana*) from late June through early August. The birds usually perched on the bean poles in my vegetable garden prior to flying into the hedgerow and would often defecate while sitting there. Inasmuch as no other bird of comparable size and similar feeding habits utilized these poles (Starlings were never seen perching on the bean poles) it was assumed all the droppings collected below the supports were those of Robins. Water was placed in pans below the roosts, and the birds often drank there. Newspapers were spread below the bean vine supports and weighted down. In this manner the droppings could readily be seen and collected with ease. It took but a moment each day to collect the droppings. More than a quart of droppings, constituting well over 1000 samples, was secured; 700 of these were examined.

The droppings were soaked just prior to examination so that the various items would separate easily. Identification of Robin fecal remains are not difficult, for the stones and seeds of fleshy fruits are usually passed in good shape; adult insects are often passed in their entirety, while cutworms and similar insect larvae are preserved in unusually good condition (Fig. 1). No volumetric index to the different

Figure 1. The remains from several Robin droppings, illustrating the ease with which identifications may be made. Cutworms, grasshopper fragments, larval European elm leaf beetles, ants (*Lasius*), various carabid elytra, entire weevils, and the seeds of wild cherry, raspberry, blue nightshade, and honeysuckle may be recognized.

TABLE 1

ANALYSES OF 700 ROBIN DROPPINGS COLLECTED BETWEEN JUNE 24 AND AUGUST 11, 1939. THE FIGURES INDICATE THE PER CENT FREQUENCY OF OCCURRENCE OF DIFFERENT FOOD ITEMS.

Animal		80.13
Annelida (Earthworms)	.57	
Arthropoda	78.86	
Arachnida	3.43	
Cheliferidae (Pseudoscorpions)	.43	
Phalangidae (Harvestmen)	.28	
Lycosidae (Wolf spiders)	1.57	
Araneae (Undet. spiders)	2.14	
Myriapoda	.43	
Chilopoda (Centipedes)	.43	
Insecta	74.06	
Orthoptera	5.57	
Locustidae	4.91	
Gryllidae	.57	
Coleoptera	11.30	
Scarabeidae	4.43	
Staphylinidae	.28	
Elateridae	.71	
Chrysomelidae	1.86	
Curculionidae	6.28	
Hemiptera	.71	
Pentatomidae	.57	
Miridae	.43	
Homoptera	.14	
Membracidae	.14	
Lepidoptera (Chiefly cutworm larvae)	6.86	
Mecoptera	.71	
Bittacidae	.71	
Hymenoptera	38.43	
Formicidae (*Lasius*, etc.)	34.47	
Parasitic Families	5.43	
Mollusca	3.28	
Valloniidae (*Vallonia pulchella*)	.71	
Cochlicopidae (*Cochlicopa lubrica*)	2.57	
Plant		73.14
Saxifragaceae		
Ribes satirum. Red Currant	1.14	
Rosaseae		
Amelanchier canadensis. Shadberry	2.43	
Fragaria virginiana. Field Strawberry	1.29	
Rubus idaeus. Raspberry	21.10	
Rubus allegheniensis. Blackberry	40.09	
Prunus pennsylvanicus. Pin Cherry	17.00	
Prunus virginiana. Choke Cherry	58.29	
Prunus serotina. Rum Cherry	11.71	
Solanaceae		
Solanum dulcamara. Blue Nightshade	5.86	
Caprifoliaceae		
Lonicera sp.	8.28	

food items was obtained, for it is apparent that such reckoning would not be significant. The different food items have a variable rate and degree of digestion. Thus ants and billbugs were passed almost entire, whereas only the skin of cutworms and the seeds of fleshy fruits could be recovered from the droppings.

The best clue to the relative importance of the various food items was obtained by tabulating the frequency with which each item occurred in the total droppings that were studied. Thus the per cent frequency of occurrence gives us some index to the importance of the different good items discussed.

Droppings were collected from June 24 to August 11, 1939. It is surprising that the Robins restrict their diet to so few items during this period of 49 days. It hardly seems likely that any food item of importance could have escaped our notice, for even the smaller fragments were quite prominent. The scant selection may have been occasioned, in part, by a subnormal rainfall, for during this 7-week period there was only 4.67 inches of rainfall at Ithaca.

The droppings frequently contained certain characteristic remains which left no doubt as to their identity. Thus the Harlequin cabbage bug (*Murgintina histriona*), ants (*Lasius*), blue-grass billbugs (*Calendra parvulus*), strawberry root weevils (*Brachyrhinus ovatus*), larval European elm leaf beetles (*Galerucella luteola*), and a number of other insects were passed through the digestive tract entire and were easily determined. The male genitalia of *Phyllophaga rugosa* were found several times. On the other hand, some remains could not be certainly identified more closely than to family rank. The case is quite different with fruits. Seeds are usually determined with ease.

It appears probable that, under favorable conditions, the feces of many birds particularly in summer, could be profitable studied. Bird baths that are under close scrutiny should provide suitable material for analyses, and the species responsible for the droppings determined with certainty. Moreover, advanced nestlings of many species may be removed from the nest and placed in boxes where the feces may be collected and studied with a view to determining the specific nature of the diet.

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THE 1939 NESTING SEASON OF BLUEBIRDS AT NASHVILLE, TENNESSEE

BY AMELIA R. LASKEY

AGAIN I have conducted the Bluebird (*Sialia sialis sialis*) nest-box project started in 1936 in Percy Warner Park in the suburbs of Nashville, Tennessee. Last year detailed results of the 1938 season were presented at the Wilson Ornithological Club meeting and later published (Laskey, 1939). The following analysis of the 1939 nesting data corroborates most of the conclusions reached last year and also indicates the effect of prevailing temperature differences on nesting activities.

This year, beginning February 16 and continuing through August, I made 55 trips to examine the boxes, representing almost 200 hours in the field. During school vacations, Arthur McMurray rendered valuable assistance. As last year, besides keeping records of the nest progress, banding the young, and removing old nests, I tried to capture and band the brooding birds.

In addition to the 38 Bluebird boxes already in place, 18 more were set out in late March and April of 1939 with the cooperation of Conrad Jamison, William Simpson, and McMurray. These boxes are in open meadows along paved roads. With two or three exceptions, they are at least 500 feet apart and are concealed from each other by the trees and narrow thickets which border the numerous meadows in the valleys and on the hillsides of this beautiful naturalistic park of 2141 acres. The boxes are larger than those placed by Mr. Musselman in the environs of Quincy, Illinois, the inside measurements being 5 x 5 x 10 inches. Experimenting with different sizes, we found that the birds are more successful in our southern climate if this roomier box is provided. There are no losses from smothering among the larger size broods, for as the nest cup becomes crowded the young move outward and flatten the entire mass of grasses with which the parents had filled the bottom of the box.

When the project was started most of the boxes were placed on posts 6 to 7 feet above the ground which necessitated carrying a ladder or climbing the post to examine the nest. This height, however, did not provide immunity from predation. Therefore to facilitate the banding of the birds and the removal of old nests, posts were cut so that boxes are now about 5 feet above the ground. To examine a nest, the top of the box is slightly raised and a small mirror is held above the opening at the proper angle to reflect the contents. Thus one does not obscure light by leaning over the opening, and the mirrored reflection reveals nest, eggs, nestlings, or brooding female clearly, eliminating unnecessary handling.

Of the 56 boxes in the park this year, 53 were occupied at least once during the season by Bluebirds, one was entirely monopolized by

House Sparrows (*Passer domesticus*), and 2 were vacant. There were 133 sets or 576 eggs laid, an average of 4.3 eggs per nest. This year there matured 290 nestlings or 50.3 per cent of the number of eggs laid. It was disappointing to find an increase of only 25 nestlings over last year's results and the percentage of successful eggs 7.3 per cent less than last year in spite of the larger number of boxes. Weather conditions seem to be an important contributing factor and there was a marked contrast between the two seasons. February and March 1938 were unusually mild with average day and night temperatures higher and with fewer fluctuations in daily range than in 1939. Vegetation was from two to three weeks in advance of that of 1939. Bluebird nesting activities also started early. Nest building began in February of 1938; a set of 4 eggs was being brooded on March 5. In 1939 nest building did not start until March; the first eggs were laid on March 18. The activitives of the Bluebird occupying Box 21 both years, raising three successful broods each season, is significant. In 1938 building of her first nest started February 23; in 1939 not until March 21. In 1938 her first egg was laid March 21; in 1939 on April 15. In 1938 her second set was started on April 28; in 1939 on June 5. For the third nesting period of 1938, her first egg was laid on June 9, but in 1939 it was on July 29. Last year she laid 14 eggs, two of which were sterile, and raised 12 nestlings. This year, she laid 15 eggs, five of which were sterile, and raised 9 young.

TABLE 1

THE NESTING PERIODS IN 1939

	First Period	Second Period	Third Period	Total
Number boxes available	49	56	56	
Number sets laid	47	50	36	133
Number with 1 egg	0	1	1	2
Number with 2 eggs	0	1	1	2
Number with 3 eggs	0	4	4	8
Number with 4 eggs	8	29	28	65
Number with 5 eggs	33	15	2	50
Number with 6 eggs	6	0	0	6
Total number eggs	233	206	137	576
Average number eggs per nest	4.95	4.1	3.8	4.3
Number sets entirely unsuccessful	17	23	19	59
Number eggs in unsuccessful sets	81	88	71	240
Number young fledged	139	99	52	290
Percentage of success based on number of eggs laid	59.7	48	38	50.3
Average young hatched per nest	3	2	1.4	2.18

Another factor which probably accounts for some of the results this year was the tardy placing of the 18 additional boxes. Bluebirds in Tennessee investigate possible nest sites on every mild day in winter

and early spring, later defending their chosen territories from other Bluebirds by fighting if necessary. For that reason the boxes placed in late March and April were not available at the nest-seeking time and only a few were used during the first period. The abundance of boxes apparently was responsible for the increasing tendency this year for a few brooding females to move to different boxes between nestings.

Percentages of success (i.e. young raised from total number of eggs laid) of the Bluebird nest box project at Nashville was found to be lower than at either Quincy, Illinois, or Cape Cod, Massachusetts. For Quincy T. E. Musselman (1935) reports as follows: 1933, 78.3 per cent; 1934, 66.6 per cent; 1935, 67.4 per cent. For Cape Cod Seth Low (1934) reports: 1932, 86.3 per cent; 1933, 64.6 per cent. In Nashville percentages for 1938 were 57.6 and 1939, 50.3.

This year 5 sets (24 eggs) of albino eggs were found. Each year there have been a few clutches of white eggs and they usually hatch successfully. So far we have traced no relationship between the various females laying such eggs. None of the offspring have been found nesting and we therefore have not been able to determine whether they lay

TABLE 2

Comparison of 1938 and 1939

	1938		1939	
	Numbers	Percentage	Numbers	Percentage
Number boxes used at least once	36		53	
Nests with 1 egg each	2	1.92	2	1.5
Nests with 2 eggs each	3	2.88	2	1.5
Nests with 3 eggs each	12	11.54	8	6.0
Nests with 4 eggs each	25	24.04	65	48.9
Nests with 5 eggs each	57	54.81	50	37.6
Nests with 6 eggs each	4	3.85	6	4.5
Nests with 7 eggs each	1	.96	0	0.
Sets of eggs laid	104	100	133	100
Total number of eggs laid	460		576	
Average number eggs per set	4.4		4.3	
Entirely unsuccessful nests	37	35.57	59	44.36
Sterile eggs	34	7.39	21	3.7
Unhatched fertile eggs	4	0.87	13	2.3
Disappeared from nest (eggs and nestlings)	103	22.39	108	18.8
Eggs deserted	18	3.91	95	16.5
Eggs and small nestlings destroyed by House Sparrows, Starlings, ants, etc.	36	7.83	49	8.4
Number nestlings leaving successfully	265	57.6	290	50.3
Average number young hatched per nest	2.54		2.18	

white or normally colored eggs. Musselman found one bird, apparently normal, that had been hatched from an albino egg returning to nest in one of his boxes and brooding a set of white eggs, thus showing that this trait may be inherited.

There were 286 eggs which either failed to hatch or which yielded nestlings that perished before fledging. Basing percentages on the total number of eggs laid, it was found that 21 or 3.7 per cent were sterile; 13 or 2.3 per cent fertile eggs did not hatch; 108 eggs and nestlings (18.8 per cent) disappeared from the nest. This included broken eggs and small dead nestlings removed by the parents as well as those taken by snakes and other predators. Thirty eggs and newly hatched nestlings were apparently destroyed by other birds for eggs were found pierced or thrown out and nestlings pecked. House Sparrows were guilty in some instances. Seven developing nestlings (1.4 per cent) were found dead in boxes, five of them when the mother bird was killed by a cat. Three July broods of hatching nestlings (2 per cent) were devoured by tiny ants. One invasion was noted at 5:30 A.M. in Box 16 as the parents flew in and out of the box in distress but made no attempt to kill the horde of ants swarming in the nest over pipped eggs and emerging nestlings. Returning a little later with pyrethrum powder and hot water, I found the parents had deserted and the dead baby birds were being rapidly devoured by the ants. Dr. M. R. Smith of the U. S. Department of Agriculture has identified these ants as *Solenopsis* sp. (*molesta* group).

Ninety-five eggs or 16.5 per cent were deserted, usually after depredations and disturbances. During the summer several park improvement projects, such as road paving and building of stone entrance gates, disturbed some of the birds. There was considerable evidence against cats which, unfortunately, are allowed to live in the park. In three or four instances, desertions may have been caused by the trapping of the brooding bird or by interference from casual park visitors.

Nest boxes placed at a distance from human habitations are more successful than those in close proximity to house or barns. Although Bluebirds learn to ignore passing automobiles when boxes are placed in meadows along highways, they seem more easily disturbed by activities around a home and seldom adapt themselves to noises and movements of a household as do Mockingbirds, Robins, and Cardinals. Around houses and barnyards they suffer much interference from House Sparrows. In the residential section of Nashville, landscaped city lots attract several species for nesting, but a box placed for Bluebirds on the lawn is rarely used. This point is well illustrated by the environment of our own home. A few years ago when the area was sparsely built, Bluebirds were numerous, but as the encroaching city is absorbing the vacant acreage with rows of houses, the birds are seen in smaller numbers, and most of the nest boxes remain unoccupied.

As in 1938 early nests were more successful than subsequent nestings. In both seasons, the first nesting period yielded a higher percentage of success than the second period, and the third period was lower than the second. The total number of eggs laid and the average number per nest decreased in each later period of both years. When analyzing the

nesting success of Bluebirds in Quincy, Illinois, where the species is a summer resident and has only two nesting periods per season, Musselman found that the first period was often more successful. In 1933 and 1934 the first period yielded a higher percentage of success than the second, but in 1935 the situation was reversed on account of a disastrous freeze in April. He says: "In spite of the drouth which caused material damage in the second nesting in 1934, the totals were similar (to those of 1933) but the rains, snow, and freeze of 1935 produced poor results in the first nesting, with birds more constant in the second nesting than usual."

TABLE 3

THE THREE NESTING PERIODS IN 1938 AND 1939 [1]

	1938			1939		
	1st	2nd	3rd	1st	2nd	3rd
Start of earliest nest	Feb. 23	Apr. 19	May 25	Mar. 2	May 1	June 15–
Start of latest nest	Mar. 23	May 19	July 4	Mar. 25	June 14	July 24
Nestlings fledged	123	90	52	139	99	52
Percentage of success	72.3	55.2	42.6	59.7	48	38

[1] In 1938 a fourth nesting period was attempted with two nests; July 23, 1 egg laid and deserted; July 25, 4 eggs, 1 nestling hatched but was found dead August 8. In 1939 there was no fourth attempt.

In compiling these dates I used only those that I was reasonably certain were of the same pairs in their respective boxes, progressing in a normal manner without interference from predators or disturbances. The pairs that started earliest with their first nest would be expected to complete their third brood earliest, but there is also a difference among individuals in the time elapsing between broods.

Some experimenting was attempted with deserted eggs. At various times five sets of marked eggs were transferred to other nests where small sets of approximately the same age were being brooded. These additions were accepted by the mother birds. Two sets of the transferred eggs disappeared with the original eggs of two nests. Two sets were either sterile or had been chilled before transferring; one of these sets had been substituted for House Sparrow eggs just being laid. Both male and female sparrows brooded them for twelve days before deserting. One set of two eggs was hatched by the foster mother on the same day as her own. This proved to be a fortunate arrangement, for although three of her four eggs were sterile, the pair successfully raised three young.

During a severe rainstorm a Robin's nest with two nestlings was blown down. The larger young one survived the fall of 20 feet and was then placed in a Warner Park Bluebird box with three nestlings at about the same stage of plumage development. This Robin was well fed by the Bluebirds, but on the sixth day of its adoption when the fledglings left the nest, it also hopped out although unable to fly and still weak on its legs. The distressed parent Bluebirds were found in a tree near the

nest-box apparently attempting to call it to them from the grassy rut in which it squatted and called. Fearing they might neglect their own young for this helpless Robin, I brought it home and successfully raised it by hand.

In 1939 brooding females in 66 per cent of the 134 nesting attempts were identified. One bird was taken on an unused nest, the others while brooding. From the banding records and recaptures of this group of 67 individuals I obtained additional data on the relative faithfulness of brooding birds to their chosen nest sites. There were recaptured 13 that had been banded in the park in previous years, and 8 of them were occupying the same boxes in which they had been banded. The occupants of Boxes 9 and 22 were using them for the third consecutive year. Nine of them had been banded as nestlings in the park, and 45 were new birds not banded until this year. During the three nesting periods of the season 17 brooding females are known to have used their respective boxes for either two or three nests. A few were found to have moved to boxes in adjoining meadows for subsequent nestings. These moves, however, usually followed an unsuccessful nest.

At my home a female Bluebird (34-172784) banded in April 1936 was found occupying the same box for her fourth year.

As in 1938 no males were found brooding in the park.

On analyzing the nesting data, I found that an egg was laid daily until completion of the set. Apparently incubation started with the laying of the last egg of the clutch. Most broods hatched in 13 or 14 days. In three cases where the entire set proved to be sterile or embryos had perished at an early stage of development, the females incubated 21 days before deserting.

Nestlings remained in the boxes from 14 to 16 days, usually the latter period. Power of flight was well developed by that time. Young leaving the box were observed flying successfully from the entrance to trees at least 100 yards away. Twice, newly hatched nestlings were seen raising the head with wide open mouth even before the natal down had dried.

Reviewing the record of nestlings, I found that of the 521 that apparently fledged successfully in the past three years, 15 females have been found breeding in the park and several males have been seen there, identified by sight as nestlings because they had been banded on the left tarsus. This season 6 females or 2.2 per cent of the 265 nestlings banded in 1938, were found breeding in the park, and there were 3 that had been banded in 1937. If captures of the males had been possible, the percentage probably would have been doubled. Low (1934) found that out of 142 nestlings banded in 1932, 4 birds (2 male, 2 female) or 2.8 per cent returned to nest in 1933.

Two immature Bluebirds which had been banded as nestlings were found dead in the park and one was found three miles north.

At the beginning of each spring season, one or two males have been found dead from injuries in or under Boxes 1 and 2. House Sparrows occasionally attempt to nest in these boxes and doubtless have fought some of the males. However on February 16, 1939, when there were no House Sparrows in the vicinity, we found in an empty box (No. 1) a male Bluebird that had recently died. The dead bird was removed and left on a small stepladder underneath while another box was visited. From a distance it was noted that a male Bluebird repeatedly attacked it, knocking it to the ground and continuing the attack there.

Only four nests were found in the park built in places other than the boxes provided. Two were in a peach tree cavity, one in a stone cavity of an entrance gate post, and the other in a tin newspaper box. These nests, totalling 18 eggs, were 39 per cent successful, yielding only 7 young.

Preparations for the 1940 season have been completed in December, 1939. A few additional boxes have been placed in the adjoining Edwin Warner Park and a number of the less successful boxes in Percy Warner Park have been moved to other locations in a section not previously supplied with boxes. In addition several small boxes have been placed in the wooded sections to attract chickadees, titmice, and wrens. Some experimenting is being done with cat or snake guards. A number of the posts have been equipped with bands of metal that have been cut to have a flaring, fringed edge which it is hoped will deter predators from climbing to the boxes.

Summary

Bluebirds, permanent residents in Tennessee, have long nesting seasons, beginning in February and lasting into September. The seasons are divided into at least three nesting periods.

Early nests have a higher percentage of success than those of later periods; the average number of eggs in a set decreases in each subsequent period; the number of entirely unsuccessful nests also increases in later periods. As the season advances there are increasing numbers of predators robbing nests for food; there are more disturbances due to human activities during summer, causing desertions and disastrously long absences of parents from nests. It is possible that extreme heat affects eggs adversely and also weakens newly hatched chicks.

Five out of 133 sets of eggs were white instead of normally colored.

Boxes placed in suitable open situations are quickly taken. Meadows are favored nest sites. Apparently boxes should be several hundred feet apart to allow sufficient territory for each breeding pair. They should be set out in winter because nest sites are investigated by Bluebirds on mild days throughout the cold season and territorial defense starts in early spring.

Faithfulness to the chosen nest site is a common trait of females and probably of males also. The same site may be used for the entire sea-

son and from year to year unless depredations or other disturbances occur.

Nest boxes placed at a distance from human habitations are more successful than those nearby. Bluebirds are easily disturbed by activities around a home and unlike some species, seldom adapt themselves to noises and movements of a household. Both male and female carry material into the box. Incubation and brooding in all nests is by the female; feeding and caring for the young by both parents. Incubation period usually is 13 to 14 days but occasionally extended to 16 days after laying of the last egg of the set. Young may leave on the fourteenth day after hatching but usually on the sixteenth.

In 1939 Bluebirds used 53 of the 56 available boxes in Percy Warner Park, laying 576 eggs (133 sets), an average of 4.3 per set. From these there matured 290 nestlings, or 50.3 per cent of the number of eggs laid.

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This is a highly colored account of an excursion which the Texas Game, Fish and Oyster Commission licensed as a scientific expedition. The book is marred by much repetition, by many examples of the pathetic fallacy, and by numerous anthropomorphisms—all expressed in a strangely stilted phraseology. Most of the "discoveries" of which we are told have been published by others in the dozen scientific papers concerning the birds of the region which appeared between 1902 and 1937.

In the field (even if not in this book) the author's romantic imaginings seem to have been contagious. The morning of their start into the mountains "the horses themselves seemed to reflect our human excitement" (p. 55), and by the fourth night even their "soft-spoken rancher guide" on retiring "placed his .45 six-shooter and .30-.30 carbine beside his blankets, so that they could be easily reached if necessary in the night." (p. 103).

In addition to several interesting photographs, there are eleven illustrations by George M. Sutton. Two of the Sutton pictures are pen-and-ink drawings done especially for this book and the others are black and white reproductions of water-color portraits of birds made in the field in the Chisos Mountain region in 1935. In spite of the loss of the color which made the originals so charming, these bird portraits remain very effective interpretations of these species and assure the book a permanent worth.—J. Van Tyne.

THE ACADIAN SHARP-TAILED SPARROWS OF POPHAM BEACH, MAINE

BY WILLIAM MONTAGNA

SINCE the Acadian Sharp-tailed Sparrow, *Ammospiza caudacuta subvirgata* (Dwight), was originally described in 1887, comparatively little work has been done with it.

In June, 1939, I made a collecting trip to Popham Beach, Sagadahoc County, Maine. Popham Beach, which is a part of the town of Phippsburg, is situated at the mouth of the Kennebec River. Acadian Sharp-tailed Sparrows have been known for years to nest in the salt marsh which extends from the mouth of Morse's River to the head of Atkin's Bay. It was in these very marshes that Norton (1927) found and described their nest.

Habits

One of the primary purposes of the trip was to secure some specimens of these birds in fresh spring plumage. Arriving at Popham Beach on June 9, I lost no time in visiting the marsh that afternoon in company with Ralph S. Palmer, who had been at Popham Beach throughout the summer of 1938 and was there for the entire summer of 1939. Although Palmer assured me that the birds must be all around us, we failed, in spite of a laborious search, to see or hear a single Sharp-tailed Sparrow. Early the next morning, however, I returned to the marsh. This time male birds were heard everywhere. Many were engaged in song flights, while others, perched on long blades of grass, sang at short intervals. Beneath some of these song perches were large amounts of droppings indicating that they had been used regularly. Norton (1897 and 1927) made similar observations. On several occasions, shortly after they had been frightened away, male birds returned to their original perch to perform.

The song flight of the males is a peculiar antic which was well described by Dwight (1887): "Sometimes he springs up into the air, particularly towards evening, and setting his wings floats down into the grass fairly gushing with song—such as it is." My observation, however did not agree with Dwight's restriction, "particularly towards evening." H. F. Lewis (1920) has also described this flight song in somewhat more detail. The sparrows I observed at Popham Beach showed little if any tendency to sing in the evening. During the morning hours they performed these antics again and again; often seven or eight males were in the air at the same time, and only a short distance from each other. As noon approached, the performances became less frequent and usually ceased toward the middle of the afternoon. On one occasion a bird was heard singing in the evening. Palmer heard

the birds singing heartily throughout the breeding season, as late as July 25. Singing then diminished, and on August 14, 1938, one last song was heard.

On June 10 two males and one female were collected. The birds had swollen cloacas and the gonads were greatly enlarged. In the female one of the follicles of the ovary was about to burst, and a nearly mature egg was in the oviduct. This female had a large brood-patch, but it was not swollen and watery; evidently the bird was not yet incubating. This specimen was collected after it had flown away from a tangle of three other birds, presumably males, which were crowding over it, attempting to copulate. On June 11 three males were collected with one shot while they were in a curious tangle such as described above. A fourth bird, perhaps a female, flew away unharmed. While going through the marsh I often encountered this peculiar behavior. However, this action was noted only in the morning. At such times the birds were quiet and unaware of one's approach, often flying away only after one had walked within a few feet of them. This habit seems most peculiar, and it may perhaps mean that there are more males than females. I had hoped to collect an even number of males and females, but the number of males taken was much greater. However, females at that time were probably on the nest and difficult to flush.

On June 14 a male descending from the song flight was observed at close range. It alighted not far from me and only one foot away from another bird which I immediately collected. The specimen proved to be a female. Its oviduct contained a full-sized egg and its brood patch was swollen and very watery. On June 15 a male descended from its flight and was seen copulating with another bird. The two were collected and proved to be a pair. The female had one egg with shell in its oviduct and another partly in the shell. Often after the aerial performance the male would join another bird, presumably a female, and together they would fly along the drainage ditches of the marsh. After a short flight they would either engage in copulation or cling to the side of the ditch only a foot or so from each other and a few inches from the level of the tidal water, remaining thus motionless for a considerable time.

Birds were found to be most abundant along the many drainage ditches. These were narrow and often very deep. At low tide the bare sides were exposed, and there the sparrows fed on small aquatic insects. A rough analysis of the crops of specimens collected showed the contents to be exclusively insect matter.

There was no evidence that the males collected had been incubating. Their bellies and breasts were well feathered and showed no indication of a brood-patch. Norton (1897) made similar observations.

These sparrows were unusually quiet, aside from the singing done by the males. Only on rare occasions were they heard uttering soft

notes of alarm. These were short and abrupt and often hardly audible. They could be distinguished with difficulty from the notes of the ubiquitous Savannah Sparrows (*Passerculus sandwichensis*).

Plumage Variation

Our series of twenty-one fresh-plumaged breeding birds, plus five specimens from the same locality, which were borrowed from A. H. Norton, show that there is a considerable range of color variation in this race. The backs may vary from a pale grayish olive without conspicuous whitish streaks to brownish black marked with sharp edges of white (Figure 1). The streaking of the breast and flanks is also variable. These streaks are for the most part only faintly indicated

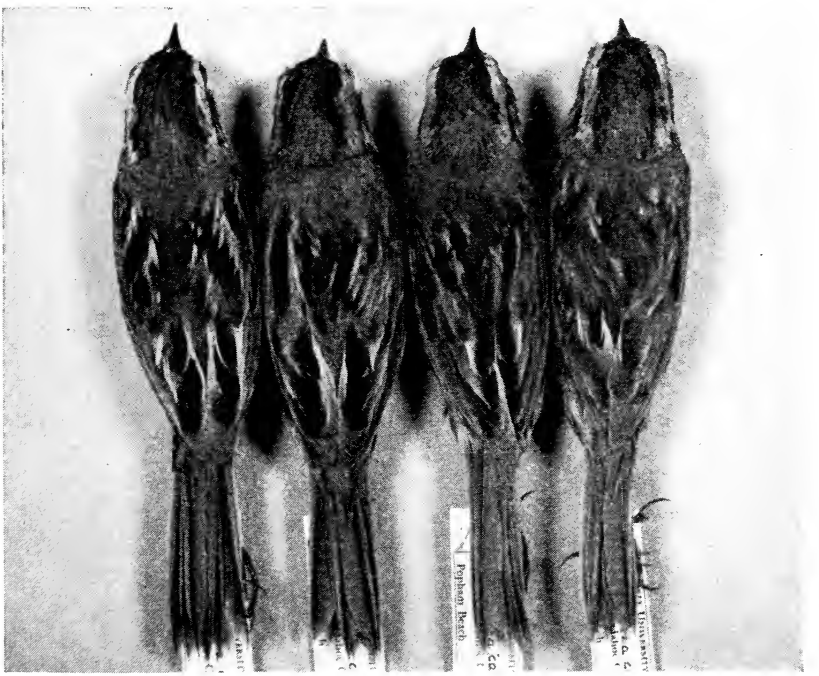

Figure 1. Extremes of dorsal coloration in Acadian Sharp-tailed Sparrows from Popham Beach. (Photograph by Ralph S. Palmer).

by ashy-green markings.[1] However, some of the birds are so sharply marked that they seem to approach *caudacuta*. I am inclined to call these intermediates between *subvirgata* and *caudacuta*. Since the

[1] Such fluctuations of colors occur normally in the races of *Ammospiza caudacuta*. A recently collected series of breeding *A. c. caudacuta* from Tuckerton, Ocean County, New Jersey, shows that the color of the back and head of these birds and the amount of spotting of the breast are quite variable characters.

A.O.U. Checklist and Hellmayr (1938:505) state that *subvirgata* breeds south only to Penobscot Bay, which is about forty miles north of Popham Beach, intermediates are surely to be expected there. A male collected on June 11 (W.M. No. 407) has the tawny breast-band sharply streaked with dark brown, and the markings of the flanks are too heavy for typical *subvirgata,* which has obsolete streaks (Figure 2).

On the morning of June 25 I collected a female which was unusually bright about the head and had well-defined streaks on breast and flanks. On comparing this specimen with material borrowed from the American Museum of Natural History (specimens from Dwight's own

Figure 2. Sharp-tailed Sparrows from Popham Beach. *Ammospiza c. caudacuta* on left; *A. c. subvirgata* on right; two intermediate specimens in center. (Photograph by Ralph S. Palmer).

collection) I found that the bird is unmistakably *A. c. caudacuta* (Gmelin).[2] Finding this bird in the middle of a colony of *subvirgata*

[2] Popham Beach is about 35 miles northeast of Scarborough, the bird's previous northernmost range. Dwight writes, "*Ammodramus caudacutus* is restricted in the breeding season to the salt marshes of the Atlantic coast from Virginia to Massachusetts. North of the latter named State, in the limited marshes of New Hampshire and Maine coasts, it is probable that *subvirgatus* would be found. . . . It is obvious therefore that breeding specimens from the Maine coast are greatly to be desired." (Dwight,

is interesting, for it seems probable that the bird was mated with a male of this race. The specimen was unquestionably in breeding condition since the ovary was greatly enlarged and the brood-patch was swollen.

This bird adds more evidence in support of the belief that some of the specimens of *subvirgata* from Popham Beach, although not all, are intermediates. There is little chance that the identity of the specimen is mistaken, for, as Dwight writes, ". . . the palest streaked *caudacutus* in any plumage may be recognized at a glance by being more streaked than any specimen of *subvirgatus*." (Dwight, 1887: 235.)

In describing the female of *subvirgata*, Dwight (1887:234) writes, "Resembling closely the male, but with richer yellow-buff, orange tinged across the jugulum and about the head and with secondaries, tertials and wing-coverts conspicuously edged with pale russet instead of grayish." Of the four females I collected on June 11, 14, and 15, two are richly colored with orange-buff about the head, particularly the superciliary and malar stripe, while the other two are dull by contrast. Moreover, males collected on June 10, 11, 14, and 15 are, as a series, as bright as the females. The jugulum is even more highly colored in the males. The four females have, as do the males, the tertiaries definitely margined with white; this character may vary in the males from a definite broad, white margin to a faint, indistinguishable one. The secondaries have a russet margin in the males as well as in the females. The wing-coverts of either sex may or may not have a narrow edge of gray. It must be remembered that the above descriptive remarks are based on birds which appear normal in color. Intermediates were not included. Apparently there is no difference in color between the males and females.

Measurements of the bill, tail, wing, and tarsus show that on the whole males average larger.

TABLE 1

Measurements in Grams and Millimeters of Sharp-tailed Sparrows from Popham Beach

	Weight	Wing	Tail	Bill	Tarsus
Males (21 birds)	17.4–20.9 (18.3)	57–60 (59.4)	49.5–53.9 (51.6)	8–8.5 (8.7)	20–24 (21.9)
Females (5 birds)	16.4–21.2 (18.1)	52.5–56.5 (55.1)	46–49 (48)	8.5–9.1 (8.8)	19.5–22 (20.7)

All of the birds collected were weighed carefully before being prepared. The weights of the sexes are nearly alike. The males average only 0.2 grams heavier. However, the number of females collected is

1896:275.) Norton says, "Though search has now been made, it has not been found farther to the northward than Scarboro, Maine, and the physical structures of the coast are such as to suggest the improbability of the normal range extending beyond this town." (Norton, 1897:99).

smaller than that of the males, and it is probable that an even number of specimens might give different results. Also, most of these females contained large eggs, and this unquestionably made their average heavier.

Among the specimens borrowed for comparison from the American Museum of Natural History, one female from Dwight's own collection is marked "Like Type." This is a fall specimen, while Dwight's type was a July bird. However, reading the original description, one has the impression that a fall bird is being described, since at that time the "Tertials, secondaries and wing-coverts" are "russet, edged like the female in breeding dress." (Dwight, 1887: 234.)

Six males, collected on June 25, had already become very worn in plumage. Their whole aspect is different from that of the birds collected ten days before. The amount of white on the tertiaries is reduced considerably. On July 25, 1938, Palmer collected a series of five males and one female. The plumage of these birds is so abraded that the tertiaries, scapulars, and back feathers no longer have white edges. The birds are brown-backed; even the greenness, which is so typical of fresh *subvirgata,* is almost entirely lost.

Summary

Acadian Sharp-tailed Sparrows were observed singing only during the morning hours; in the afternoon they were quiet and inconspicuous.

Male birds, as many as three, were seen crowding over one female, perhaps attempting to copulate. This may mean that either the population of unmated males was greater than that of available females or that the males had polygamous tendencies. Repeatedly birds were seen copulating immediately after the male's descent from the song flight.

One breeding female *A. c. caudacuta* was taken in a colony of *subvirgata.* Some of the specimens collected prove to be intermediates between *caudacuta* and *subvirgata.*

There is no difference of coloration between the sexes. Plumage variation is described.

The males, although only slightly heavier, average larger in linear measurements than females.

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Birds of Oregon. By Ira N. Gabrielson and Stanley G. Jewett. Published by Oregon State College, Corvallis, Oregon, 1940: 6 x 9 in., xxx + 650 pp., 97 pls., 20 figs. in text (maps), colored frontispiece, folded life-zone map. $4.25.

This book fills a long-standing need for a comprehensive treatment of the birds of Oregon. It is the first general book on the ornithology of that state and as such is admirably complete. Through long experience in the field, the authors are especially well qualified to discuss occurrence, abundance, and habits of species. It is explained in the introduction that the text was written entirely by Gabrielson, but (importantly) a large part of the endless task of checking records and literature was assumed by Jewett.

The illustrations form a prominent part of the work. Besides the colored frontispiece by O. J. Murie, they consist chiefly of high grade photographs by William L. Finley, H. T. Bohlman, Alex Walker, Reed Ferris, and the authors. The scientific value of these would have been increased if localities and dates on which they were taken had been included in the legends. Small maps, run as text figures, assist to clarify distribution of races in certain geographically variable species. The life-zone map is that worked out by Vernon Bailey for his "Mammals of Oregon."

An introductory section of 19 pages is entitled "Something About Birds as a Group." This necessarily sketchy survey is intended for the beginning student. Helpful, and more complete sections on topography and life-zones, and on the history of ornithology in Oregon follow.

As regards systematics, the book is decidedly conservative. It is evident that there is no attempt at systematic revision, although there is much new information about the distribution of races accepted by the A.O.U. Check-list of 1931. Thus, none of the many subspecies described by Oberholser in 1932 from the Warner Valley area are accounted for, except that they are included with the list of birds with type localities in Oregon. Records of distribution are as a rule not included if of date later than 1935, when the manuscript was completed. For example, Jewett's own record (*Condor*, 41, 1939: 85) of the Black Pigeon Hawk in summer at Paulina Lake, east of the Cascade Mountains is not mentioned.

Each species account begins with a description quoted from Mrs. Bailey's "Handbook of Birds of the Western United States." This is followed by a paragraph on distribution, first giving the general distribution, a useful feature, and then that for Oregon. The body of the account includes, in running style, statements about the history of first discovery of the bird in the state, seasonal status, abundance, habitat, nesting, food, and habits as observed in Oregon. Repeated use of the book has convinced the reviewer of its dependability and worth as a reference on distributional matters and as a source for items on natural history. —Alden H. Miller.

WINTER BANDING OF OKLAHOMA CROWS[1]

BY E. R. KALMBACH AND S. E. ALDOUS

IT SOMETIMES happens that unexpected by-products or minor aspects of investigative work become as important as the principal results. These may have direct application to the problem undergoing study or they may have a bearing on some related matter that has long been in need of an answer. Such was the case with an "unscheduled" Crow-banding enterprise carried out by the junior author while engaged in conducting experiments in the control of Crows (*Corvus brachyrhynchos*) in Oklahoma during the winter of 1935–36.

The experimental work in Crow control consisted, among other things, of an appraisal of trapping as a control measure (Aldous, 1936). Several traps of the "Australian" type having lateral dimensions of 10 to 12 feet were constructed.[2] When baited with carrion and properly attended to, these were capable of retaining alive large numbers, and under favorable conditions, were useful in reducing local Crow populations.

Despite a strenuous demand on the part of local farmers and sportsmen that all Crows caught should have their necks wrung, an appreciable number (714) were banded and released. The returns from these have contributed new information on Crow movements in and out of Oklahoma. Not only do these data have a direct bearing on problems associated with crop damage but, what is of equal importance, they show the relation of winter Crow control in Oklahoma to the welfare of the upland game and insectivorous birds in that state and the waterfowl that breed to the north. It is this "by-product" of the Crow control studies that furnishes the subject matter of this paper.

Banding Procedure

In the course of the Crow control work one trap was built and operated near Chickasha in Grady County and three others near Norman in Cleveland County. All the birds caught in the Norman traps were released in that vicinity, but most of those caught at Chickasha were removed to distant points where they would be less likely to become victims of certain other control experiments that were being carried out in that area. Accordingly, of the 714 crows banded, 486 were released near Norman, 95 near Oklahoma City, 48 near Chickasha, 35 near Shawnee, 34 near Ardmore, and 16 near Tabler. Oklahoma City, the most northerly of these points, is about 124 miles

[1] A brief discussion of the results obtained from a part of these returns (125) appeared in a revised edition of U. S. Department of Agriculture Farmers' Bulletin 1102, issued in June 1939.

[2] Those interested will find a description and drawings of an "Australian" Crow trap in *Wildlife Research and Management Leaflet BS-27*, entitled "A Cage Trap Useful in the Control of White-necked Ravens." Copies of this leaflet may be obtained on request from the Fish and Wildlife Service, Department of the Interior, Washington, D. C.

north of Ardmore, the most southerly point of release; while Shawnee, the most easterly point, is about 61 miles east and a little north of Chickasha, the point of origin of all transported birds.

Banding started on December 5, 1935, and was conducted at intervals until March 10, 1936, when 11 Crows constituted the final catch. During that period 21 groups of Crows were banded and released, the catches ranging from a few birds to 177 captured at Norman on January 27. Notwithstanding the fact that release of the birds extended over an appreciable period (more than 3 months), the recapture of individual Crows strongly indicated that this group of birds was quite sedentary during the banding period. Of the 486 Crows banded at Norman, 2 reentered a trap 7 times; 4, 5 times; 4, 4 times; 9, 3 times; 16, 2 times, and 75, once. Subsequent returns from the banded Crows further emphasize the relatively stationary nature of these birds during the winter. Consequently, despite the extended banding period and the release of birds at several points, returns from the birds may be discussed to advantage as having originated with a definite group of wintering birds. This idea is embodied in the map (Figure 1) on which the focal point of the radiating lines indicating movement is registered at Norman, Okla., where about 68 per cent of the banded birds were released. In computing the distances traveled by the birds (a subject discussed later), measurements were made from the exact point of release.

Returns

From the 714 Crows banded, 143 returns have so far been received. Figure 1 presents, in addition to the points of recovery, a general indication of the season of the year during which the birds were killed. Recoveries represented by the larger black dots are those made between the first of April and the end of August, a period that may be looked upon as the breeding and rearing season of bird life generally in North America and the period in which problems of Crow predation might arise. The smaller circles mark recoveries made between the first of September and the end of March, a time of year not generally associated with Crow depredations on other birds.

Of the 65 Crows recovered during the breeding and rearing season (April 1 to August 31), 49 (75 per cent) were killed in the Prairie Provinces of Canada. The dates and localities of numerous other returns recorded in the states north of Oklahoma (some indicated by black dots and others by circles) give evidence of the fact that many others of this group of wintering Oklahoma Crows may also have been on their way to or from Canadian breeding grounds when they were killed.

The grouping of the black dots in the southern part of the Prairie Provinces lends statistical evidence of a state of affairs frequently observed by field ornithologists working in that region, namely, the

dense concentration of nesting Crows close to the northern border of agriculture. The shaded area in the northern part of the map indicates, roughly, the coniferous forest region which Crows do not enter in great numbers. When they do appear, it is usually in the vicinity of clearings and settled areas where a semblance of their commonly preferred environment may be found.

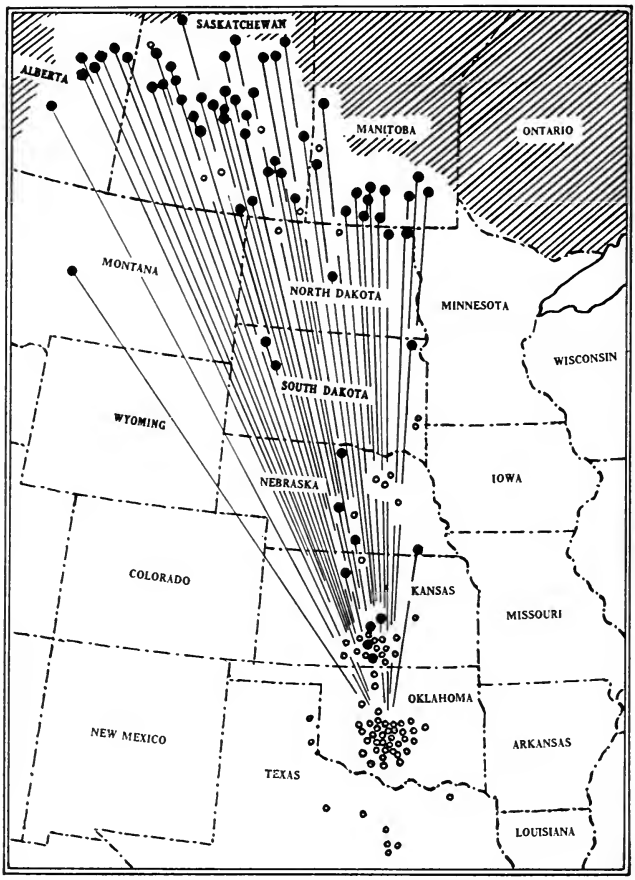

Figure 1. Map showing the recovery points of 143 to 714 Crows banded and released in south-central Oklahoma during the winter of 1935–36. The black dots indicate recoveries made between April 1 and the end of August; the smaller circles, between September 1 and the end of March.

Of the 7 recoveries from Alberta, the most northwesterly one was recorded near Camrose, southeast of Edmonton. This bird had traveled about 1,435 miles from its point of release at Norman, Okla. Another, shot near Strathmore, Alberta, had traveled westwardly through

16 degrees of longitude, and its point of recovery is on a meridian that, southwardly, passes west of Great Salt Lake, Utah. Of the 35 retrieved in Saskatchewan, 30 were recovered during spring and summer and the remaining 5 were shot in the fall, indicating that some of these birds are late in leaving their breeding ground. The most northerly of all these returns is that of a Crow shot at Meadow Lake, Saskatchewan, a point due west of Prince Albert Park at nearly 54° north latitude and fully 350 miles north of the Canadian border. This bird, which had been released at Ardmore, Okla., had traveled about 1,480 miles from its winter home, the longest migration recorded for any of these Oklahoma Crows. Several others, traveling nearly as far, were recovered at points east and southeast of Prince Albert. All but one of the 13 recoveries made in Manitoba were recorded in spring and summer. This group includes the most eastwardly of the Canadian returns; yet the most easterly one is that of a Crow shot at Beauséjour, northeast of Winnipeg, a little more than one degree of longitude east of the point of banding. Besides the pronounced northerly migration of these Crows to their breeding grounds near the limits of agriculture, it is evident that there is a definite drift to the west, a tendency also shown by many other species of migratory birds traversing this plains area.

Of the returns from states north of Oklahoma, mention may be made of the single bird shot at White Sulphur Springs, Montana, the most westerly point within the United States at which one of these Crows was collected. The bird was taken in the middle of June and probably was breeding in the vicinity. Three of the 5 Crows recovered in North Dakota were collected in the breeding season, and the other two, shot in the fall, may have been on their way south from northerly points. Of the 5 collected in South Dakota, one each was taken in April, May, and June and may have been local breeders; one was collected in March, and the fifth in December, apparently a late traveler from the north. Of the 9 collected in Nebraska, 5 were taken during fall, winter, or early spring, 3 in April, and one in May. Of the 21 Crows recovered in Kansas, 16 were shot in the nonbreeding season and only 5 during April, May, and June.

It will be noted that of the 143 returns recorded *not one was recovered in the state of Oklahoma during the "breeding and rearing season."* The 38 Crows recovered in that state were collected between the third of November and the end of March. Twenty-two of these were taken early in the spring following their banding (1936); some of the others survived as long as 3½ years. It is likely that many of these Crows captured in Oklahoma during winters subsequent to the one in which they were banded had made journeys to the north to breed. A similar statement may be made regarding the 9 wintering Crows collected in Texas, each one of which had lived through at least one breeding season between the time of banding and its recovery. That these birds

had bred in the north and on subsequent southward journeys had passed beyond the vicinity of their banding is a plausible assumption.

The period and the extent of migration of these Oklahoma birds are revealed by the average distances traveled by the birds recovered in the respective months. These data are set forth in Table 1. In addition to information on the distances traveled, note is made of the number of returns and the states in which the birds were collected.

TABLE 1

RETURNS OF BANDED CROWS LISTED BY MONTHS, THE AVERAGE DISTANCE TRAVELED BY EACH MONTHLY GROUP, AND THE STATES IN WHICH THE RECOVERIES WERE MADE

Month	Number of returns	Average distance in miles from point of release	Locality of recoveries by states
January	13	97	Oklahoma, 8; Kansas, 2; Texas, 2; Nebraska, 1.
February	18	98	Oklahoma, 10; Kansas, 4; Texas, 4.
March	27	210	Oklahoma, 13; Kansas, 7; Texas, 1; Nebraska, 4; South Dakota, 1; Manitoba, 1.
April	16	940	Kansas, 2; Nebraska, 3; South Dakota, 1; Saskatchewan, 7; Manitoba, 1; Alberta, 2.
May	21	1,046	Kansas, 1; Nebraska, 1; South Dakota, 1; North Dakota, 2; Manitoba, 4; Saskatchewan, 11; Alberta, 1.
June	23	1,055	Kansas, 2; South Dakota, 1; North Dakota, 1; Montana, 1; Manitoba, 5; Saskatchewan, 11; Alberta, 2.
July	5	1,234	Manitoba, 2; Saskatchewan, 1; Alberta, 2.
August	0	No data	No returns.
September	4	1,123	North Dakota, 1; Saskatchewan, 3.
October	2	973	North Dakota, 1; Saskatchewan, 1.
November	3	67	Oklahoma, 3.
December	11	264	Oklahoma, 4; Texas, 2; Kansas, 3; South Dakota, 1; Saskatchewan, 1.

SEASONAL DISTRIBUTION OF RETURNS

During the years covered by these returns the general northward exodus from Oklahoma, as indicated both by the average mileage traveled and by the states in which the birds were recovered, takes place before April 1. Even at that date one bird had reached Manitoba. Before the end of April, 10 of the 16 birds recovered during that month had found their way into Canada, and the average distance traveled by all the birds recovered in April was great enough to extend from the point of release to beyond the Canadian border. Because of the limited number of returns, the southward movement of the birds is not so clearly set forth. Although these banding data do not disclose

the fact, field observation indicates a marked influx of Crows into Oklahoma in October. The returns do show, however, the presence of the birds in that state in November and December. In the latter month returns were received not only from the winter Crow range in Kansas, Oklahoma, and Texas, but also one from South Dakota and another from Saskatchewan.

The paucity of recovery records for the second half of the calendar year is at present unexplained. Despite the increase in shooting that one might expect in October and November, the returns for the six months, July to December, inclusive, were materially less than for the first six months in *each* of the three years for which there are complete data. The returns for each of these years, given in semiannual totals, are as follows: 1936, 56 and 20; 1937, 44 and 3; and 1938, 10 and 2. At the time of this writing, returns for 1939 are available for only the first 6 months, a total of 8.

Mortality Rates

The rapid decrease in the number of returns during the years following the release of the birds gives evidence of the gun pressure under which these birds exist. The yearly totals of 76, 47, 12, and 8 (first 6 months) for the years 1936 to 1939, inclusive, lead one to believe that relatively few of these birds live more than four years in this plains area where they are subject to gunfire throughout their migration route and on their breeding grounds and to the devastating toll of bombing while in their winter roosts in Oklahoma. In the 3½ years immediately following the release of the 714 banded Crows, 143, or slightly more than 20 per cent, of them have been reported killed. The returns for the calendar year immediately following banding amounted to about 10.5 per cent of the birds banded, a percentage somewhat less than that of the returns usually obtained from waterfowl shot during the first season following banding. It is possible that the number of returns for these Crows might have been greater were it not for the fact that, in their winter home, many are killed in bombings under conditions not conducive to the recovery of bands.

Discussion

If the 143 returns so far obtained from the banding of 714 wintering Crows in Oklahoma reflect the general habits of the species in that state, it is evident that problems of control or management of this bird must be approached with the realization that it is highly migratory. Wintering individuals quite evidently are not summer residents. They are, however, breeders far to the north, many of them raising their young in the Prairie Provinces of Canada where there appears to be a concentration close to the northern border of agriculture. There also is evidence that those birds that survive the migration to and from the

breeding grounds will return to the general area of the previous winter's sojourn.

On these premises certain deductions may be made having a bearing on the economics of the Crow in Oklahoma and on the merits of Crow control in that state.

Considering first the matter of Crow control for the protection of late-maturing crops, particularly grain sorghums, it is logical to conclude that a reduction in the number of Crows from November to the end of March would have its effect on the individuals that not only are present throughout this period but which, if they survived, would return to the state in subsequent winters. Without attempting at this time to pass on the economy of winter Crow control for crop protection in Oklahoma, there is little question but that such control will have both immediate and later effects on the particular individuals concerned with these depredations. Whether the progeny of surviving individuals take the same migratory route as that of the adults and help swell the numbers frequenting winter roosts could not be determined by this banding program. If such is the case, the benefits of winter control for the purpose of crop protection may have even more far-reaching effects.

Crow control for the benefit of upland game or insectivorous birds often is advocated. According to the evidence brought forth in this banding work, a winter campaign of Crow control in Oklahoma would have little or no effect on the welfare of these groups of birds breeding and raising their young in that state. Not one of the winter-banded Crows was recovered in Oklahoma between April 1 and August 31; this clearly indicates, when considered in connection with the localities of the returns obtained during the breeding season, that the winter Crows of Oklahoma are not its summer corvine residents. That the summer Crows of Oklahoma may be the winter residents of Texas seems a plausible assumption. In that event, winter Crow control in the latter state would have some effect on the relatively sparse summer Crow population of Oklahoma, although the preponderant population of Texas Crow roosts is likely also to be comprised of more northerly raised birds.

The control of Crows in Oklahoma during the winter is often considered a conservation measure by reason of benefits accruing to waterfowl nesting far to the north. These banding records have definitely shown that many (possibly a great majority) of the winter Crows of Oklahoma do nest and spend the spring and summer months in close proximity to the northern border of agriculture where, in favorable environments, waterfowl still are common nesters. Kalmbach earlier came to the conclusion that in this relatively narrow strip the Crow is a hazard of marked importance to nesting waterfowl even though the continental aspects of Crow pressure on the duck supply may not

be so alarming (Kalmbach, 1937). In referring to the merits of Crow control at winter roosts to the south aimed to improve waterfowl conditions farther north, he ventured to remark (page 35) that the benefits "are, in turn, less direct, since only a part of the birds present at these roosts (number at present unknown) actually enter the problem of Crow-waterfowl relationships on the breeding grounds." By that is meant that, although Crows are exceedingly abundant in the pothole and lake country at the border of agriculture, many of them in that very area, live in and obtain food from agricultural environments. What part of the Canadian Crows are pursuing the role of persistent duck-egg stealers and what have habits not greatly different from those of Crows in this country is not known. In any event control in Oklahoma would have its effect spread over the Crow population of a wide area in the southern part of the Prairie Provinces, an effect that would be diluted not only by the extent of the area, but also by the fact that only a part of the Crows nesting therein enter the problem of Crow-waterfowl relationships. In the light of these considerations and in view of the even more impelling fact that Crows in destructive abundance are present on possibly only a sixth of the duck-nesting area of Canada and Alaska, Crow control in the roosts of Oklahoma must be looked upon as having possible benefits to a part of the waterfowl in one, the central, flyway; its effect on the continental supply of waterfowl must be greatly discounted.

These, briefly, are the points of discussion most likely to arise from a consideration of the data obtained from this banding project. There are, however, others and, lest they be entirely overlooked, let it be remembered that in western Canada, where Indian corn is displaced largely by small grains, where there are no late-maturing sorghums to be attacked, where Crows are present mainly during the seasonal period of insect prevalence, and where little is seen of the enormous gatherings that characterize its winter home, the Crow presents a markedly different economic problem. Much is heard among certain groups of the Crow's depredations on other bird life; there are many others, however, who have observed and are grateful for the work done by the Crow on insect life. They, too, have an interest in control policies aimed to administer wildlife so as to render the greatest good to the greatest number. Of all those directly concerned they in fact may be the most vitally involved.

Strange though it may seem, there are, even in Oklahoma, certain sections grown largely to wheat and oats where Crow control is not considered a pressing problem.

Summary

The banding of 714 Crows in south central Oklahoma during the winter of 1935–36 has yielded, during the three and one-half years

following their release, 143 returns, slightly more than 20 per cent of the birds banded.

Analysis of these returns shows that, of the 65 Crows recovered during the breeding and rearing season (April 1 to August 31), 49 (75 per cent) were killed in the Prairie Provinces of Canada. The dates and locations of numerous other returns recorded in the states north of Oklahoma indicate that many others of this group of Crows may have been on their way to or from Canadian breeding grounds. During this same period of the year not one of the winter-banded Crows was recovered in Oklahoma, clearly indicating that winter Crow control in Oklahoma can have little or no effect on nesting upland game or insectivorous birds of that state.

Although winter Crow control in Oklahoma is destined to remove some birds that would enter the problem of Crow-waterfowl relationships in the Canadian provinces, the effect of this control is certain to be much "diluted" if the results are to be judged in a continental perspective. This comes about because only a portion of the Crows nesting in Canada can be classed as duck-egg predators, and because the Crow, in what might be termed destructive abundance, occupies possibly only a sixth of the duck-nesting area of Canada and Alaska.

As a protective measure for late-maturing crops, particularly grain sorghums, winter Crow control in Oklahoma may be looked upon as fairly selective with respect to the removal of the very individuals involved in these depredations. Not only is this winter population quite sedentary during that season but the banding returns have shown that birds which survive are likely to return to the same general region in subsequent winters.

The rapid decrease in the number of recoveries noted in successive years following banding leads to the belief that relatively few of these birds live for more than 4 years in this plains area where they are subject to gunfire throughout their migration route and on their breeding ground and to the severe toll of bombing in their winter roosts in Oklahoma.

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Fish and Wildlife Service, U. S. Department of the Interior, Denver, Colorado and St. Paul, Minnesota

GENERAL NOTES

Notes on Nesting Habits of the American Bittern.—On May 2 at 5:00 P.M., the writer accidentally flushed an American Bittern (*Botaurus lentiginosus*) from its nest in a wet meadow of cord grass (*Spartina pectinata*) 7 miles north of St. Paul, Minnesota. At that time there were two warm eggs in the nest. In the afternoon of May 12, my field partner found another American Bittern nest containing four warm eggs. This nest was only 150 feet from the one first discovered. Both nests were in the same five-acre meadow of cord grass, and they hatched successfully on the same day. In spite of the proximity of the two nests, there was no evidence of strife between the adults during the period of incubation and care of the young in the nests. Both Bent (*U. S. Nat. Mus. Bull. No.* 135, 1926:75) and Forbush (Birds of Mass. and Other New England States, 1, 1925:321) comment on the fact that several Bittern nests may be found in a small meadow, and Forbush implies that this may be a suggestion of the gregariousness so characteristic of the nesting habits of other herons.

The nests were placed directly on the ground, and they consisted of a platform of loosely gathered cord grass. The nests were shallow and measured ten inches in diameter. They were elevated only 3 or 4 inches, and were placed in good patches of cover formed by dead cord grass and three-foot willows. Concealment from above was fair. The nearest open water was 200 feet from the nest first discovered and 350 feet from the other. The meadow which was chosen for the nesting sites was surrounded by low, sloping hills that supported a medium growth of oak. Each nest was approximately 150 feet from the closest break in cover type between the meadow and the base of the timbered hills.

The adults did not flush from either nest until we were within 2 or 3 yards. Both the eggs and the nesting sites had been considerably fouled by the excrement of the adults. However, there was no wasted or uneaten food in or around the nests. Egg shells and infertile eggs were not removed from the nests after hatching.

F. L. Burns (*Wils. Bull.*, 27, 1915:282) and Bent (*loc. cit.*) placed the incubation period at 28 days, but Mousley (*Wils. Bull.*, 51, 1939:83–5) found it to be 24 days, and my data confirms this.

On May 2 at 5:00 P.M., there were two warm eggs in the nest first discovered. On my next visit, May 4 at 11:45 A.M., the adult was flushed and 4 warm eggs were found in the clutch. On May 12 the nest was intact, and 35 minutes after flushing the adult had still not returned to the nest. On May 16 both nests were intact, and on May 26, 2 young were found in each nest. In the nest first discovered one of the young was thoroughly dried and the second, which was wet, had apparently just emerged from the shell. In fact, the mucous membrane in the egg shell was still moist. In the other nest one of the young was completely dried and the other was partially so. One of the eggs was noticeably pipped.

On June 6 there were three young Bitterns in each nest. Since the young hatched on different days, and the eggs were deposited on successive days, incubation presumably started with the deposition of the first egg. From the (assumed) deposition of the first egg on May 1 to the hatching of the first bird on May 25 is an incubation of 24 days. The fourth egg in each nest was infertile.

On June 6 both nests were visited. In the nest first discovered, the two larger young crawled from the nest and attempted to hide in the cord grass, but the third and smaller one was inclined to remain in the nest. In the other nest the three were all of the same size, and when approached, they left the nest and attempted to escape in the dead cord grass. By June 8 all young had left both nests, having remained in the nests for about 13 days. This checks closely with the period of "two weeks" reported by Bent (*loc. cit.*)

Although this swamp was hunted over regularly by a male Marsh Hawk (*Circus hudsonius*), the Bittern nest was never disturbed.—David B. Vesall, *Carlos Avery Nursery, Forest Lake, Minnesota.*

A Suggestion Concerning Territorialism In Tapera naevia.—So little is known of the breeding habits of *Tapera naevia,* the only Western Hemisphere cuckoo proven to be parasitic, that it seems desirable to record fragmentary yet suggestive observations concerning the territorialism of the species. Present knowledge of the breeding habits is summarized by Friedmann (*Ibis,* 1933:532–9). To these records of the hosts I wish to add that on Dec. 27, 1939 near Santa Elena, Entre Rios, Argentina, I found a young *Tapera* in the nest of the Oven-bird, *Schoeniophylax phryganophila.* In addition there were two young and three eggs of the host ready to hatch. The *Tapera* had probably hatched about two days before the others.

In the vicinity of Santa Elena the species is abundant, and although seldom seen, is conspicuous because of its loud, persistent call. About the first of November the birds begin to repeat their monotonous two-syllabled note, "crespín," frequently calling throughout the night. Each bird calls from one circumscribed locality and remains there for a long time. Four birds, presumably the same although not marked for identification, called for a month, each from its own limited area. This habit of calling from one location is also known to all the natives and may be considered a universal behavior. Friedmann (*loc. cit.*) states that both sexes call and proved that the female calls by collecting one in the act. The sex ratio of the species is not known. The fact that in museum collections there are many more males than females (74 to 28) may be interpreted to indicate that the male calls more frequently and thus is more frequently collected or that there really exists a surplus of males in the population. This latter condition is the more likely since a species with abnormal breeding habits usually has an abnormal sex ratio (Mayr; *Amer. Nat.,* 73, 1939:156–79).

The fact that *Tapera* calls persistently from one circumscribed area is of great importance in relation to the territorialism of the Cuculidae. In order to ascertain the sex of the bird calling from one definite spot I tried unsuccessfully for three weeks to collect one of the four calling birds but their wariness and ventriloquial ability always outwitted me. For *Cuculus canorus* it is known (Makatsch, 1937, Der Brutparasitismus der Kuckucksvogel) that each female has a definite territory and also that the males live in a more or less limited area. Molnar (*Aquila,* 1939: 257–64) reports that each female has a territory but mates with several males. However, at times other females lay eggs in this territory. In the parasitic African Cuckoos, Friedmann (*Auk,* 45, 1928:33–8) finds that, although two species have weak territorial instincts, several species establish definite territories which are dependent upon available nests to be parasitized. The male is more faithful to the territory than the female. Thus the habit of maintaining one definite area occurs in two subfamilies (Cuculinae and Geococcyginae) which are widely separated geographically and taxonomically.

In terms of the phylogeny of the Cuculidae there are two possible interpretations of the development of territorialism. Either the habit of maintaining a territory has developed independently in the Cuculinae and the Geococcyginae (the subfamily to which *Tapera* belongs) or the Geococcyginae are descended from a cuculine stock which had already developed territorialism. If this latter interpretation is correct, then, since many members of both subfamilies are non-parasitic, it is necessary to conclude that territorialism developed in the group prior to parasitism and also before the family spread to the western hemisphere.—David E. Davis, *Sheldon Traveling Fellow, 1939–40, Harvard University, Cambridge, Massachusetts.*

The Arctic Three-toed Woodpecker as a Breeding Bird in Wisconsin.—The nesting of the Arctic Three-toed Woodpecker (*Picoides arcticus*) has been considered probable but indefinite for Michigan (Josselyn Van Tyne, Check List of the Birds of Michigan, 1938) and for Wisconsin (A. C. Bent, Life Histories of North American Woodpeckers, 1939). A. J. Schoenebeck (Birds of Oconto County, 1902) states: "In the year of 1893 Capt. B. F. Goss and myself found two nests of this bird, both containing young birds." Under date of September 28, 1937, E. R. Ford wrote to me that The Chicago Academy of Sciences has a set of four eggs of the above species taken by A. J. Schoenebeck in Oconto County, Wisconsin, May 16, 1894. The data read: "Incubation just begun, nest in hollow in pine tree excavated by bird six feet up, near edge of deep pine woods."—A. W. Schorger, *168 North Prospect Avenue, Madison, Wisconsin.*

Injured Birds as a Possible Source of Unusual Records.—A Snow Bunting (*Plectrophenax nivalis*) with a broken wing was picked up near Fargo, North Dakota on January 6, 1939, by Roy Humphreys, Jr. The break seemed to be close to the bird's body and impossible to treat. The bird thrived on a diet of commercial bird seed and most of the time had the liberty of a screened porch. It recovered the use of the wing and on March 5 Roy released it after I had banded it.

A Lapland Longspur (*Calcarius lapponicus*) picked up by school children late in March, 1939, was not so fortunate. The bird was cared for by Mrs. H. M. Sherwin, but did not recover the use of its wing. Late in the spring it was released on the grounds of the Camp Fire summer camp, ten miles south of Detroit Lakes, Minnesota. This at once suggested that if such a bird happened to be collected, it might be in breeding condition and become an unusual record. There must be many birds thus left behind during migration.

On May 20, 1940, I banded a Slate-colored Junco (*Junco hyemalis*). When released, the bird flew rather weakly and somewhat to one side as if one wing were weak. It was very probably this bird which I had seen on May 16, the only one noted since May 4, which is about the normal time for the last of the species in this locality. This was apparently an individual which had been injured and unable to migrate with the rest. If delayed for some time it might fail to leave, or what seems more probable, drop out at some other point on its northward journey because of its wing condition.

Another instance of somewhat different character seems worthy of mention. On October 22, 1939, I trapped and banded a Harris Sparrow (*Zonotrichia querula*) which had lost all of the flight feathers except the outermost primary in the left wing. New feathers were already breaking the sheaths, so the accident must have occurred some days earlier. The bird was takn at a place where a trap had just been set about ten rods from the others. Three days later the bird appeared at the other traps, quite unable to fly when released. On October 26 the new feathers projected about one-half inch beyond the sheaths. On October 28 they had reached a length of an inch and the bird was able to lift itself a foot or more above the ground for a couple of rods. On October 31 the feathers had attained one and one-fourth inches and the bird was flying quite well. Another quarter inch growth was recorded November 3 and the wing seemed practically normal. On the following day the bird was taken only once but a Harris Sparrow was quite voluble in the bushes that evening. It was not seen again and probably departed that night. No other individual of the species had been taken since October 21.—O. A. Stevens, *Fargo, North Dakota.*

EDITORIAL

The Twenty-sixth Annual Meeting of the Wilson Ornithological Club will be held in Minneapolis on November 22 and 23. Headquarters will be at the Minnesota Museum of Natural History on the University of Minnesota main campus. The newly-finished museum is an attractive building with all facilities needed for such a meeting. Adjoining the museum is the new building known as the "Center for Continuation Study" which includes living and dining quarters for seventy guests. This whole building is being placed at the disposal of the Club for the meeting. Members are asked to make reservations well in advance by writing to Mr. J. M. Nolte, 136 C. C. S. University of Minnesota, Minneapolis. Please mention the Wilson Club when writing, for space is being reserved for us that weekend.

A special committee, consisting of G. M. Sutton, Mrs. Ruth E. Lawrence, R. T. Peterson, and W. J. Breckenridge is arranging a large exhibit of bird art to be held in the University Art Gallery in Northrup Auditorium near the museum. There will be shown not only pictures by a large number of our present-day artists but also a number of representative works by noted artists of the past.

There will be the usual program of papers and members are requested to send the titles of the papers they wish to present to Dr. Pettingill on or before October 19. An important feature of the meeting will be a Symposium on Wildlife Management under the chairmanship of Professor Aldo Leopold.

At a reception in the Museum on Friday evening the study collections and library will be at the disposal of members, and a showing of motion pictures of birds will be held in the auditorium. There will also be an exhibit of some rare bird books incuding first editions of Audubon's double elephant folio, Wilson, Catesby's "Natural History," Swainson's "Fauna Boreali" from the Museum and other libraries of Minneapolis and Saint Paul.

On Sunday following the meeting there will be a field trip to the State Game Propagation Farm, thirty-five miles from Minneapolis. There will also be arranged sight-seeing tours to old Fort Snelling, the Mississippi and Minnesota Rivers, and other points of interest in the Twin City region.

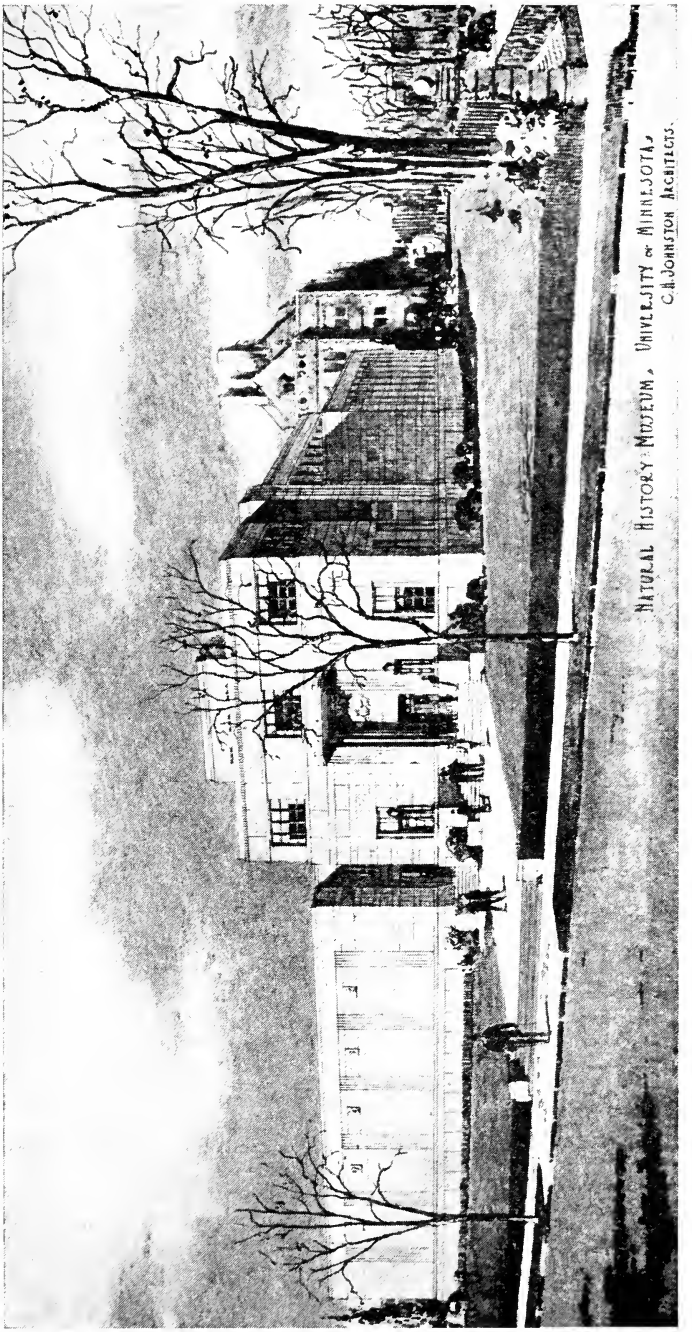
All indications point to a very enjoyable and stimulating meeting. Begin now and make your plans to be there. If you have never attended one of these meetings you can hardly realize how much you have been missing.

Some bird students like to keep a classified index to current publications in their special field of interest by pasting on card-index cards the printed references. If those interested will notify us we shall be glad to have extra copies of the *Bulletin's* lists of current papers printed on one side of the paper for such cutting and posting. If a number of people ask for this service it can be furnished at a very low cost.

OBITUARY

James H. Fleming, dean of Canadian ornithologists, died in Toronto on June 27. He was a profound scholar and knew world birds and the literature concerning them as few have ever done. His private collection of the birds of the world ranked high even among the great public collections in America. Mr. Fleming had been a member of the Wilson Ornithological Club for thirty-four years.

Arthur H. Howell, noted ornithologist and mammalogist, died in Washington, D.C., on July 10. He was the author of volumes on the birds of Alabama and of Florida and for the last two years had been editor of the Journal of Mammalogy.



University of Minnesota Museum of Natural History where our Annual Meeting will be held November 22 and 23.

WILDLIFE CONSERVATION

EDWARD K. LOVE FOUNDATION PROMOTES MISSOURI CONSERVATION. Some of the activities stimulated by grants from the Edward K. Love Foundation, established in December 1938 with a principal of $100,000, will be of interest to Wilson Club members. They are designed to fit into the program of the Conservation Commission, which has repeatedly emphasized the paramount importance of scientific research, natural production, and public participation.

For scientific research:

(1) Two $500 research fellowships at the University of Missouri, each with an additional allotment for travel-expense. The Foundation stipulates that one of these Fellows shall be engaged in the study of furbearers, the other in the study of some problem in aquatic biology. The former, Mr. Carl R. Noren, is studying limiting factors in the life-history of the raccoon; the latter, Mr. James R. Hurt, is beginning a survey of the distribution, ecology, and management of aquatic plants in Missouri.

(2) The Foundation has contributed $1,000 to the Commission, toward the expenses of an aquatic biologist, Dr. W. C. Frohne, who will be concerned with research and with the management of aquatic resources.

For natural production and public participation:

(3) County wildlife organizations:

In each quarter of Missouri, $200 in cash prizes, half for constructive work in the restoration of upland wildlife, half for similar efforts on behalf of aquatic and semi-aquatic wildlife. Artificial restocking is *not* included among these activities, which are outlined in the form of a dozen or more projects having as their obpective the improvement of native environment and increased public participation

(4) 4-H Clubs:

(a) Two $100 scholarships for the freshman year at the University of Missouri, for boys or girls who have made outstanding individual contributions along the lines just indicated.

(b) $100 in cash prizes for group activities of a similar nature.

(5) Future Farmers of America:

One $100 freshman scholarship at the University of Missouri and $200 in cash prizes.

(6) Other High-School conservation clubs:

$100 in cash prizes.

The first scholarship awards under (4) and (5) were made last summer. The first cash awards are to be made to all four groups in the spring of 1940. All awards are made on the basis of written reports, oral interviews, and field examination of the projects by field biologists of the Conservation Commission. The entire matter is in the hands of a central committee, with special committees supervising the several special activities.

DUCKS UNLIMITED. During the past ten years there have arisen two conservation organizations bearing similar names: "MORE GAME BIRDS" and "DUCKS UNLIMITED." The intent of these organizations has been freely criticized by *Nature Magazine* and by numerous workers in the conservation field. As is frequently the case, however, many of the critics have not been thoroughly acquainted with the personnel or accomplishments. This is not the place to review these organizations completely and we intend only to point out that such organizations frequently serve better than admitted by their critics.

The MORE GAME BIRDS organization certainly over-stressed "restocking and predator control," but they have contributed several bulletins useful to wildlife workers. DUCKS UNLIMITED, INC., (an out-growth of MORE GAME BIRDS activities)

is functioning in the United States to raise funds which are sent to DUCKS UNLIMITED, LTD., of Canada. The quality of field work, public contacts, and other activities of the Canadian work of DUCKS UNLIMITED seems to compare not unfavorably with that of well-known government agencies engaged in similar reconnoitering and restoration. It is not claimed by them that crows and droughts are the principal enemies of waterfowl; for they readily admit the seriousness of shooting. Any organization sincerely and intelligently working for waterfowl habitat restoration and public education in conservation affairs deserves tolerance and due appreciation, regardless of which side of our Canadian border the work is being done. Such organizations are no doubt benefiting from past experiences, as also are many of the state and federal agencies entrusted with wildlife affairs.

FEDERAL AID TO WILDLIFE. Under new projects Ohio and Connecticut are working on Ruffed Grouse, Virginia and Nebraska on the Quail, and Oregon is studying the Sage Grouse. Oregon, California, and Idaho are doing work with the beaver; Vermont is planning a survey of its fur animals, and Mississippi is undertaking a wildlife resources survey under the leadership of Miss Fannye Cook, biologist for the Commission. Many states, chiefly in the West, are undertaking deer management projects, and numerous states are acquiring new refuge areas.

WILDLIFE CONSERVATION COMMITTEE
Miles D. Pirnie, Chairman

ORNITHOLOGICAL NEWS

Dr. Alden H. Miller has been appointed Director of the Museum of Vertebrate Zoology, University of California.

Dr. Thomas S. Roberts was given the honorary degree of Doctor of Science by the University of Minnesota last June in recognition of his accomplishments in ornithology and his success in developing the Minnesota Museum of Natural History.

The Sixth Annual Midwest Wildlife Conference will be held in Urbana, Illinois on November 14 to 16. A special feature of the meeting will be the dedication of the new five-story Natural Resources Building on the University of Illinois campus.

The Department of Zoology of Carleton College has recently been given the North American bird egg collection of Alpheus Hewitt of Winnebago, Minnesota. This collection comprises 4,000 eggs, all with full data. The majority of the specimens were collected forty or fifty years ago and there are included therefore the eggs of many species which are now exceedingly rare.

The Fifty-eighth Annual Meeting of the American Ornithologists' Union was held at the New England Museum of Natural History in Boston and at the Institute of Geographical Exploration of Harvard University, September 9 to 12, with a registered attendance of 310.

Officers elected for the new year were as follows: President, James P. Chapin, New York City; Vice-Presidents, James L. Peters, Cambridge, Massachusetts, and George Willett, Los Angeles, California; Secretary, Lawrence E. Hicks, Columbus, Ohio; Treasurer, Rudyerd Boulton, Chicago, Illinois; Council, Ira N. Gabrielson, Washington, D.C., James Savage, Buffalo, New York, and J. Van Tyne, Ann Arbor, Michigan.

The Brewster Medal was awarded to James L. Peters for his "Check-list of Birds of the World."

Two Fellows were elected: Stanley G. Jewett, Portland, Oregon, and Robert T. Moore, Pasadena, California. In addition to 228 new Associate Members, 8 new Members were elected: Oliver L. Austin, M.D., Tuckahoe, N.Y.; Joseph J. Hickey, New York City; George H. Lowery, Baton Rouge, La.; Eugene E. Murphey, Augusta, Ga.; John R. Pemberton, Altadena, Calif.; Arlie W. Schorger, Madison, Wis.; Milton B. Trautman, Put-in-Bay, Ohio; and Lawrence H. Wilkinshaw, Battle Creek, Mich.

The 1940 meeting will be held in Denver.

ORNITHOLOGICAL LITERATURE [1]

CHECK-LIST OF BIRDS OF THE WORLD. Volume 4. By James Lee Peters. Harvard University Press, Cambridge, Mass., 1940: 6 x 9 in., xii + 291 pp. $4.00.

Volume 4 of Peters' Check-List, uniform in high standards of scholarship with its predecessors, treats the cuckoos, owls, goatsuckers, and swifts. It includes 114 genera, 464 species, and 1259 forms, and thus covers a smaller number of birds than any of the preceding volumes.

The tedious work of compilation is carried out in a thoroughly competent and accurate manner, but the Check-List is far from being a mere compilation. The author, with his wide knowledge of the literature and taxonomy of the class, has contributed a large amount of original matter in each volume. In many cases independent study of the more critical groups was made and resulted in the reclassification of entire families. Among the birds covered by the present volume, the owls had been particularly neglected, and the author's research in this family is especially welcome.

Surprisingly few of the North American birds included in this volume bear different names from those of the A. O. U. Check-List. Three genera, *Micrathene* Coues, *Aegolius* Kaup, and *Apus* Scopoli, are used in preference to *Micropallas, Cryptoglaux,* and *Micropus,* respectively, of the A. O. U. These changes are necessary under the "one-letter rule" of the International Rules of Zoological Nomenclature. The use of *Apus* unfortunately calls for a change in the A. O. U. subfamily, family, subordinal, and ordinal names for the group of swifts allied to "*Micropus.*" Following certain European writers, Peters calls these Apodinae, Apodidae, Apodi, and Apodiformes, respectively. He has overlooked, however, Burmeister's much earlier use of the term Apodidae for a family of crustaceans. This name is still in current use among carcinologists. Burmeister's action precludes employing this term for the swifts and would seem to also preclude the use of its derivatives for ordinal, subordinal, or subfamily terms. One cannot use the terms Micropodidae or Cypselidae as the family name of the swifts, either, since these names are based on synonyms of *Apus*. Article 5 of the International Rules states: "The name of a family or subfamily is to be changed when the name of the type genus is changed." The best solution of this unhappy situation seems to be the erection of a new family name for the swifts. **Chaeturidae,** nom. nov., with *Chaetura* Stephens as the type genus. The suborder may be known as **Chaeturae,** nom. nov., and the order **Chaeturiformes,** nom. nov. A new subfamily term for the swifts allied to *Apus* is also required. These birds may be called **Panyptilinae,** nom. nov., with *Panyptila* Cabanis as type genus.

Peters uses *Bubo virginianus wapacuthu* (Gmelin), *Nyctea scandiaca* (Linnaeus), and *Strix varia georgica* Latham as earlier and applicable names for *B. v. subarcticus, N. nyctea,* and *S. v. alleni* of the A. O. U. List. Two genera recognized by the A. O. U., *Scotiaptex* and *Antrostomus,* are combined with *Strix* and *Caprimulgus,* and three forms of accidental occurrence in North America, *Cuculus optatus, Surnia ulula pallasi,* and *Scotiaptex nebulosa barbata,* are synonymized with other Old World forms. The Long-eared Owl is treated as a race of *Asio otus*. Seven subspecies of owls, most of them described since the publication of the latest edition of the A. O. U. Check-List, are accorded recognition by Peters, although one of them is said to be "doubtfully separable."

Although the text of the work is executed in a thoroughly reliable way, we find that in the introduction Mr. Peters has made a slip when comparing the increase of forms and decrease of recognized genera in the groups covered by Volume 1 of Sharpe's Hand-list. He gives the number of genera and forms in Volume 1 of Sharpe as 830 and 3626, respectively, apparently taking Sir Ray Lankester's count from the preface of Volume 2. He further states that the same groups in his own Check-List comprise 569 genera and 5106 forms, giving a

[1] For additional reviews see pages 172, 190, and 197.

decrease of 261 [31%] in the number of genera and an increase of 1480 [41%] in the number of species and subspecies recognized. All of these figures are incorrect.

In the first place, Sharp included fossil as well as recent species and genera, so it is not fair to compare his total figures with those of Peters, who gives only recent forms. According to my count, the total number of recent genera included in Volume 1 of Sharpe is 741; of forms 3303. These figures include recently extinct species, which Sharpe gives in antique type like the fossil ones. The total number listed by Peters for the same groups is 662 and 5127 forms, by careful count. This is a decrease of only 79 genera (11%), and an increase of 1824 forms (55%). Broken down to Orders, a comparison of the two lists is as follows:

	Genera			Species		Forms	
Order	Sharpe	Peters	Change	Peters	Sharpe	Peters	Change
Struthioniformes	1	1	0	1	4	6	+2
Rheiformes	1	2	+1	2	3	6	+3
Casuariiformes	2	2	0	8	16	35	+19
Apterygiformes	1	1	0	3	6	5	—1
Tinamiformes	9	9	0	51	69	118	+49
Sphenisciformes	6	6	0	17	17	22	+5
Gaviiformes	1	1	0	4	5	8	+3
Colymbiformes	7	5	—2	18	25	39	+14
Procellariiformes	25	24	—1	107	121	187	+66
Pelecaniformes	8	9	+1	59	77	126	+49
Ciconiiformes	73	58	—15	124	168	244	+76
Anseriformes	73*	64	—9	170	210*	231	+21
Falconiformes	92	89	—3	289	515	701	+186
Galliformes	95	94	—1	276	476	830	+354
Gruiformes	84	81	—3	205	303	482	+179
Charadriiformes	139	124	—15	315	412	604	+192
Columbiformes	94	63	—31	326	560	889	+329
Strigiformes	30	29	—1	143	316	594	+278
Total	741	662	—79	2118	3303	5127	1824

* Includes "Palamedeidae" omitted by mistake from Volume 1 of Sharpe.

With the completion of Volume 4, Peters has now covered about half (82) of the 165 families of birds. His work is far from being half completed, however, since he has published on only one-third (838) of the estimated 2600 genera, one-third (2783) of the 8500 species, and one-fourth (6570) of the 27,000 described forms of birds. It therefore seems that the estimate of ten volumes needed to cover all the birds of the world will have to be revised upwards to sixteen, even without allowing for the annual increase of some 200 valid described forms. At the present rate of one volume every three years, we must wait until Mr. Peters' eighty-seventh birthday in 1976 to see the Check-List finished.—P. Brodkorb.

Birds of Western Pennsylvania. By W. E. Clyde Todd. University of Pittsburgh Press, 1940: 8½ x 11 in., xv + 710 pp., one black and white and 22 colored pls., folding map. $5.00.

We welcome the publication of Mr. Todd's long-anticipated "Birds of Western Pennsylvania." The introductory sections of this book include accounts of the geography and ornithological history of the area, the author's own field work, and the general features of bird distribution. The author's early training in the U. S. Biological Survey is probably reflected in his decision to use the "Life-zone" concept in his discussion of bird distribution. It is, however, incongruous to find

a rather detailed account of bird distribution by life-zones concluded by the statement that "the attempt to express these faunal differences in terms of the current life-zone divisions is unsatisfactory and confusing" and to read (p. 8) that "Zoologists and botanists . . . have found it unacceptable and unworkable." If so, what significance is there in these pages about Pennsylvania life-zones? One strange statement made in this connection, which we cannot let pass unchallenged is the author's assumption (p. 8) that ornithologists are not zoologists. Most of us would define ornithologists as fortunate zoologists who are using the Class Aves as a medium for the study of zoological problems.

As one would expect in a work produced by Mr. Todd, this book is exceptionally well proof-read and checked. The only typographical error we have found is the citing (p. 496) of volume 2 instead of volume 3 of Forbush's "Birds of Massachusetts." Among ornithological errors we note a repetition of the old beliefs that the Cowbird's incubation period is only 10 days and the Spotted Sandpiper's 15 days, and that the Black-capped Chickadee does not migrate.

It is surprising to find one of Mr. Todd's reputation including in his book so many species whose occurrence is based only on rather questionable sight records. In this category we would place the Louisiana Heron, Iceland Gull, Franklin Gull, Little Gull, Canada Jay, Hoary Redpoll, and Lark Bunting.

The complete accounts of the habits of more than 25 species are contributed by others. These co-authors include B. H. Christy, Ruth Trimble, E. W. Arthur, T. D. Burleigh, and seven other observers.

For the most part the accounts of habits are excellently done but occasionally there appear bits of sentimentalizing or humanizing that are very out of place in a scientific book. For example, no scientist should ever be guilty of writing about a bird's "brazen pride" or "villainous habits" or "merry disposition." Birds are not little humans and a scientist is not increasing knowledge among men by writing as though they were. It is only fair to state that most of these lapses are to be found in the accounts of bird habits contributed by other writers, but the responsibility for their appearance here remains the author's.

We find it hard to understand the author's use of a number of scientific names, which he himself states unequivocally are incorrect, simply because they were used in the 1931 A.O.U. Check-list. The perpetuation of error for the sake of standardization is certainly not the best scientific procedure.

There may be some system behind the author's capitalization of English proper names of bird species but we have failed to fathom it. On some pages he has capitalized consistently but others seem to be an indescriminate mixture of capitalized and uncapitalized names.

We frankly do not believe the story the author quotes of the Killdeer that put the squad of young Killdeers through close-order drill and we are discouraged to read again in 1940 of the "ruse" employed by the "resourceful" Yellow Warbler to combat the interloping Cowbird. Another questionable suggestion is that the extra nests built or started by Red-wings are perhaps meant as a provision "against peering eyes or prying hands."

The precise distribution of many species is shown by excellent "spot maps"—not the misleading, old-fashioned type of map in which the author draws in a solid distribution zone in which he thinks the species must surely occur. We only wish that the symbols for individual records had been made somewhat larger. In some cases (as p. 393) the maps require very close inspection to be understood.

The volume is handsomely illustrated with a large number of very effective bird portraits by George Miksch Sutton. Many of the pictures are as fine bird portraits as have ever been published. One hundred and eighteen of these pictures are in color and are arranged in a novel and very successful manner whereby all of the birds are reproduced in proportionate size and with but one (in a single case, two) species in a picture. Two to nine of these pictures are repro-

duced on a page, all explanatory text being conveniently placed in corresponding rectangles on the opposite page. The artist has thus avoided the Swiss-family-Robinson groupings forced on many painters by the necessity of showing many species on one plate. The reproduction of a few of the plates in the copies we have seen leaves something to be desired but most are excellent.

This book is unusual among modern bird books in that no photographs have been used as illustrations.

"The Birds of Western Pennsylvania" concludes with an admirable gazetteer of 921 entries, a thoroughly annotated bibliography, and a good index. A new feature of this book is the multiple repetition of a large proportion of the references in separate bibliographies at the close of each species account. It is certainly a convenience to have these, but the repetition of the complete references and even some annotations has added unnecessarily to the bulk of the volume.

We hope that our several criticisms of minor points will not cause anyone to miss the fact that this is one of the most scholarly, useful, and attractive state bird books yet published.—J. Van Tyne.

The Birds of Buckeye Lake, Ohio. By Milton B. Trautman. Univ. of Michigan Museum of Zoology Miscellaneous Publications No. 44, May 7, 1940:1–466, 16 pls., 2 maps, $2.50.

The value of any science lies not so much in its discoveries as in the number of minds which participate in its development.

In Audubon's day the cost of participation in ornithology was exile at the physical frontier. During the ensuing century the theatre of activity moved gradually inward until Margaret Nice proved, in 1937, that any layman can find an ornithological frontier in his (or her) own backyard.

The Nician explorations, however, call for the continuous use of precise ecological techniques such as banding, and a command of the latest researches in avian psychology. To this extent the rank and file are still in the status of admirers of pioneering, rather than pioneers.

The significance of Milton B. Trautman's "Birds of Buckeye Lake" lies in the fact that it explores the ornithology of a "backyard" region with the help of ecological thinking and observation alone, i.e., without the use of precision techniques. Hence "Birds of Buckeye Lake" is something any ornithologist can do in his own region, given only the persistence, imagination, and field skill of Milton B. Trautman.

To me there is something comfortable in this. I admire and emulate the Nician techniques, but I love old-fashioned acumen in the field, and I welcome Trautman's proof of how good a job it can do.

Like Murphy's "Oceanic Birds," Trautman's volume is outstanding not alone for its life histories of species, but especially for its introductory analysis of the region in which they live. Many local works on birds contain an introductory description of the locale, but most such descriptions are lame indeed compared with Trautman's rich history of central Ohio. Geographers, historians, and agronomists can afford to own Trautman's work for its history alone. Ecologists in particular can glean new wisdom from his skillful interpretation of the retrogression of soils, waters, floras, and faunas since the days of first settlement.

The early history of Buckeye Lake is compiled from other authors and old settlers, but since 1906 Trautman has been eye-witness to the local pageant. His intensive studies cover the period 1922–1934, during which time 541 days were spent in the field.

Several of Trautman's methods of study are original. No other ornithologist has followed groups of migrants cross-country by car to note their social organization en route. No other ornithologist has recorded in such detail the characteristic flock formations and behaviors of arriving and departing waterfowl (and few

other lakes lend themselves as well to such studies as does Buckeye). Few other ornithologists know their fishes, mammals, and plants as well as their birds. Trautman's graphic month-by-month record of changes in distribution and abundance is hardly original, but I recall no other author who has applied it to so many species.

So ambitious an undertaking could hardly be wholly free of slips and foibles. Thus Trautman, like the Audubon Society, calls a species list with numbers seen a "census." I prefer to reserve the term "census" for an actual enumeration of the birds present on a given area.

Not the least merit of Trautman's volume is its simplicity and clarity. The reader is never befuddled, nor is he forced to swallow any needless ecological jargon. (One might even conclude that the absence of such jargon is becoming an earmark of ecological competence. The works of Charles Elton, Fraser Darling, and Margaret Nice would likewise support such a view.)

A good bibliography and index add much to the reader's convenience in using "Birds of Buckeye Lake," and a series of excellent photographs add to his pleasure in owning it.

I am puzzled by just one thing: Why did Ohio let Michigan bring out the Trautman volume? The average reader, however, will content himself with being grateful that somebody brought it out.—Aldo Leopold.

A Book on Duck Shooting. By Van Campen Heilner. Penn Publishing Co., Philadelphia, 1939: 6¼ x 9 in., xiii + 540 pp., 16 color pls., 235 photos, many drawings. $7.50.

This is one of the best duck hunters' books we have seen and holds much of interest for the ornithologist as well. The first 250 pages are devoted to some most entertaining essays on the author's duck hunting experiences in many parts of the world. The essays are very well done but, as the author says, the most valuable part of this book is the appendix, which includes chapters on flight speeds of birds (by May Thacher Cooke), waterfowl flyways (by F. C. Lincoln), modern decoys (by Joel Barber), boats and blinds (by H. L. Betten), sunspots and cycles of abundance in waterfowl (by Ralph De Lury), marshes of the past and future (by Clarence Cottam and Warren S. Bourn), and duck clubs. The final section is a "Guide for Duck Shooters," consisting of small scale drawings of the American species of waterfowl, their scientific names, and their geographical ranges.

Eleven species of ducks and seven of geese are shown in the color plates and a number of others are shown nearly as well in the many excellent drawings, all by Lynn Bogue Hunt. The pictures are admirable and their reproduction good but, unfortunately, they are often very inadequately labeled. For example, a fine colored plate of the three American species of scoters is labeled "Coot Shooting in New England." Other pictures have the name of only one of two or more species figured.

The so-called bibliography at the end of the book is so brief as to be almost useless. Only 28 titles are listed and all data beyond the bare mention of author and title is omitted.

The book is handsomely printed and does great credit to both author and publisher.—J. Van Tyne.

A Manual of Aquatic Plants. By Norman C. Fassett. McGraw-Hill Book Co., New York, 1940:6 x 9 in., vii + 382 pp., many illustrations. $4.00.

To date a problem in connection with writings on the utilization and management of waterfowl food plants has been adequate treatment of identification within the space limits practicable in economic publications. That problem may

now be dismissed and readers referred to Dr. Fassett's excellent work which deals primarily with recognition of the plants. Through cooperative effort the book has been copiously illustrated and as the author says "The text is essentially a set of directions for looking at the pictures." The work consists chiefly of keys fully correlated with the illustrations and intended to permit determination of plants even in sterile condition. Generalized descriptions and succinct references to supplementary recent publications on the groups of plants also are given.

The ornithological material is concentrated in a chapter summarizing knowledge on use of the plants by birds and mammals, that is accompanied by an index to the notes by species and other groups, and a bibliography (of 95 items) of the sources of information. Data on fishes is similarly treated. There is a glossary of technical terms and a full index. A much needed and well executed manual.—W. L. McAtee.

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Vol. 52 DECEMBER, 1940 No. 4

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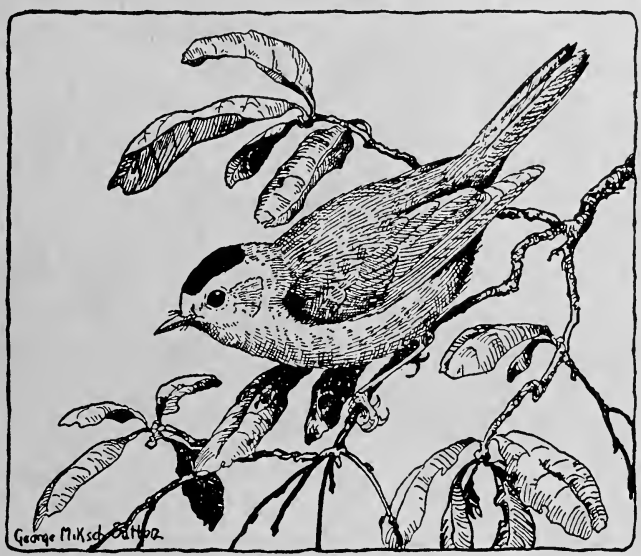
The Wilson Bulletin



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Founded December 3, 1888. Named after Alexander Wilson, the first American ornithologist, and called the "Father of American Ornithology."

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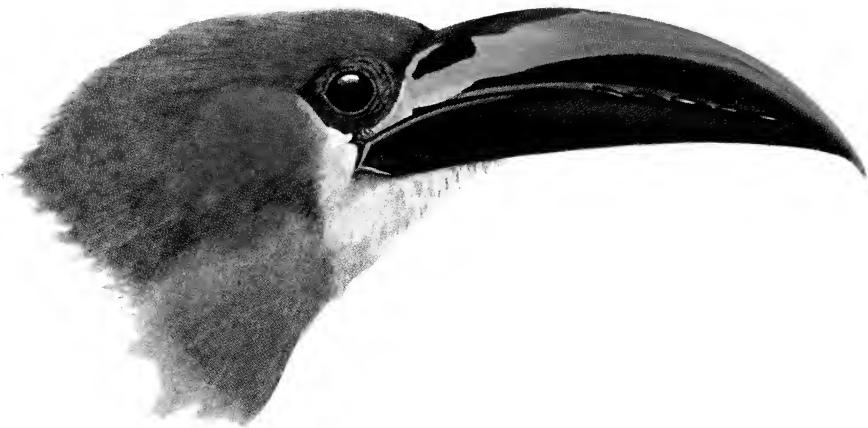

HEAD OF EMERALD TOUCANET
(Aulacorhynchus prasinus prasinus)

From sketch in water-color by George Miksch Sutton, drawn from a freshly-killed male specimen taken near Tamazunchale San Luis Potosí, April 26, 1939.

THE WILSON BULLETIN

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BIRDS OF TAMAZUNCHALE, SAN LUIS POTOSÍ[1]

BY GEORGE MIKSCH SUTTON AND THOMAS D. BURLEIGH

TAMAZUNCHALE[2] is one of the best known, as well as one of the most interesting towns the tourist passes through in following the main highway from Laredo, Texas to Mexico City. It is situated on the Moctezuma River, at about 300 feet elevation, in extreme southeastern San Luis Potosí. Immediately south of it rise well-wooded mountains whose crowns and sides are patched with tiny clearings, corrals, and corn fields. In the shelter of the larger trees carefully tended coffee bushes grow, some of these "plantations" occupying level stretches of flood-plain, others clinging to steep slopes far above the river.

The forest about Tamazunchale can hardly be called dense, though it is tropical in character. There are, however, impenetrable tangles in the cut-over districts as well as along the forest edge; and the rough mountainsides, with their shaggy blanket of moss, ferns, and vines, are difficult to scale, almost the only safe route to higher elevations being the improved road itself or the dry, tortuous, boulder-strewn beds of streams.

The 1939 Semple Expedition spent a little more than two weeks investigating the Tamazunchale section, part of a day March 26, and the period from April 14 to 29. The junior author participated for a comparatively short time, finding it necessary to start north for the United States April 17.

On March 26 the three-man party worked a fine woodland near the Rio Axtla, twenty miles north of Tamazunchale. Here, even close to the highway, birds were abundant and noisy. From April 14 to 16 inclusive the immediate vicinity of Tamazunchale was thoroughly explored, especial attention being paid to certain brushy woodlands north of town, and to the crudely cultivated banks of the river. From April 17 to 29 Semple and Sutton visited several more or less distant places in addition to the Rio Axtla woodland

[1] Third of a series of papers on the 1939 John B. Semple Expedition to eastern Mexico.

[2] Present-day spelling of Temaxteocali, said to have meant "Temple of the Toad God." The town is familiarly known among tourists as "Thomas and Charlie."

above referred to—the vicinity of Palitla, a village just over the ridge to the north of Tamazunchale; the flat country about Matlapa and Jalpilla, villages a few miles north of Palitla; and the banks of the Moctezuma and certain wooded ravines from four to ten miles south of Tamazunchale. A brief visit was made to the village of Axtla (on the Axtla River, a few miles east of the main highway) April 25; and on the way north to Valles, on April 29, important stops were made near Xilitla and at El Xolol.

On April 26 the senior author chanced to follow a dry stream bed back from the highway several miles into the mountains. Here, at a point which must have been ten miles south or southeast of Tamazunchale, and at an elevation of between 2,000 and 3,000 feet, he came upon a clear, cool stream, a fair-sized torrent that appeared to originate as a fall, that slipped swiftly along the base of the mother-cliff for several hundred yards, roared as it widened and changed course, then suddenly disappeared underground. Enchanted with this weird and beautiful thing, he returned on the two following days. Far above him, back and forth across the face of the vine-hung cliff, huge flocks of green parakeets flew. At a distance they looked like young leaves stripped from the treetops and blown by a fierce wind. Their screeching could be heard even above the noise of the cataract; but a more memorable sound was the ear-splitting squawks of the macaws that flew, pair by pair, overhead. The tall *jobo* trees were laden with ripe fruit. Here the parrots, big, middle-sized and little, came to feed. Other animal life was scarce, though now and then a squirrel barked, a hummingbird darted by, or a huge damsel fly idled past on wings that flashed steel-blue and silver.

The following list of 142 forms is considerably larger than that made by the Semple Expedition at Valles[3], less than 70 miles to the north. There are several reasons for this. First, more time was spent at Tamazunchale—a total of 432 man-hours in the field, as against the 240 man-hours spent at Valles. Second, at Tamazunchale much work was done along the Moctezuma and Axtla Rivers and certain of their tributaries, whereas at Valles no work was done along any stream. Third, the topography and vegetation are much more varied at Tamazunchale than at Valles. Because of the abundance of tree growth at the former place it is quite possible that many familiar birds of the eastern United States (such as the Baltimore Oriole, Catbird, Indigo Bunting, and Rose-breasted Grosbeak) winter regularly there but not at Valles or that, in their spring migration, they linger at the foot of the mountains near Tamazunchale, then fly *over* the Valles district to more favored feeding- or resting-grounds farther north.

The authors gratefully acknowledge the assistance of members

[3] Only 87 forms (species and subspecies) were recorded at Valles at virtually the same season (*Condor*, 42, 1940: 259–62).

of the staff of the following institutions: the Museum of Comparative Zoology at Harvard College; the American Museum of Natural History; the United States National Museum; and the Fish and Wildlife Service of the United States Department of the Interior. In particular do they wish to thank Mr. James Lee Peters, who was good enough to identify six swifts and a Wood Owl for them; and Dr. J. Van Tyne, who assisted in certain nomenclatural problems.

Crypturellus cinnamomeus (Lesson). Cinnamomeous Tinamou. Encountered only in brushy woodlands in low, comparatively flat country. Heard repeatedly a mile or so north of Tamazunchale and on April 18 in the vicinity of Jalpilla and Matlapa.

Poliocephalus dominicus (Linnaeus). Least Grebe. Two seen April 25 swimming slowly upstream along the Axtla River, not far from the village of Axtla.

Phalacrocorax olivaceus (Humboldt). Olivaceous Cormorant. Seen along the Moctezuma River several times, notably on April 16, when as many as twenty were counted; and along a small stream near Jalpilla, April 21, when six were seen.

Butorides virescens (Linnaeus). Green Heron. Recorded twice: April 17, when one was seen along the Moctezuma, four miles south of Tamazunchale; and April 21, when three were seen along a small stream near Jalpilla.

Florida caerulea (Linnaeus). Little Blue Heron. One in blue plumage seen near Jalpilla, April 21.

Casmerodius albus egretta (Gmelin). American Egret. Adult female, with full train of nuptial plumes, taken near Jalpilla, April 21 (Semple).

Querquedula discors (Linnaeus). Blue-winged Teal. Four pairs in a flock seen along the Moctezuma River seven miles south of Tamazunchale, April 17.

Coragyps atratus (Bechstein). Black Vulture. Noted every day. Especially common about the towns and along the improved roads.

Cathartes aura (Linnaeus). Turkey Vulture. Like the Black Vulture, a common and virtually ubiquitous species.

Ictinia misisippiensis (Wilson). Mississippi Kite. Recorded twice in the flat country just north of Matlapa, two being seen on April 18, one on April 20.

Buteo magnirostris griseocauda (Ridgway). Gray-tailed Hawk. Hawks were uncommon in the Tamazunchale region. The present species was noted occasionally in open, comparatively flat country. A nesting female, with well defined brood-patch, was shot April 19, along the Axtla River (Semple).

Asturina nitida plagiata Schlegel. Mexican Goshawk. Uncommon. One seen April 16 along the Moctezuma River not far from Tamazunchale. Breeding male taken near Matlapa, April 18 (Semple).

Pandion haliaetus (Linnaeus). Osprey. One seen flying along the Moctezuma River near Tamazunchale, April 24.

Micrastur semitorquatus (Vieillot). Collared Micrastur. One noted April 15, at dusk, a mile north of Tamazunchale.

Herpetotheres cachinnans chapmani Bangs and Penard. Mexican Laughing Falcon. Noted but once: a male, in soiled, badly worn plumage, taken near Jalpilla, April 18 (Semple).

Polyborus cheriway audubonii Cassin. Audubon's Caracara. Nesting pair encountered April 21, near Jalpilla. Not certainly identified elsewhere in the district.

Ortalis vetula vetula (Wagler). Chachalaca. Common in brushy woodlands. Female, with ovary somewhat enlarged, taken April 26 in shallow ravine leading back from the Moctezuma, seven miles south of Tamazunchale.

Colinus virginianus maculatus Nelson. Spotted-breasted Bob-white. Fairly common in open, brushy woodlands. Noted several times in the vicinity of Jalpilla

and Matlapa, a breeding male being taken at the latter place April 18 (Semple).

Tringa solitaria cinnamomea (Brewster). Western Solitary Sandpiper. The Solitary Sandpiper was recorded twice: a single bird seen at a woodland pool near the Axtla River, April 18; and a female collected near Matlapa, April 24 (Sutton). The belly plumage of the latter was somewhat stained with oil. This specimen is clearly of the western subspecies, the inner web of the outermost primary being marbled with grayish white at the base, the wing measuring 137 mm., the bill 34.

Actitis macularia (Linnaeus). Spotted Sandpiper. Single birds noted repeatedly along the Moctezuma River south of Tamazunchale, April 14 to 16.

Columba flavirostris flavirostris Wagler. Red-billed Pigeon. Noted daily along the borders of the heavier woodlands, especially near the Moctezuma River from four to seven miles south of Tamazunchale. Breeding male taken near Palitla, April 29 (Semple).

Zenaidura macroura (Linnaeus). Mourning Dove. Noted infrequently along the roads and in opener country. Small flock seen near Tamazunchale, April 24.

Zenaida asiatica asiatica (Linnaeus). Eastern White-winged Dove. Fairly common in the vicinity of Jalpilla and Matlapa, and along the Axtla River. Not seen south of Tamazunchale. Especially abundant north of the Axtla River in the vicinity of El Xolol where large flocks were seen along the highway and a breeding female was taken April 29 (Sutton). The wing of this specimen measures 150 mm., the tail 100.

Scardafella inca (Lesson). Inca Dove. Noted infrequently about the towns. Fairly common in Tamazunchale.

Columbigallina passerina pallescens (Baird). Mexican Ground Dove. Noted here and there in opener country wherever we went. Especially common about Matlapa and Jalpilla, where several pairs were breeding. At the former place a nest with egg and newly hatched young was found April 20, and a male (in irregular molt) was taken April 24.

Columbigallina talpacoti rufipennis (Bonaparte). Ruddy Ground Dove. Found wherever *C. passerina* was found, and commoner. Two nests with small young found and breeding male and female collected near Matlapa, April 24. Male taken at same place April 29.

Claravis pretiosa (Ferrari-Perez). Blue Ground Dove. Rare, but seen infrequently near Matlapa, Jalpilla and the village of Axtla. A pair, noted from time to time flying through Tamazunchale, must have been nesting in the very heart of town.

Leptotila verreauxi angelica Bangs and Penard. White-fronted Dove. Common wherever we went, being found singly or in pairs. A female (laying eggs) was taken April 20 at Palitla, and a male (testes much enlarged) was taken near Tamazunchale, April 27.

Leptotila plumbeiceps plumbeiceps (Sclater and Salvin). Plumbeous-headed Dove. Noted infrequently in well-wooded sections. Female with much enlarged ovary taken in flooded woodland near El Xolol, April 29 (Sutton).

Ara militaris (Linnaeus). Military Macaw. Scattered pairs seen April 18 (near Jalpilla), April 21 (along the Axtla River), and April 24 to 29 in wooded ravines leading off from the Moctezuma River, from four to eight miles south of Tamazunchale.

Aratinga holochlora holochlora (Sclater). Green Parakeet. Abundant in certain heavier woodlands along the Axtla and Moctezuma Rivers and at considerable elevations in the mountains (2,500 to 3,000 feet) where there were fruit-bearing trees. Specimens taken April 14 to 17.

Amazona viridigenalis (Cassin). Red-crowned Parrot. Noted infrequently in heavier woodlands along the Axtla River and four or five miles upstream from Tamazunchale along the Moctezuma. Pair and their nest discovered at latter place, April 20 (Semple). Breeding female taken along Axtla River, April 22.

On this date a Red-crowned Parrot was seen to attack and put to flight a Brown Jay that probably had invaded the former's nesting territory.

Piaya cayana thermophila (Sclater). Central American Squirrel Cuckoo. Fairly common in heavier woodlands, especially along the rivers. A female, taken April 26 in a well-wooded ravine seven miles south of Tamazunchale, was laying eggs.

Coccyzus americanus (Linnaeus). Yellow-billed Cuckoo. Noted but once, a single bird, near Jalpilla, April 21.

Crotophaga sulcirostris sulcirostris Swainson. Groove-billed Ani. Noted infrequently. Male taken near Jalpilla, April 19 (Semple).

Ciccaba virgata centralis Griscom. Central American Wood Owl. A mottled, middle-sized owl, presumably a Wood Owl, was noted at night on April 14, and again on April 15. Our only definite record, however, is of a male taken after dark five miles up the Moctezuma River from Tamazunchale on April 17 (Sutton). The eyes of this bird shone dull red in the rays of a strong flashlight. It gave a piercing screech. Its stomach contained but one item—a middle-sized, slender-legged, flesh-colored hairless spider.

Mr. James L. Peters has been good enough to compare our bird with the type of *C. v. tamaulipensis* (Phillips) at the Museum of Comparative Zoology He reports (in a personal letter to the senior author, dated November 18, 1940) on the comparison as follows: "Your bird has not only a darker ground color above, but the pale markings are much reduced in area and of a darker color; the broad silky feathers surrounding the facial disk have a brownish wash, with dark shaft streaks and edgings, whereas in *tamaulipensis* these same feathers are pure white externally, with dark bases. Below the two birds are marked about the same, but your specimen is more suffused with brownish across the breast and *tamaulipensis* has a buffy wash on posterior underparts."

Mr. Peters further states that our bird is "very close indeed to specimens of the pale phase of *C. v. centralis* and . . . an almost perfect match for a specimen of *centralis* from British Honduras."

Glaucidium brasilianum ridgwayi Sharpe. Ferruginous Pigmy Owl. Common wherever we went, its insistent hooting being heard during daylight hours as well as at dusk. Breeding pair taken two miles north of Tamazunchale, April 15. Nest with two fresh eggs found April 27, in stub about twelve feet from ground. The bird at the nest was the male. It called *while at the nest* (Semple). Nest with three fresh eggs found in deserted woodpecker hole about fifteen feet from ground near El Xolol, April 29 (Sutton). Male and female specimens taken April 15 to 29 represent both the grayish brown and rufescent phases of plumage.

Nyctidromus albicollis merrilli Sennett. Merrill's Pauraque. Fairly common in brushland near the rivers. The wing of a breeding male taken April 24 measures 174 mm.; that of a female (April 15) 174.5.

Caprimulgus serico-caudatis salvini Hartert. Salvin's Whippoorwill. Fairly common in brushlands at low elevations. One specimen taken: a male, with much enlarged testes, two miles north of Tamazunchale, April 20 (Semple).

Streptoprocne zonaris mexicana Ridgway. Mexican Collared Swift. Abundant along the Axtla River and at Matlapa and Jalpilla, April 18–20, hundreds being seen in the air at once. The birds could not have been far from their nesting-grounds, for the gonads of specimens captured were much enlarged. The wing measurement in two males is exactly the same: 211 mm.

Chaetura pelagica (Linnaeus). Chimney Swift. Small swifts, all of them more than likely of the genus *Chaetura*, were seen daily April 14 to 24. They could not be identified without shooting, however, and they were very difficult to shoot. Male and female specimens taken from foraging flocks neart Matlapa and at Tamazunchale April 18 to 23 prove, with one exception, to be common eastern Chimney Swifts[4]. None of them was in breeding condition.

[4] Identification of all specimens of *Chaetura* checked by Mr. James Lee Peters.

Chaetura vauxi (Townsend). Vaux's Swift. A female *Chaetura* collected from a rapidly circling flock near Matlapa, April 18, proves to be *vauxi*. The ovary was slightly enlarged.

Pampa pampa curvipennis (Lichtenstein). Curved-winged Sabre-wing. This interesting species, which we referred to familiarly as the "singing hummingbird," was encountered repeatedly from April 17 to 28 in woodlands not far from water. The "singing" males had favorite perches. Here they squeaked, chippered and sputtered, turning their heads nervously from side to side. They were very pugnacious and curious. If we crept through the underbrush toward them they frequently came to meet us, whirring down into our very faces, then backing up abruptly to settle upon one of their chosen "singing perches," where they chattered furiously.

A female taken April 24 at Palitla was molting about the head. The ovary of this specimen was considerably enlarged.

Amazilia yucatanensis cerviniventris (Gould). Fawn-bellied Hummingbird. Fairly common in shaded woodlands. The testes of a male taken along the Axtla River, March 26, were not enlarged. A female taken April 18, near Matlapa, was laying eggs. On April 20, at Palitla, a nest with two fresh eggs was found four feet from the ground at the side of a pleasant path through the forest. The brooding female did not fly off until the nest was touched (Sutton).

Chlorostilbon canivetii canivetii (Lesson). Canivet's Emerald. Noted daily from April 15 to the end of our stay, usually in opener, drier woodlands. Males frequently were to be seen perched on wires along the highway or on slender dead twigs that stuck up from the shrubbery. A male taken April 18 at Matlapa apparently is subadult, most of the belly feathers being grayish white rather than shining green at their tips.

Agyrtrina candida (Bourcier and Mulsant). White-bellied Emerald. Noted but once, a breeding male taken along a dry stream-bed in heavy woodland at about 2,500 feet on a mountainside above the Moctezuma River 7 miles south of Tamazunchale (Sutton).

Eugenes fulgens (Swainson). Rivoli's Hummingbird. Male noted April 24, near Palitla.

Anthracothorax prevostii prevostii (Lesson). Prevost's Mango. Two breeding males taken in open fields: April 16, near Tamazunchale; and April 22, along the Axtla River (Sutton).

Trogon ambiguus ambiguus Gould. Coppery-tailed Trogon. Noted with certainty but once: a female (ovary unenlarged) taken along the Axtla River, April 22 (Semple). This specimen is decidedly grayer on the head, chest, back, rump and upper tail coverts than average *T. a. ambiguus*. Noticeable grayish white barring on the tertials and inner secondaries, as well as the irregular, somewhat blotchy markings on the outer rectrices, probably indicate immaturity.

Trogon collaris puella Gould. Jalapa Trogon. Noted only in heavier woodland on mountainsides at from 1,500 to 2,500 feet elevation. Male taken April 27 seven miles south of Tamazunchale (Sutton). The call-note of this bird (and of the female, which was not collected) was a plaintive "kee-koo, kee-koo."

Trogon caligatus sallaei Bonaparte. Northern Gartered Trogon. The commonest Trogon of the region, and apparently the only species breeding at low elevations. We came upon it infrequently along shaded streams, finding it always in pairs. A nest found not far from the Axtla River, April 25, was at the end of a burrow among orchid roots, thirty feet from the ground in a great tree. Here our attention was first attracted by the peevish cries of the female bird, perched on a dead twig. She was seen to flutter time after time to the nest entrance, but she could not gain a foothold because the male was clinging there.

The birds were watched for some time. The male clung at the entrance for almost ten minutes. His tail was bent badly out of shape at the tip, presumably from being jammed in the nest. Finally he went in. The female now stationed

herself at the entrance, propping herself with her tail. She stayed there virtually motionless for ten minutes, then flew back to the dead twig to resume her crying. At length the male appeared, swooped briskly out, and the female, with an alacrity not often observed in trogons, fluttered to the nest and crept in (Sutton).

Megaceryle torquata (Linnaeus). Ringed Kingfisher. Noted but once, a single bird flying along the Moctezuma River near Tamazunchale, April 16.

Chloroceryle americana (Gmelin). Green Kingfisher. Noted but once: April 16, a single bird along the Moctezuma River several miles upstream from Tamazunchale.

Momotus coeruliceps (Gould). Blue-crowned Motmot. Fairly common in well shaded woodlands near the Moctezuma, males being collected April 14 and 27 (Semple and Sutton).

Ramphastos sulfuratus Lesson. Keel-billed Toucan. A large black toucan, with yellow throat, was seen April 13, not far from the Axtla River. It flew down from a hill-top to a huge, fruit-bearing tree to feed with mixed flocks of smaller birds (Sutton).

Aulacorhynchus prasinus prasinus (Gould). Emerald Toucanet. Noted repeatedly in heavier woodland along the Moctezuma River from six to ten miles upstream from Tamazunchale, male specimens being taken there April 14 and 26 (Semple and Sutton). In freshly killed birds the pupil was round, the iris dark brown, and the bill strikingly black, white, mahogany brown and light greenish yellow (see frontispiece).

The species was known locally as the "pájaro verde" or "green bird." We encountered it in small companies rather than in pairs, as a rule, finding it secretive and rather hard to see. The only call-notes we heard from it were low, hoarse croaks. One seen April 26 had a malformed (open) bill, the mandibles meeting only at the tip, the bold serrations along the culmen in consequence being unusually noticeable.

Chloronerpes aeruginosus (Malherbe). Lichtenstein's Woodpecker. Noted but twice: near Palitla, where one was seen April 24; and along the Moctezuma River, 7 miles upstream from Tamazunchale, were a breeding male was taken April 26 (Sutton).

Centurus santacruzi grateloupensis (Lesson). Santacruz Woodpecker. Fairly common among larger trees along the Moctezuma. A male taken by Burleigh at Tamazunchale, April 14, obviously represents the present subspecies for it is even paler throughout the underparts than spring specimens from Cordoba, Veracruz.

Scapaneus guatemalensis regius (Reichenbach). Veracruz Ivory-billed Woodpecker. Fairly common in heavier woodlands. Our only specimen, a breeding male, taken by Semple along the Moctezuma four miles upstream from Tamazunchale, is of the present race, the wing measuring 202 mm.

Veniliornis oleaginus oleaginus (Lichtenstein). Oleaginous Woodpecker. Noted only in deeper woodlands along the Axtla River, where a breeding male was taken March 26 (Sutton) and two birds were observed April 25. The wing of our specimen measures 101.5 mm., the tail 54.

Xiphorhynchus flavigaster flavigaster Swainson. Ivory-billed Woodhewer. Fairly common in brushy as well as heavier woodlands, breeding specimens being taken April 20–27.

Platypsaris aglaiae gravis van Rossem. Northern Rose-throated Becard. Seen daily, mated pairs being noted from April 17 to the end of our stay. Three nests found, each of them roughly spherical, made of twigs, and suspended from the tip of a swaying branch. The first of these, found by Semple on April 17, was fifty feet or more from the ground, at the very tip of a supple bough that whipped back and forth in the wind. Here the birds went on with their building work, heedless of the commotion. Our two specimens measure: male, wing, 93.5 mm., tail, 70; female, wing, 96.5, tail 73.

Tityra semifasciata personata Jardine and Selby. Mexican Tityra. Fairly common, especially along the Moctezuma River upstream from Tamazunchale, where sparring males or mated pairs were observed repeatedly. Pairs seen at or near deserted woodpecker holes, April 14 to 20, were thought to be nest-hunting. A female that was laying or brooding eggs was frightened from such a hole April 25.

The naked space about the eyes in freshly collected specimens was raspberry red, much brighter in males than in females.

Thamnophilus doliatus mexicanus Allen. Mexican Ant Shrike. Fairly common in brushy woodlands, especially about Jalpilla and Matlapa. At the latter place a female with fully formed egg in the oviduct was taken April 24 (Sutton).

Griscom, in his "Distribution of Bird-Life in Guatemala" (*Bull. Amer. Mus. Nat. Hist.*, **64**, 1932: 233), characterizes *Thamnophilus doliatus intermedius* Ridgway as "a variable bird," ranging from "southern Mexico to western Panama on Caribbean slope, and Pacific coast of Guatemala," apparently expecting us to believe that San Luis Potosí and "Pacific coast of Guatemala" birds are the same. With this concept we cannot concur, since our Tamazunchale (and Valles) specimens are very long-tailed by comparison with *intermedius* from Guatemala and Honduras. It appears from a careful examination of all pertinent material in the U. S. National Museum, the American Museum of Natural History, and the Museum of Comparative Zoology, that J. A. Allen, in bestowing the name *mexicanus* upon Cabanis' and Heine's "*Thamnophilus affinis*" (from Jalapa, Veracruz) was actually naming an intermediate race. Insofar as Jalapa, Veracruz birds themselves are concerned, therefore, *T. d. mexicanus* Allen might stand as a synonym of *T. d. intermedius*, but since Jalapa birds *tend* to be longer-tailed than those from Honduras it seems eminently sensible to use the name *mexicanus* for long-tailed, northward-ranging birds (such as those collected by us in San Luis Potosí) rather than to complicate matters further by finding an entirely new name for them.

The tail in ten Guatemala male *intermedius* selected at random from the M.C.Z. collection measures: 60, 58, 66, 61, 65, 66, 66, 62, 60, and 64 mm.; in ten Honduras male *intermedius:* 63, 64, 64, 65, 63, 63, 63, 65, 62, and 64; in San Luis Potosí male *mexicanus* at hand; 72, 72.5 and 72.

Tyrannus melancholicus couchii Baird. Couch's Kingbird. Common in opener country, especially along the Moctezuma River not far from Tamazunchale. The gonads of a male and a female specimen taken April 16 were somewhat enlarged.

Legatus leucophaius variegatus (Sclater). Greater Striped Flycatcher. Fairly common along the edges of woodlands. Breeding males taken March 26 and April 15. The wing in these measures 91 and 96 mm., clearly indicating this larger race.

Myiodynastes luteiventris luteiventris Sclater. Sulphur-bellied Flycatcher. Fairly common along the rivers, nesting pairs being encountered daily. Our two specimens (female, April 14; male, April 20) agree with birds from more southern parts of Mexico in being warmly toned on the back, but *swarthi* (described from Arizona) appears to be a not very strongly marked race.

Megarynchus pitangua (Linnaeus). Boat-billed Flycatcher. Fairly common. April 15 a pair were discovered at a woodland pool not far from Tamazunchale. Their nest, which was very bulky, was placed in an exposed position in the top of a leafless tree that stood in the water (Burleigh).

Myiozetetes similis texensis (Giraud). Giraud's Flycatcher. Fairly common, breeding pairs being encountered daily throughout our stay. April 14 birds with nesting material in their bills were seen. April 21, near Jalpilla, a nest was found among the leaves of an air plant on a horizontal branch twenty feet from the ground. The nest, being composed of dry grasses, was plainly discernible, the more so because the noisy and demonstrative owners remained so close to it (Sutton).

Pitangus sulphuratus (Linnaeus). Derby Flycatcher. Common, nesting pairs being seen daily.

Myiarchus cinerascens (Lawrence). Ash-throated Flycatcher. Three seen near Jalpilla, April 18.

Myiochanes richardsonii (Swainson). Western Wood Pewee. Noted twice, a single bird April 23 and a single bird April 24, along the Axtla River. The call-note was clearly that of the western rather than of the eastern species.

Empidonax minimus (Baird). Least Flycatcher. Identified with certainty but once, a single bird that gave its "che-bec" call-note several times, April 27, along the Axtla River, twenty miles north of Tamazunchale.

Empidonax sp. From April 14 to 18 the absence of small flycatchers of this genus was notable. On the latter date several were seen, and between then and April 23 a migratory wave passed through. No specimen collected.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher. Single bird seen April 23 on the outskirts of Tamazunchale.

Tachycineta thalassina (Swainson). Violet-green Swallow. Noted but once, a flock circling over the Moctezuma River near Tamazunchale, April 16.

Stelgidopteryx ruficollis (Vieillot). Rough-winged Swallow. Noted but once, a mixed flock of Cliff Swallows and Rough-wings, seen not far from Tamazunchale along the Moctezuma, April 18.

Petrochelidon pyrrhonota (Vieillot). Cliff Swallow. Noted but once, April 18, as indicated above.

Progne chalybea chalybea (Gmelin). Gray-breasted Martin. A colony of twenty-some pairs nested about the bridge spanning the Axtla River twenty miles north of Tamazunchale. Here a male and female were taken April 21.

Psilorhinus morio (Wagler). Brown Jay. Fairly common. A nest found April 22 was broad and flat, and situated about fifteen feet from the ground among the bare lower branches of a large tree. The parent bird, presumably the female, was brooding (Semple). April 25, a partly finished nest was found not far from the Axtla River, again on a leafless branch in a shaded part of the forest, about twenty feet from the ground (Sutton).

Xanthoura luxuosa luxuosa (Lesson). Green Jay. Common. Our only specimen (male, Axtla River, April 25) measures: wing, 118 mm., tail 138.

Parus atricristatus atricristatus Cassin. Black-crested Titmouse. Fairly common in opener woodlands. The wing of our only specimen (female, April 15, Burleigh) measures 67 mm.

Cistothorus platensis stellaris (Naumann). Short-billed Marsh Wren. Noted but once, a company of scolding and singing birds in a marshy spot near Matlapa, April 18. From these a male with slightly enlarged testes was taken. Though in the midst of an extensive prenuptial molt, this bird was singing with fervor (Sutton).[5]

Thryothorus maculipectus microstictus (Griscom). Northern Spotted-breasted Wren. Fairly common, male and female specimens being taken April 14 to 23. On April 23 a partly completed nest was discovered near Tamazunchale (Sutton).

Troglodytes domesticus Wilson. House Wren. Noted infrequently April 14 to 21. No specimen taken.

Henicorhina leucosticta prostheleuca (Sclater). Sclater's Wood Wren. Fairly common, being found as a rule in less brushy woodlands than those favored by *Thryothorus maculipectus*, though the two species were occasionally encountered side by side. Breeding males taken near Tamazunchale April 23 to 27.

Toxostoma longirostre (Lafresnaye). Long-billed Thrasher. Seen repeatedly in brushy woodlands. No specimen collected.

Dumetella carolinensis (Linnaeus). Catbird. Noted repeatedly April 15 to 22. Not so common thereafter, but recorded infrequently until April 28. Female taken at Jalpilla, April 19 (Semple).

Turdus grayi Bonaparte. Gray's Robin. Fairly common in big trees along the

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[5] See note in *Auk*, 57, July, 1940: 419.

outskirts of Tamazunchale, singing males being heard from April 15 to the end of our stay.

Hylocichla ustulata (Nuttall). Spruce-woods Thrush.[6] Thrushes of this species were seen and heard singing frequently April 18 to 28, but no specimen was taken.

Catharus aurantiirostris melpomene (Cabanis). Nightingale Thrush. Noted but once, a male taken in a densely thicketed ravine near the Axtla River, April 22 (Sutton). This specimen was molting about the face and throat. The testes were only slightly enlarged. The breeding ground of this form is said to be the "highlands" of southern Mexico, so the valley of the Axtla is probably part of its winter range.

Polioptila sp. Gnatcatchers were seen from time to time in brushy woodlands in the immediate vicinity of Tamazunchale, but no specimen was collected.

Bombycilla cedrorum Vieillot. Cedar Waxwing. Several large flocks seen along the Axtla River, April 19.

Vireo griseus micrus Nelson. Small White-eyed Vireo. White-eyed Vireos were noted repeatedly in brushy woodlands, especially in the vicinity of Jalpilla and Matlapa. A mated pair taken at the former place April 19 are referable to the present race (wings in both specimens 55 mm.) though the fact that they are definitely yellower below and greener (less gray) above than February *micrus* from Nuevo Leon suggests that they may be somewhat intermediate between *micrus* and *perquisitor* Nelson, the latter a little known form described from Palantla, Veracruz.

Vireo solitarius (Wilson). Blue-headed Vireo. Noted daily April 14 to 22. No specimen taken.

Vireo virescens flavoviridis (Cassin). Yellow-green Vireo. Noted daily in woodlands of all sorts. Everything about the bird (its song, manner, and habitat) suggested the common Red-eyed Vireo of the eastern United States. Male and female specimens taken April 14 to 22.

Cyclarhis gujanensis flaviventris Lafresnaye. Mexican Pepper Shrike. This sweet-voiced bird was fairly common in brushy woodlands. A female taken by Semple, seven miles south of Tamazunchale, April 28, was laying eggs. Eyes of all individuals closely observed were brick red.

Mniotilta varia (Linnaeus). Black and White Warbler. Seen daily April 14 to 24, a female being collected on April 16 (Burleigh).

Vermivora celata (Say). Orange-crowned Warbler. Several noted April 16, not far from Tamazunchale. Not satisfactorily identified otherwise.

Vermivora ruficapilla (Wilson). Nashville Warbler. Noted several times April 18 to 21.

Compsothlypis pitiayumi (Vieillot). Pitiayumi Warbler.[7] Several seen along the Axtla River, April 22. No specimen taken.

Dendroica virens virens (Gmelin). Black-throated Green Warbler. Noted repeatedly April 14 to 22. Male, molting slightly about head, taken April 14 (Burleigh).

Dendroica pensylvanica (Linnaeus). Chestnut-sided Warbler. Male seen in ravine seven miles south of Tamazunchale, April 26 (Sutton).

Seiurus noveboracensis (Gmelin). Northern Water-Thrush. Noted twice along the Axtla River, a single bird April 16, and a single bird April 18.

Seiurus aurocapillus (Linnaeus). Ovenbird. Two seen near Jalpilla, April 18.

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[6] Of the several common names suggested for this species, Spruce-woods Thrush seems to the senior author to be most apt and pleasing. "Buffy-faced Thrush" is descriptive but not euphonious. Many good names that might be given the bird would apply equally well to other species.—G.M.S.

[7] For *Compsothlypis p. pitiayumi* Hellmayr uses the common name 'Olive-backed Warbler' (Birds of the Americas, Pt. 8, 1935: 357). This, it seems to the senior author, is inadequate unless *C. americana* and *C. pitiayumi* are considered conspecific, for both groups are more or less 'olive-backed.' G.M.S.

Basileuterus culicivorus culicivorus (Lichtenstein). Lichtenstein's Warbler. Fairly common in heavier woodlands. One specimen taken, a male, April 27 (Semple).

Basileuterus rufifrons jouyi Ridgway. Jouy's Warbler. Noted infrequently in open and brushy woodlands. Breeding female and male taken respectively on April 25 and 28.

Geothlypis trichas (Linnaeus). Marsh Yellow-throat.[8] Noted infrequently April 14 to 22, a male being taken on the fourteenth (Burleigh). This specimen was molting extensively about the head, and we prefer not to attempt subspecific determination for the present.

Chamaethlypis poliocephala palpebralis Ridgway. Mirador Yellow-throat. Common locally in weed-grown fields, marshy spots, and along the grassy edges of open woodlands. Males and females taken April 15 to 21 were molting extensively about the head and chest. At Matlapa and Jalpilla, April 18 to 21, males were repeatedly noted singing flight songs and females seen building nests.

Icteria virens (Linnaeus). Yellow-breasted Chat. Several noted along the Axtla River and at Matlapa and Jalpilla, April 22 to 24.

Euthlypis lachrymosa lachrymosa (Bonaparte). Fan-tailed Warbler. Two breeding pairs encountered along wooded ravine seven miles south of Tamazunchale, April 26 to 28. A female taken there on the twenty-sixth was obviously preparing to nest (Sutton).

Wilsonia pusilla Wilson. Wilson's Warbler. A few noted daily April 14 to 19. No specimen taken.

Setophaga ruticilla (Linnaeus). American Redstart. Adult male seen near the Axtla River, April 21.

Icterus gularis (Wagler). Alta Mira Oriole. Abundant. Mated pairs noted repeatedly and several nests found. One of these (April 17) was suspended from a single telephone wire that hung high above a wooded ravine.

Icterus graduacauda graduacauda Lesson. Black-headed Oriole. Not common. A few noted March 27, on which date a male was taken. During April not certainly identified until the twenty-sixth, two mated pairs being seen at that time several miles south of Tamazunchale. Male taken April 28.

Icterus galbula (Linnaeus). Baltimore Oriole. Noted repeatedly April 15 to 19.

Icterus spurius (Linnaeus). Orchard Oriole. Noted several times April 15 to 19, a male being taken on the fifteenth (Burleigh). No indication of its breeding anywhere in the region.

Cassidix mexicanus prosopidicola Lowery. Mesquite Great-tailed Grackle. Common about farmlands and in open country. A breeding male, taken April 16, measures: wing, 198 mm.; tail, 202. A female (April 20) measures: wing, 144; tail, 146.

Dives dives dives (Lichtenstein). Sumichrast's Blackbird. Abundant and noticeable because of its incessant singing, especially in the heavy woodlands along the Axtla River. Breeding specimens taken March 26 and April 21 to 24.

Amblycercus holosericeus holosericeus (Lichtenstein). Prevost's Cacique. Noted first April 22, on a heavily thicketed hillside back from the Axtla River, and along a small stream near Palitla, two females being taken that day. Noted infrequently thereafter until April 28.

Tangavius aeneus aeneus (Wagler). Red-eyed Cowbird. Noted infrequently April 17 to 29. Female specimens, with enlarged ovary, taken April 21 and 23.

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[8] Satisfactory common names for such species as *Geothlypis trichas* are hard to decide upon. 'Yellow-throat' is not adequate because members of the genus *Chamaethlypis* also are 'Yellow-throats.' 'Witchety' would not be bad, if only someone had used it a century or so ago! Since *Geothlypis* is nearly always found about marshes, whereas *Chamaethlypis* often is found in dry fields, the common name Marsh Yellow-throat is offered here. G.M.S.

Piranga ludoviciana (Wilson). Western Tanager. Noted once, a male, along the Axtla River, April 22.

Piranga rubra (Linnaeus). Summer Tanager. Identified with certainty only on April 14, on which date three adult males were seen at Tamazunchale.

Tanagra lauta lauta Bangs and Penard. Bonaparte's Euphonia. Seen repeatedly in small companies or in pairs, April 14 to 20. Two males collected.

Tanagra affinis Lesson. Lesson's Euphonia. Identified with certainty only on April 14, when a male was collected (Sutton).

Thraupis abbas (Lichtenstein). Abbot Tanager. Fairly common, mated pairs being seen daily throughout our stay. A thin-walled nest, found April 25, was situated on a horizontal branch among some small air plants, about 25 feet from the ground, at the edge of an opening in the forest (Sutton).

Habia gutturalis littoralis (Nelson). Tabasco Ant Tanager. Fairly common in thicker woodlands along the Axtla River and near Palitla. Female specimens taken April 19 to 22 are referable to *littoralis* rather than *salvini*, for their throats are buffy ochraceous with an admixture of red rather than "ocher yellow or dull cadmium yellow" (see Ridgway, Birds of North and Middle America, Part 2, 1902: 148). Males taken during the same period compare favorably with either *littoralis* or *salvini*. Thus far we have not been able to discover any constant difference between adult males of these two races.

Rhodothraupis celaeno (Lichtenstein). Crimson-collared Grosbeak. A few were seen April 21 and 22, near the Axtla River, a male being taken on the latter day.

Richmondena cardinalis (Linnaeus). Cardinal. Noted only in brushy woodlands one to two miles north of Tamazunchale, two or three pairs being seen there each time we visited the place. No specimen taken.

Hedymeles ludovicianus (Linnaeus). Rose-breasted Grosbeak. Noted repeatedly April 14 to 29, never more than two or three a day, but in several sorts of woodland. Evidently a common transient or winter visitant.

Guiraca caerulea (Linnaeus). Blue Grosbeak. Noted several times April 21 to 28, in the vicinity of Jalpilla, Matlapa, and Palitla. No specimen taken.

Cyanocompsa parellina parellina (Bonaparte). Blue Bunting. The Blue Bunting presumably nests at Tamazunchale, but we did not procure a specimen that we knew to be breeding. A male and female taken in brushy woodland two miles north of town are too large-billed for *C. p. beneplacita* and, since the male is too dull a blue and the female too rufescent a brown (both above and below) for *C. p. lucida*, we are forced to conclude that they are straight *parellina*. Presumably this is the race that nests in the vicinity.

Cyanocompsa parellina lucida Sutton and Burleigh. Bright Blue Bunting. This recently described race must pass through the Tamazunchale section in migration. A subadult male (April 20) that is noticeably smaller-billed and brighter blue below than the male *parellina* referred to above, and a female (April 22) that is less rufescent brown both above and below than female *parellina* from Veracruz, both represent the present race.

Passerina cyanea (Linnaeus). Indigo Bunting. Noted daily April 14 to 21, especially in the vicinity of Jalpilla.

Passerina ciris (Linnaeus). Painted Bunting. Noted repeatedly April 16 to 24, at Jalpilla, Matlapa, and along the Axtla River.

Tiaris olivacea pusilla Swainson. Mexican Grassquit. Seen throughout our stay, notably April 15 and 16, when large flocks were encountered near Tamazunchale. Male with enlarged testes taken April 16 (Burleigh).

Saltator atriceps atriceps (Lesson). Black-headed Saltator. Common locally and very noticeable because of its noisiness. Especially abundant along the Axtla River, where it was always the first species to respond to our squeaking, from four to a dozen birds following us about wherever we went, scolding incessantly. Male and female specimens taken March 26 and April 19 to 28 exhibit

well the remarkable variation in extent and intensity of chest-band that is characteristic of this form.

Saltator coerulescens grandis (Lichtenstein). Lichtenstein's Saltator. Noted infrequently along the highway between Matlapa and the Axtla River. Male, with testes greatly enlarged, taken not far from the Axtla, April 19 (Sutton).

Sporophila torqueola morelleti (Bonaparte). Morellet's Seedeater. Fairly common in open country. A singing male, taken near Tamazunchale April 16, was molting about the face and throat (Sutton).

Volatinia jacarini splendens (Vieillot). Northern Blue-black Grassquit. Common in open pasturelands not far from Tamazunchale. Flocks of busily feeding birds seen repeatedly from April 23 to the end of our stay. The males indulged in astonishing antics which we assumed to be part of their courtship—quick, complete flip-flops made from dead twigs or from fence wires in the most adroit manner. Males, with testes greatly enlarged, taken April 23 (Sutton).

Arremonops rufivirgatus (Lawrence). Texas Sparrow. Common. Our two specimens (male, April 16; female, April 21) are too large-billed, and too dark both above and below for *A. r. rufivirgatus*. Since they are not big-billed enough nor dark enough on the chest and flanks for *A. r. crassirostris* (Ridgway), they must be called intermediates. The male measures: wing, 65 mm., tail 64; the female: wing, 61, tail, 59.

Atlapetes brunnei-nucha brunnei-nucha (Lafresnaye). Chestnut-capped Atlapetes. Fairly common from four to nine miles up the Moctezuma River from Tamazunchale, on the lower slopes of the mountains. Breeding specimens taken there April 14 to 27.

CORNELL UNIVERSITY, ITHACA, NEW YORK.

ORNITHOLOGICAL NEWS

The Minnesota Ornithologists' Union issued a special number of its official publication, *The Flicker,* in commemoration of the 1940 Wilson Ornithological Club meeting in Minneapolis. An illustration and description of the attractive Calder statue of Alexander Wilson in Philadelphia, an annotated list of the birds named by and for Wilson, and a paper on the different editions of Wilson's American Ornithology make the issue of special interest to collectors of Wilsoniana. In addition there is an historical sketch of the Minnesota Ornithologists' Union and a summary of 1940 Minnesota nesting records. We understand that the editor, Arnold Erickson of the University of Minnesota, University Farm, St. Paul, has a few extra copies of this issue which may be obtained at twenty-five cents each.

By a recent Act of Congress the Barro Colorado Island Biological Laboratory has been put on a permanent basis with government financial support. The island has been set aside as a wildlife reserve under the name of the "Canal Zone Biological Area" and will be administered by a Board made up of three Cabinet officers, the Secretary of the Smithsonian Institution, the president of the National Academy of Science, and three "distinguished biologists." The three biologists on the present board include two ornithologists, Thomas Barbour and Alexander Wetmore.

On December 20 the American Geographical Society presented the Cullum Geographical Medal for 1940 to Robert Cushman Murphy.

Guy Emerson has been elected President of the National Audubon Society (formerly known as the National Association of Audubon Societies).

Frederick H. Test is now Instructor in the University of Michigan Department of Zoology.

DISTRIBUTION AND CHARACTERS OF THE UTAH RED-WING

BY WILLIAM H. BEHLE

IN 1938 Louis B. Bishop described a new race of Red-wing from Utah. The type and cotype, a male and female, were taken on April 21, 1921 near Saltair, 4200 ft., Salt Lake County, Utah. Saltair is a resort and bathing pavilion on the shore of Great Salt Lake and lies some 18 miles due west of the business district of Salt Lake City. The new race was named *Agelaius phoeniceus utahensis*. No statement of range was given by the describer, although specimens that indicate the general extent of the race are listed in an accompanying table of measurements. Breeding specimens represented in his materials from Utah were taken at Saltair, the Bear River Marshes (Boxelder County) and in Garfield and Beaver counties (localities not given). Records from outside the state (non-breeding birds) were from Portal and Prescott, Arizona, and Newcastle, Colorado. Comparative measurements were given for the *utahensis* representatives, as well as for a few specimens of the surrounding races, *nevadensis, fortis* and *sonoriensis*.

There have accumulated in recent years in the Museum of Zoology at the University of Utah some 170 study skins of the Red-wing from various parts of the state. Of these, 93 are adult breeding specimens. Through the courtesy of Dr. Alden H. Miller of the California Museum of Vertebrate Zoology I have had available for comparison 38 breeding examples from southern Idaho, as well as a small series of 12 topotypes of the race *nevadensis*. Based on a study of these materials, the ensuing comments are intended as supplementary data in presenting the picture of the distribution and variation of the Utah race of Redwing.

The geographically variable features in connection with this new race concern several characters, namely, the increased red pigmentation of certain body areas, the width of the darker centers of the breast feathers of females, the size and length of bill, and the length of wing and tail. In general, this new race shows intermediate features between surrounding races, but one character (an increase in red pigmentation) seems to be more or less distinctive of this race alone.

Bishop (1938) mentioned that his females from Saltair were conspicuous in having a wash of color on the throat area that tended toward pale flesh color or salmon pink. I find this character to be of high incidence, being found in practically all of the specimens examined, and those few that lack it may be first year birds. Apparently correlated with the throat-wash character is an increased reddish coloration on the bend of the wing of females. Females from the sloughs and marshes

east of the Great Salt Lake seem to possess the greatest amount of red pigmentation both on the throat and bend of wing areas, but the great majority of the female specimens from the Snake River region of southern Idaho also possess these characters, as do birds throughout northern Utah. Females from southeastern Utah and beyond into Arizona are likewise characterized by this increased red. However, certain specimens in the southwestern part of Utah seem to lack the intense red. In practically all of the male examples of *utahensis* seen, the epaulets of the shoulder region are more richly colored than in specimens of other races. The red is more of a scarlet tone and so is different from the orange red of other races.

There are interesting points of contrast between areas of intergradation with respect to this intense red pigmentation character of both males and females. In northeastern Utah and southeastern Idaho where on the basis of size characters the population appears to be somewhat intermediate between *utahensis* and *fortis,* the increased red pigmentation is present. In southwestern Idaho and northwestern Utah where the tendencies are toward *nevadensis,* as indicated by bill characters, the color remains that of *utahensis.* In contrast to these cases, in extreme southwestern Utah breeding males in a few instances show epaulets that are more of an orange red as in the race *nevadensis,* while most of the females lack the reddish wash on the throat and breast and are less highly colored on the bend of wing. Size characters, especially of bill, in specimens from this area are those of *utahensis.* This time the color characteristics indicate the beginning of an intergradational trend.

There are, of course, no distinctive racial characteristics in males with respect to the black plumage areas. In females, though, there are features that show an intermediate condition as between neighboring races. Compared with *fortis, utahensis* specimens have the central brown portion of the breast feathers not as heavy or wide. The result is that the intervening light areas are more extensive, thus giving a general lighter appearance. In comparing *utahensis* and *sonoriensis,* the central dark areas in *utahensis* are wider than those in the more southern race. This is in keeping with a general trend of paleness toward the south.

In bill characters *utahensis* shows an intermediate condition between *fortis* and *nevadensis,* being smaller and shorter than *fortis* but with something of the heaviness of bill of that race. The *utahensis* representatives do not have the long, attenuated appearance to the bill characteristic of specimens of *nevadensis.* They appear to be shorter, slightly deeper at the base, and more abruptly pointed. Curiously, though, the measurements accompanying this paper do not show any appreciable differences between the races in these respects. The distinction, however, is apparent when typical spcimens of each race are compared. The birds with most typical bills representing *utahensis* are

those from Salt Lake City and vicinity and from Moab and vicinity. It seems that the bills of the birds from the Snake River region of southern Idaho are the most variable of any series studied. This represents the periphery of the range of *utahensis* where the influence of *nevadensis* is felt. Thus it would seem that there is greater variability where two genetic strains intermingle than elsewhere.

In wing length I have found practically no difference between *nevadensis* and *utahensis,* nor does there seem to be any geographic variation within the race *utahensis* with respect to this character. The race *fortis* has a conspicuously longer wing than *utahensis* and where *utahensis* intergrades with *fortis* increased length of wing is apparent. Specimens north and northeast of the Bear Lake area indicate this. Length of tail varies with wing length.

To summarize all of this variation, it seems that the race *utahensis* has a center (which may or may not be the center of differentiation) where breeding birds are the most typical and show the most diagnostic characters. The type locality is, fortunately, in this center, which is the area in central northern Utah, east of Great Salt Lake. Birds from this section have heavy, deep, but relatively short bills and intense red pigmentation. Radiating out from this center there is to the southwest a trend toward paleness of the underparts of females and a tendency for the intense red pigmentation to fade out. This starts in extreme southwestern Utah. The bill characteristics in this area remain typical of *utahensis,* however. These changes indicate intergradation, probably with *nevadensis.* To the north and northeast of the center mentioned above, extending into southeastern Idaho and western Montana, the trend is toward larger size. Birds from the vicinity of Bear Lake indicate the beginning of this trend toward *fortis,* yet they retain the coloration of *utahensis.* Extending north and northwest from the center previously mentioned, the trend is toward *nevadensis,* for in the Snake River region of southern Idaho the birds have bill characters that are more those of *nevadensis,* but again the coloration is that of *utahensis.*

From his studies on Red-wings, van Rossem (1926) conceived of different ancestral stocks. One of these, that has presumably invaded the western United States from the southeast, forms a chain of races from *megapotamus* of the Rio Grande valley through *sonoriensis* and *nevadensis* to *caurinus* of the northwest humid coast belt. The features in common among these races are the slender type of bill, streaked females, and the middle wing coverts of adult males of a clear buff on their exposed portions. A second strain, characterized by heavy bill, streaked females, and males also of the buff-winged type, has presumably pushed northward from southern Mexico with one branch extending into California and represented by *neutralis,* the other an extension north to become *fortis.* The race in the eastern part of the Great Basin, namely, *utahensis,* seems not to belong to the slender-

billed strain but rather has closer affinities with the thick-billed strain. This indicates, perhaps, a pushing in from the northeast and a derivation from the thick-billed *fortis* stock.

While it seems that *utahensis* blends with *fortis* in southeastern Idaho and probably Wyoming, it probably intergrades with *nevadensis*

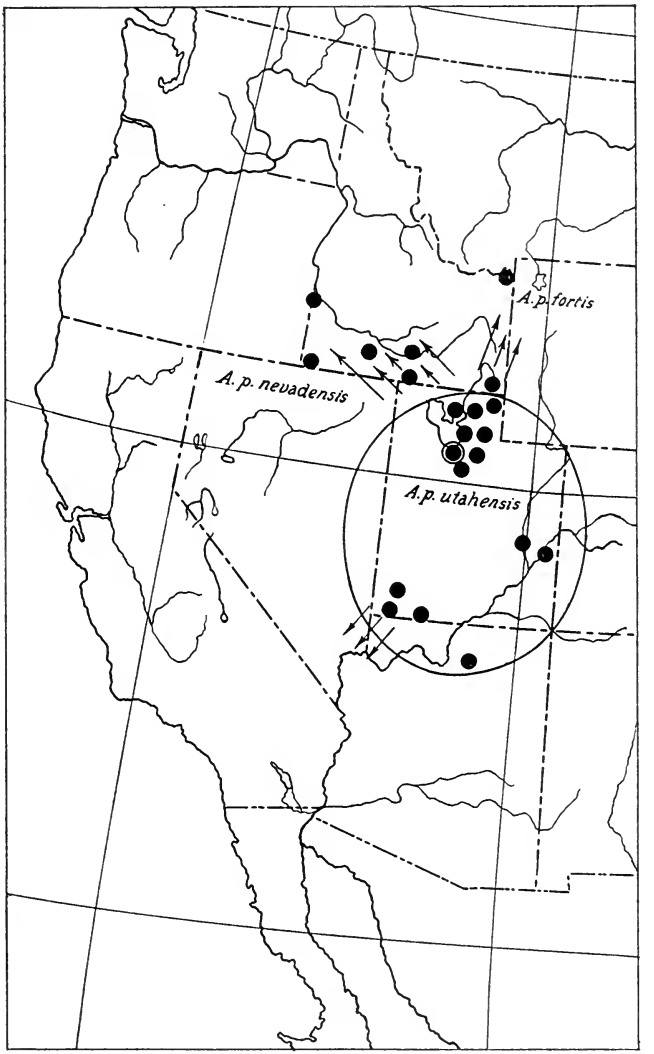

Figure 1. The breeding range of *Agelaius phoeniceus utahensis*. Solid dots indicate localities from which breeding specimens have been collected. Encircled dot designates type locality. Intergradational trends are indicated by arrows.

to the south. The A.O.U. Check-list indicates that *nevadensis* extends across Arizona, except for the extreme southern portion, into New Mexico and western Texas. If this is the case, there is all the more reason to regard *utahensis* as a southward or southwestward extension from *fortis* after that strain had pushed north farther east. There is the alternative explanation that in the gradual shifting of these stocks spacially throughout time, that the *nevadensis* stock pushed into Arizona, New Mexico and Texas, and replaced a thick-billed form from that area. However, this hypothesis seems less tenable than the other.

Bishop (1938) calls attention to the fact that Red-wings wander widely, winter in great flocks, and that individuals of one race may become "lost" and travel with flocks of another race to their breeding grounds. To illustrate this he cites a few examples, one of which concerns a male specimen of *nevadensis* collected in a breeding colony of *utahensis* on the Bear River Marshes, June 23, 1930. In such cases one is always confronted with the question of whether such lone individuals are truly strays of a neighboring race or whether they represent extreme variants of the local race. In such a genus as *Agelaius* which shows much individual variation as well as great geographic variation, I am inclined toward the latter view.

There is the possibility that the type specimen of *sonoriensis* was a winter-taken migrant from the range of *utahensis*. Van Rossem (1926:227) stated that the type was a young female in first winter plumage taken February 10, 1867. No type specimen was indicated by Ridgway in his original description of *sonoriensis*, but the type was later designated as from Camp Grant, Arizona, which is located some 60 miles east of Tucson, Arizona. This locality is east of the breeding range of *sonoriensis* and in a region frequented in winter by both *fortis* and *nevadensis*, and as Bishop has indicated, also by *utahensis*. Quoting from van Rossem: "In color, the type is not quite like the average from the metropolis of the race and its bill is shorter than any other female *sonoriensis* so far examined. It recalls certain young females of *fortis* in some particulars and its identity may yet be shown to lie in that direction." In the absence of further material, van Rossem applied the name *sonoriensis* to the race inhabiting the Lower Colorado River Valley and the coastal districts of Sonora and Sinaloa. Bishop, when about to name the Utah race, was troubled with the problem of whether the type of *sonoriensis* might possibly have been a winter-taken migrant from the range of *utahensis*. He corresponded with and sent specimens to Dr. Oberholser and Dr. Wetmore, who were in a position to examine the type. It is now the feeling of all concerned, that the type of *sonoriensis* should be regarded as correct; that it is essentially like birds breeding in the lower Colorado River Valley and south to Mazatlan; that in any event nothing would be gained by attempting to discredit the type. To do so would lead to nomenclatural confusion.

TABLE 1

MEASUREMENTS IN MILLIMETERS OF ADULT BREEDING RED-WINGS

		Wing	Tail	Exposed culmen	Depth bill at base	Tarsus
5♂♂	Quinn River Crossings, Humboldt Co., Nevada (topotypes *nevadensis*)	124.8(124.0-128.6)	91.5(90.0- 95.4)	22.8(21.3-24.2)	11.2(10.7-12.3)	30.4(29.0-31.5)
6♂♂	Riddle, Owyhee Co., Idaho (intergrades)	124.1(121.0-128.5)	91.9(89.4- 96.4)	23.5(20.0-25.2)	11.5(11.0-12.1)	28.7(26.4-30.4)
4♂♂	Payette, Payette Co., and Homedale, Owyhee Co., Ida. (intergrades)	128.2(126.0-134.0)	96.9(94.0-100.0)	22.3(21.8-23.0)	11.4(11.0-12.3)	30.2(28.9-32.6)
9♂♂	Rupert and vicinity, Minidoka Co., Idaho (intergrades)	125.0(120.7-128.6)	93.8(89.0- 98.6)	21.9(21.3-24.3)	10.2(9.8-10.4)	29.3(26.6-30.0)
2♂♂	Bear Lake and vicinity, Bear Lake Co., Idaho (intergrades)	124.6(123.5-125.8)	91.4(90.5- 92.4)	20.5(20.0-21.0)	11.6(11.5-11.7)	29.7(29.4-30.1)
12♂♂	Bountiful and vicinity, Davis Co., Utah (*utahensis*)	126.2(123.6-129.0)	93.0(87.5- 95.4)	21.3(20.3-22.3)	11.3(10.5-12.3)	29.5(28.5-30.4)
13♂♂	Salt Lake City and vicinity, Utah (*utahensis*)	124.3(118.0-128.7)	93.7(88.7-106.0)	21.1(19.7-25.4)	11.3(10.7-11.8)	29.5(26.8-31.7)
7♂♂	Pine Valley and vicinity, Washington Co., Utah (*utahensis*)	123.7(122.2-126.4)	91.9(90.0- 93.6)	21.7(20.3-22.7)	10.8(10.0-11.7)	29.2(27.9-29.9)
7♂♂	St. George and vicinity, Washington Co., Utah (*utahensis*)	125.6(123.0-129.7)	93.3(89.3- 97.8)	21.4(20.0-23.0)	10.6(10.0-11.1)	28.8(27.1-29.4)
2♂♂	Green River, Emery Co., Utah (*utahensis*)	126.1(125.7-126.6)	90.2(88.9- 91.5)	22.4(22.2-22.7)	10.8(10.7-11.0)	30.2(28.9-31.6)
22♂♂	Moab and vicinity, San Juan Co., Utah (*utahensis*)	126.6(121.0-132.0)	93.4(86.7- 97.8)	20.4(18.0-24.0)	10.9(10.6-11.6)	30.0(27.6-32.5)
6♀♀	Quinn River Crossing, Humboldt Co., Nevada (topotypes *nevadensis*)	101.2(97.6-104.6)	73.5(70.2- 76.4)	18.3(18.0-19.1)	9.1(8.6- 9.6)	26.2(25.1-27.0)
4♀♀	Riddle, Owyhee Co., Idaho (intergrades)	99.9(98.8-101.4)	70.6(68.7- 73.8)	18.5(18.0-19.6)	9.4(8.5-10.1)	25.5(24.7-26.0)
4♀♀	Payette, Payette Co., and Homedale, Owyhee Co., Ida. (intergrades)	104.5(99.4-108.2)	76.1(71.0- 78.4)	18.9(18.4-19.8)	9.1(9.0- 9.5)	26.4(25.8-26.8)
7♀♀	Rupert and vicinity, Minidoka Co., Idaho (intergrades)	105.4(104.0-108.4)	76.6(73.2- 79.0)	18.5(17.2-19.5)	9.2(9.0- 9.7)	26.1(24.0-27.4)
3♀♀	Bountiful and vicinity, Davis Co., Utah (*utahensis*)	106.8(104.4-109.7)	80.3(79.6- 81.7)	17.1(17.0-17.3)	9.3(9.5- 9.1)	27.1(25.9-28.4)
3♀♀	Salt Lake City and vicinity, Utah (*utahensis*)	106.9(104.8-109.0)	78.6(76.5- 81.5)	17.4(17.0-17.6)	9.0(8.7- 9.2)	26.1(25.7-26.8)
3♀♀	Pine Valley, Washington Co., Utah (*utahensis*)	98.9(97.5-101.7)	72.8(69.1- 74.9)	17.7(17.5-17.9)	8.8(8.4- 9.3)	26.7(26.0-27.5)
7♀♀	St. George and vicinity, Washington Co., Utah (*utahensis*)	101.2(99.5-104.2)	74.7(71.3- 79.4)	17.9(17.1-18.7)	9.1(8.8- 9.3)	23.9(25.0-28.2)
7♀♀	Green River, Emery Co., Utah (*utahensis*)	102.8(100.9-104.0)	75.1(70.6- 77.6)	18.0(16.7-19.2)	9.8(8.8-11.0)	26.0(24.4-26.6)
6♀♀	Moab and vicinity, San Juan Co., Utah (*utahensis*)	104.6(102.0-106.0)	76.0(72.5- 78.8)	17.1(16.0-18.2)	9.2(8.5- 9.8)	26.1(25.6-26.7)

SPECIMENS OF *Agelaius phoeniceus utahensis* EXAMINED: Breeding specimens are indicated by an asterisk. Specimens listed from Idaho are in the California Museum of Vertebrate Zoology, with one exception as indicated. These are intergrades. All those listed from Utah are in the Museum of Zoology, University of Utah. The number of specimens from each locality is also indicated. Total number, 206.

IDAHO: *Payette County*: 2 mi. S Payette*, 1. *Owyhee County*: Homedale*, 10; 1 mi. S Riddle, 5300 ft.*, 7. *Gooding County*: 2 mi. E Hagerman*, 3. *Minidoka County*: 2 mi. E Acequia*, 8; 4 mi. E Rupert, 4. *Cassia County*: Elba*, 4. *Bear Lake County*: Paris*, 3 (Mus. Zool. Univ. Utah).

UTAH: *Rich County*: Laketown*, 1; Woodruff, 4. *Morgan County*: Morgan*, 1. *Cache County*: Logan, 3. *Boxelder County*: Bear River Migratory Bird Refuge, 2. *Davis County*: Kaysville*, 2; Bountiful*, 13; Rudy Duck Club*, 4; Antelope Island, Great Salt Lake*, 2. *Salt Lake County*: Salt Lake City*, 26; Magna, 2; Riverton*, 6. *Utah County*: Jordan River near Camp Williams, 2; 7 mi .W. Spanish Fork*, 2. *Washington County*: Pinto, 6500 ft.*, 2; Pine Valley, 6700 ft.*, 8; St. George, 2800 ft.*, 20; Hurricane*, 9; Zion National Park*, 2. *Carbon County*: Wellington, 10. *Emery County*: Green River*, 10. *Grand County*: Moab, 4000 ft.*, 32; Castle Valley, 15 mi. E Moab*, 3.

ARIZONA: *Coconino County*: Tuba City, 5200 ft.*, 1. (Mus. Zool. Univ. Utah).

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NESTING PIGEON HAWKS

BY JOHN AND FRANK CRAIGHEAD

EVER since we first saw Pigeon Hawks[1] passing over Cape May, New Jersey, on their southward migration, we had hoped some day to study and to photograph their nesting habits. When we learned from Captain R. L. Meredith that the species nests in the "Border Lakes" region of Minnesota and Ontario, the possibility of realizing our ambition seemed within reach. In the summer of 1935, with the Pigeon Hawk nesting grounds as our objective, we traveled north 40 miles from Grand Marais, Minnesota, to Gunflint Lake.

The Pigeon Hawk country is a land of heavy timber interspersed with numerous lakes and bare, burned-over, open areas of glacier-scarred, metamorphic rocks. Spruce, birch, and tamarack grew in the low, swampy areas bordering the lakes. Jack pine, aspen, and birch occupied the higher ground and ridges, while the numerous islands were clothed with heavy, mixed stands of white pine, spruce, balsam, and a few old scattered jack pines. Bare rocks, large burned-over tracts, and numerous lakes formed the open areas; it was the type of country in which one would expect to find Sharp-shinned Hawks and Goshawks rather than falcons. Goshawks, Ruffed Grouse, and Spruce Grouse were abundant in the heavy forest, while the Common Loon, the Goldeneye, and the American Merganser nested on the small islands in the lakes.

Locating Nests

Although the country was new and strange to us, we had no difficulty in locating the first Pigeon Hawk nest. Far out across Gunflint Lake, we heard one of the birds calling. Thus guided, we paddled to the end of a long peninsula and there 35 feet above the ground in the top of a spruce tree was a nest containing four young falcons about six days old (July 5).

We located seven nests between July 5 and July 9. Five were disclosed by the calls and excited behavior of the birds when we were in the general vicinity of their nest. The birds called from conspicuous perches and were often heard and seen from a quarter to a half mile across the water. Two nests were discovered by climbing the trees to inspect stick structures. At these sites neither parent birds were seen for several hours, but when they did return, they screamed and dove at us just as the hawks had done at the other nests. Presumably they had been hunting at too great a distance to detect our presence when we first arrived. All the nests were from 35 to 60 feet above the ground and with one exception were located

[1] *Falco columbarius.*

in the very tops of the trees. The rather bulky nests were constructed of large twigs, lined in most cases with very small twigs and coniferous needles. One nest was lined with cedar bark and contained deer hair. Nests were at least 2 miles apart, distributed over a large area, and all were located near water.

Figure 1. Typical Pigeon Hawk country. Nest No. 5 was located on the small island at the right.

Photographic Technique

At only two nests was it at all possible to take photographs. Even these were so situated that we could not build a tree blind but were forced to release our still and movie cameras by remote control from a blind on the ground. Glasses were used to keep watch on the nest. The cameras were fastened to the swaying tree tops by angle irons and ball and socket joints. The slender tree tops bent under our weight and in order to have the cameras sighted properly after we had descended and the tip of the tree had straightened up, it was necessary to sight and focus below the nest. In spite of this precaution, the swaying of the trees caused several pictures to show only half a hawk and half a nest. The blind was constructed of shelter-tent halves and dyed mosquito netting. The netting and a fly spray were a most important part of the equipment to protect us at least partially from the hordes of mosquitoes that beset us day and night. It was necessary to climb the tree after every feeding, wind the movie camera and reload the still cameras. Fortunately

this did not seem to disturb the hunting and feeding routine of the hawks too much, or to cause undue alarm or suspicion. It was not the hawks that caused our greatest photographic difficulty, but the very poor and often-changing light conditions. It was necessary to make many exposures in order to obtain a few good pictures.

Figure 2. Female Pigeon Hawk at the nest.

Behavior at the Nest

While the blind was being built and the cameras were being placed in a nearby tree, both birds attacked us, striking repeatedly and scolding fiercely. The protesting call of the Pigeon Hawk is very much like the *killi, killi* cry of the Sparrow Hawk (*Falco sparverius*) but much shriller and repeated so rapidly that it ends with a piercing *ki-ki-ki-ki-kieeee* or a gutteral *kac, kac, kac* when the hawk is exceptionally frightened or excited. Once heard it can hardly be mistaken. The female was especially aggressive, but the male soon retired and by the time we were ready to crawl into the blind he had left on a hunting excursion. Even after the photographic preparations had been completed the falcon continued to dive at the cameras, then returned to the nest to inspect the young. A little before sunset the male returned from across the lake with food. When he approached the island, the female left the nest, took the bird from him in the air and returned to feed the young ones. The next morning the male went hunting again while the female

kept guard from the top of a spruce tree. The male soon came in with a small bird. Before we could see him we heard his call from far out over the lake. The call was very similar to the long drawn out food cry of the Duck Hawk (*Falco peregrinus*) but higher pitched. He circled several times then transferred the bird to his beak. The

Figure 3. Young Pigeon Hawks being fed. The parent birds always plucked the prey before bringing it to the nest.

female did not fly out to take the food from the male as before, but remained perched on a limb. As the male flew past very close to her, she took the bird from him with her talons. After transferring the prey to his mate, the male left and before long returned with another bird. Instead of passing the food to the female as before, he went straight to the nest and fed the young. The click of our camera did not disturb him.

When the feeding was completed both birds went hunting. The female returned at intervals to inspect the young. The male paid a call late in the afternoon while the female was away. Finding everything in order he cruised off again and later returned with food which he fed to the young.

There were three feedings between 9:00 A.M. and 5:00 P.M.; the male brought all the food and fed the young twice. The female kept guard most of the day. If undisturbed both birds would probably have hunted.

On July 9 a blind was built at the other nest where photographing was possible. The cameras were set up, and two hours elapsed before

either bird appeared. Both were hunting, evidently at a great distance from the nest. The female returned without food, but later the male flew in with a bird and passed it to the female in the air. The next day when we climbed to the nest and set up our cameras both birds attacked us. The little male struck us repeatedly and drew blood on our heads and hands. He was exceptionally bold and did not hesitate to strike while flying at full speed. A strong wind and a cold rain made photographing difficult and hunting poor. The young hawks were fed only once.

TABLE 1

PIGEON HAWK NESTS

Nest No.	Date discovered	Nesting Site: Location	Tree	Height of Nest	Distance from water	Number of young: Male [1]	Female	Approximate age
1	July 5	Peninsula in Gunflint Lake, Minnesota	Spruce	35 ft.	100 ft.	2	2	6 or 7 days
2	July 5	Small island in Big Saganaga Lake, Minnesota	White pine	40 ft.	50 ft.	1 unhatched egg	2	6 or 7 days
3	July 6	Small island in Big Saganaga Lake, Minnesota	White pine	60 ft.	150 ft.	1	3	2 days
4	July 6	Northern Shore of Big Saganaga Lake, Ontario	White pine	40 ft.	300 ft.	0	1	4 or 5 days
5	July 7	Small island in Northern Light Lake, Ontario	White pine	50 ft.	200 ft.	2	3	14 days
6	July 7	Same as above	Jack pine	50 ft.	20 ft.	2	1	4 or 5 days
7	July 7	Southern edge of Saganagons Lake, Ontario				1	1	5 or 6 days

[1] By the time the young are 5 or 6 days old the sexes can generally be distinguished by weight and size of feet. The females have noticeably larger feet. The sex ratio indicated in the chart was determined by this method and later checked with the sex ratio of the young when full grown.

FEEDING OF THE YOUNG

The next day the wind blew the storm clouds away and swayed the slender tree that held our cameras. About noon the female returned with a Purple Martin (*Progne subis*). Having had only one meal the day before, the young hawks were extremely hungry, and

rushed for the food pulling and tugging at the prey. The old bird braced her feet on the edge of the nest, and a tug of war ensued. All four young pulled against the mother and got possession of the Martin, for in spite of their small size they were more than a match for her. Dodging back and forth across the nest, she attempted to regain the bird with which the young ones were eagerly but unsuccessfully struggling. Finally they quieted down, the falcon took possession of the prey, tore it into bits, and fed her hungry family. When the meal was almost completed one little hawk, not satisfied with her share seized the remains of the Martin and scurried to the far edge of the nest. She attempted to swallow the large morsel and almost succeeded when a sister pulled the food out of her mouth, turned her back on the first bird, spread her tiny wings, and took her turn trying to devour it. The mother falcon then left. Alone the young hawks struggled for the possession of the remains of their meal. Each one after snatching the food from his neighbor attempted to gulp it down. The remains of the Martin went the rounds; none could swallow it and all were too young to tear it up.

Between feedings the little falcons slept and occasionally preened their coats of down. Mosquitoes made life miserable for us in the blind and also attacked the young falcons. The mosquitoes bit their unprotected ears and even penetrated the down on their well covered backs and breasts.

In the afternoon the male returned twice with food; the young were fed once, and the female ate the second bird herself.

The parent falcons plucked all of the birds they brought to the nest as food for their young. Since we usually photographed or watched the process from a distance without interrupting it, only one food item (a Purple Martin) could be positively identified. We often saw the hawks chasing Purple Martins and Tree Swallows (*Iridoprocne bicolor*), and many small birds which appeared from a distance to be of these species were brought back to the nest.

W. J. Breckenridge has reported (*Auk*, 55, 1938: 669) similar feeding habits in the case of a pair of Pigeon Hawks with half-grown young which he studied "near Lake Saganaga" on the Minnesota side of the International Boundary in 1937. The prey consisted of small birds and dragonflies and the male "captured almost all of the prey."

Hunting Habits

From within the blind we saw the female Pigeon Hawk catch a large dragonfly and eat it while on the wing. The dragonfly, although very difficult for most birds to catch, appeared to be easy prey for the swift Pigeon Hawk. But how did these hawks catch birds? We had seen them vainly pursue Tree Swallows and Purple Martins. How could they catch them? One morning our question was answered. We saw a female Pigeon Hawk glide lazily above the lake and then

Figure 4. An immature male Pigeon Hawk from the Border Lakes region.

drift slowly over a large tract of burned-over land where only charred stubs stood high above the new, thickly-matted vegetation. When she reached this open, waste land, Tree Swallows suddenly appeared and darted at her as she spiraled lazily up and up. When so high in the sky that the swallows looked like tiny insects, the falcon turned over suddenly and dived earthward with the swallows chasing behind. As her speed increased she pulled away from the trailing swallows. When almost to the ground the Pigeon Hawk zoomed

upward and as she shot skyward the swallows that were flying behind also turned and shot skyward in front of her. She was now the pursuer and they the pursued. The greater weight of the hawk had so increased her downward speed that when she pitched up she mounted faster than the light swallows ahead of her. The swallows climbed upward in an attempt to escape, but the hawk mounted faster and deftly snagged a swallow as it seemed to hang motionless in the air. The rest milled about the hawk at a safe distance as she glided down over the lake and out of sight.

Behavior in Captivity

On July 12 we took several young hawks and left the mosquitoes and Pigeon Hawk country behind. The young birds developed into trim hawks. In order that we might learn more about their flying habits and ability, we trained them and flew them at various kinds of prey. The trained falcons easily caught Starlings, Blue Jays, Purple Grackles, and Bob-white. They could overtake pigeons but these were too heavy for the falcons to hold and after several unsuccessful flights they refused to chase them any more. The little males preferred smaller birds and were flown successfully at English Sparrows. Our Pigeon Hawks would often "bind" to their quarry after the manner of the short-winged hawks, but at other times they would "stoop" and strike down their prey like a Duck Hawk. When necessary they would even follow their prey into the woods.

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THE BREEDING WARBLERS OF THE CENTRAL ALLEGHENY MOUNTAIN REGION

BY MAURICE BROOKS

MOUNTAIN masses, and the interpretation of their plant and animal life, present a standing challenge to the biologist. The Appalachian mountain system, being of moderate elevation and located in mid-latitude regions, does not exhibit the striking contrasts to be found in high altitude mountains of more southern regions, where a climb of a few miles may take the observer from the tropical to the arctic-alpine; nevertheless our eastern ranges have been a haven of refuge for land forms since Palaeozoic times and have their fascinating problems of modern, as well as ancient, natural history.

The Area

The area with which this paper deals is centered roughly between the northern and southern extremities of the Appalachian system, and embraces the mountainous portion of western Maryland, all of West Virginia west of the Shenandoah valley, and portions of Frederick, Shenandoah, Rockingham, Augusta, Highland, Bath, Alleghany,[1] Craig, Giles, Bland, and Tazewell counties, Virginia. Thus it includes all of the Allegheny ridges between the Great Valley of Virginia and the Ohio River, from the Pennsylvania border on the north to the southern extremity of West Virginia. The "Ridge and Valley province" (of Fenneman, 1938) lying directly east of this territory, and the high Blue Ridge peaks of southwestern Virginia are excluded, since it is felt that their biotic conditions differ in a number of essentials from those of the area under consideration.

From the ornithological standpoint, the region is remarkably homogeneous, although the boundaries are somewhat arbitrary. Portions of southwestern Pennsylvania, the unglaciated Allegheny plateau of eastern Ohio, and parts of southwestern Virginia and eastern Kentucky might well have been included, had it not been that these areas are receiving adequate ornithological treatment at other hands.

Embracing a portion of the divide between Atlantic seaboard and Ohio-Mississippi drainage systems, the region offers a natural meeting place for forms of life which follow the mountain ridges down from the north, which gain entrance from the south through unobstructed river valleys, or which invade the area from both the

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[1] There is frequent confusion in literature as to the various spellings of the mountains, and some of the geographical divisions, with which this paper deals. For purposes of clarity it may be stated that the United States Geographic Board has adopted the spelling *Allegheny* for the mountains and river, *Alleghany* as the name of the county in Virginia, and *Allegany* for the county in Maryland. Usage of the names in the present paper conforms to the Board's rulings.

east and the west. At such a junction point northern and southern, and eastern and western, bird races meet, with somewhat puzzling intermediates becoming the rule rather than the exception.

The Problem

So many excellent papers on the ornithology of this territory have appeared that another one would scarcely seem justified, were it not that one factor of tremendous ecological significance has not received the attention which it deserves.

Briefly stated, this factor derives its significance from just one circumstance; within one or two generations the forests of this considerable area, relatively undisturbed for thousands or perhaps millions of years, have undergone wholesale destruction from man's lumbering operations, from the attendant fires which have swept much of the region, and from the plant diseases which have been introduced. Thus birds which had become, over long periods, habituated to a certain set of living conditions have found themselves within a comparatively short time faced with the problem of adjusting themselves to different conditions, or of disappearing from a considerable portion of their ancestral breeding range.

Because of the fact that many of these upland watersheds have now been taken over for administration as forest land by the United States Forest Service, state conservation departments, and other public agencies, we may well doubt that any such wholesale changes in the character of the country as have taken place within the last fifty years will ever occur again. Thus we are contemporaries of the birds in this transition period, and it behooves us as ornithologists to record all that we can learn of their attempts at readjustment. Fortunately, there are those still with us who can remember many of the Allegheny forest regions when they were in near-pristine condition, and we are able to draw from their memories and their records when we attempt to contrast the bird life of virgin and of cut-over areas.

To the birds, this period of rapid change, induced by man's lumbering methods, may well have been as socially significant as was the industrial revolution to human beings. Certainly we know that many species have profoundly changed their habits since the coming of the white man, as witness the Chimney Swift's readiness to adopt new breeding situations. Reference to a bird list made in the West Virginia spruce belt forty years ago, and to one made in the same region today, will show the striking ornithological changes which have occurred. Some species may have disappeared locally, and many new ones have appeared; the bird life may in fact be considerably enriched. Whatever these shifts may have been, however, practically all breeding birds of the area are now living under radically changed conditions.

There is an element of immediacy in this study. Within the region defined by this paper there are a few, but very few, scattered remnants of original deciduous and coniferous forests. Where these occur, birds may still be observed under conditions which approximate those which once obtained throughout the area. So rapidly are these virgin stands being removed, however, that a few more years may well see their practical disappearance. Unfortunately, it is not the policy of the U. S. Forest Service, at least in eastern United States, to buy and preserve original timber stands.

In areas which have undergone lumbering operations, conditions change very quickly. This is a region of rapid tree growth and heavy timber increment, and cut-over areas, even though practically denuded, are quickly clothed in vegetation which may be widely different from that which originally occupied the land. Under highly favorable lumbering methods, when fire is kept out, reforestation by the original species may occur, and here we find a minimum of disturbance to the bird life. Such happy combinations of circumstances have, unfortunately, been rare in our region. Generally speaking, vegetational changes occur in rapid succession, and he who would mark attendant changes in bird life must be on the ground, and must have ample basis for comparison and contrast.

Another contemporary change of tremendous import in the forests of the mid-Appalachian region has resulted from the introduction and spread of the chestnut bark disease (*Endothea parasitica*). On many of the Allegheny ridges American chestnut (*Castanea dentata*) was the principal timber species, and the death of the chestnuts, now unfortunately almost complete throughout the region, has left standing millions of dead trees which once helped to form a forest crown. The exposed understory vegetation is bringing about reforestation of a very different character. The dense brushy growths which have followed the death of the chestnuts have favored the nesting of a number of bird species which had previously been scarce in, or absent from, these forests. In fact, a definite association of breeding warblers in such situations may now be found throughout the area. Certain warblers (the Golden-winged is notable) seem almost to depend on standing dead chestnut trees for perches from which song is given.

This new association of species in brushy areas is one of the most interesting features of bird life in the Allegheny region today. Under the discussions of individual species it will be covered more fully. That the association is a temporary one, however, may be inferred from the fact that a few more years will see the fall of all standing dead chestnut trees, and will find the present brushy areas grown up to a new type forest.

The writer has spent practically his entire lifetime in the region which this paper includes, has camped in original stands of red spruce, hemlock, pine, and deciduous forests, and has had opportunities for

study throughout the region. In addition, full advantage has been taken of the work of others in the same field. Recognizing that no one person could possibly do justice to so large an ecological field, he nevertheless ventures to place on record some observations relating principally to the breeding wood warblers of the region, and to draw from these observations some conclusions, with the hope that they may be modified, enriched, or enlarged through the experiences of others.

The Wood Warblers

For the purposes of this study the warblers of the Family Compsothlypidae have been selected for a number of reasons. In the first place, a large number of species breed within the area, the list including twenty-seven species, one hybrid (Brewster's Warbler), and an undetermined number of races which are known to nest, together with two or three species whose presence has been noted during the breeding season, but whose nests have not yet been found.

A second consideration is that no portion of the region is without its characteristic breeding warblers, some areas numbering twenty or more species. Another significant circumstance is that the breeding warblers are rather well distributed as to their centers of abundance. The mountain ridges harbor many species of northern association, while the region's position on the borderland of the south gives it a good representation of Carolinian forms. By far the most clearly defined biotic zone of the region is the Alleghenian portion of the Transition (as Merriam conceived it). This zone has a particularly well developed warbler population. Finally, the breeding warblers serve fairly well to delineate the biotic zones into which the territory falls.

Life Zones in the Region

The writer enters into a discussion of life zones with some trepidation, knowing that there are many biologists who question the validity of any or all the zone concepts so far proposed. Without going too deeply into the matter, a few general observations are ventured. The first is that, by general agreement, biotic zones are more clearly defined in a mountainous than in a flat country, and we are dealing here with a mountainous region. Secondly, much of the criticism directed against any given life zone concept has had reference to the methods and criteria by which the zones were set up, leaving unchanged the basic fact that sharply defined and highly different associations do exist side by side. Again, much of the criticism of any life zone system has seemed to me fallacious in that it considers too narrow a portion of the biotic field. In a given region the bird life may be poorly zoned, whereas plant life, or even mammal life may show zonation much more clearly.

It should be made clear that references to zones in this paper consider them as associations of plant and animal life, not narrowed to the ornithological, or any other, field. For such associations the name *biome* has been proposed, and its use offers many advantages. The writer believes, however, that the more familiar *life zone* is justified, if it be remembered that the term carries broad sociological connotations.

Without reference, therefore, to the criteria by which zones have been separated, and with no brief for any particular zone system, Merriam's, Dice's, or any other, the fact remains that the mid-Allegheny region which this paper treats shows fair sized areas where the biota are definitely of the association which has been known as Carolinian, a much larger area which falls in the Alleghenian, and smaller, but in some cases sharply defined, territories where both fauna and flora are predominantly (if not purely) Canadian.

In our region only the larger valleys, notably the valleys of the Ohio and the New River-Great Kanawha River systems, are predominantly Carolinian. Among the warblers, only the Blue-winged and the Sycamore, with, perhaps, the Prothonotary, are restricted to this zone. However, Yellow, Cerulean, Prairie, Kentucky, and Pine Warblers, Yellow-breasted Chat, and Louisiana Water-thrush reach their greatest abundance here.

The forests of this region are predominantly southern mixed hardwoods, with considerable stands of scrub pine (*Pinus virginiana*) and pitch pine (*P. rigida*) on the more sterile hills. The picture is complicated, however, by occasional cold ravines where hemlock (*Tsuga canadensis*) and other more northern species are to be found, and in these may be found breeding warblers which normally occur only at higher elevations or latitudes.

If there be such a thing as the Alleghenian province of the Transition zone, our region represents it *par excellence*. Only a few years ago a prominent ornithologist stated in a national scientific meeting his belief that the Alleghenian is not a valid biotic division, in so far, at least, as birds are concerned. It seems to me that recent systematic work tends strongly to establish the opposite view. Such Alleghenian forms as Mountain Vireo, Cairns's Warbler, and Carolina Junco have long been known, while Burleigh has recently named the Southern Creeper (*Certhia familiaris nigrescens*) and the Southern Winter Wren (*Nannus troglodytes pullus*), and Dr. Oberholser has described a southern Appalachian race of the Black-capped Chickadee (*Penthestes atricapillus practicus*). It is true that the latter three are more common in the Canadian portion of the southern mountains, but they have apparently separated out in the general region under consideration.

By the very definition of the word, much of the mid-Allegheny territory falls marvelously well into a transition area. Where else may Yellow-breasted Chat and Mourning Warbler breed in the same

thicket, Black-throated Green Warbler and Cerulean Warbler nest in the same beech woods, and Louisiana Water-thrush and Northern Water-thrush find homes along the same stream?

In our territory Golden-winged Warbler (and perhaps Brewster's Warbler) seem to be restricted to the Alleghenian zone, while Worm-eating, Hooded, Black and White, Blackburnian, Parula, and Chestnut-sided Warblers, Oven-bird, and Redstart here reach their greatest abundance. Every breeding warbler known from the territory, save the two or three species previously mentioned as being restricted to the Carolinian, has been found in the Alleghenian.

The interesting association of breeding warblers (mentioned earlier in the paper) which has followed the death of American chestnut trees occurs almost exclusively in the Alleghenian province. Dense thickets which occur under standing dead chestnut trees are frequently made up of chestnut sprouts, rhododendron (*R. maximum*), mountain laurel (*Kalmia latifolia*), blackberries (*Rubus sp.*), scrub oak (*Quercus ilicifolia*), wild grapes (*Vitis sp.*), black locust (*Robinia pseudo-acacia*), and other scrubby growth. In these thickets Black and White, Golden-winged, Magnolia, Cairns's, Chestnut-sided, and Canada Warblers, Oven-bird, and Yellow-breasted Chat breed regularly, often in abundance. At higher elevations Mourning Warblers join this group, while at lower and intermediate elevations Hooded Warblers are common. Where there are living trees of some size Blackburnian Warblers and Redstarts are also abundant.

Thus we have ten or twelve warbler species regularly occupying a special type of habitat which must be new to them, at least on so extensive a scale.

At least two warblers of southern association, Hooded and Worm-eating, are more common in the Alleghenian than in the Carolinian portions of the territory which this paper discusses. This may well be due to the fact that suitable breeding habitats for these birds are more common at elevations slightlty above the larger river valleys.

In the northern portion of the region under consideration the Alleghenian division of the Transition zone descends as low as 1000 feet elevation, and usually gives way to the Canadian at about 3500 feet. In the southeastern portion of the area the Alleghenian begins at about 1500 feet and ascends to 4000 feet or more. Dr. J. J. Murray and Professor Ruskin Freer do not consider that any of the Allegheny peaks in Virginia reach the Canadian zone. In Giles County, Virginia, near the southern extremity of our region, the Alleghenian begins at about 2000 feet, and points which rise to 4300 feet fail to show much evidence of a Canadian character.

Since by far the largest portion of the whole area under consideration lies between elevations of 1500 feet and 3500 feet, it can be

seen that the Alleghenian is the most extensive (and most significant) biotic division with which we have to deal.

Several types of forest occur within the area, and serve to show the striking 'transition' nature of the region. Southern mixed hardwoods, with some pitch pine, occur at the lower elevations, while stands of oak-chestnut-hickory come onto the dry ridges. Northern hardwoods (birch-beech-maple-basswood) are common above 2000 feet, and there are many coves where walnut and tulip poplar (*Liriodendron tulipifera*) are abundant. Hemlock is to be found along many streams, while on the eastern slopes of the Allegheny ridges there is a considerable stand of white pine (*Pinus strobus*). As rainfall decreases toward the eastern edge of the region scrub and pitch pines, and scrubby oaks become abundant.

Dr. J. J. Murray has recently published (1939c.) an excellent study of the Canadian zone (or modified Canadian zone) as it occurs in the southern Appalachians. He concludes that Virginia has no true Canadian zone territory, but believes that the high Allegheny ridges in Highland County (as well as the elevated Blue Ridge peaks near the North Carolina line) approach this zone. Western Maryland now has no Canadian area save, perhaps, the small portion of Cranesville Swamp which lies within Garrett County. This leaves, within the territory of this paper, only certain high mountainous areas in West Virginia to represent the Canadian, or modified Canadian, zone.

The original forest of red spruce (*Picea rubra*) pretty closely delimited the Canadian zone in West Virginia. Although the state once had over 700,000 acres in almost pure stand of this species, most of the spruce timber has been removed within the last fifty years. Clear cutting of the timber has all too frequently been followed by destructive fires, and spruce has been replaced, to a great extent, with hardwoods. Where this has occurred the Canadian character of the country has largely been lost, such areas now being clearly referable to the Alleghenian.

Fortunately, there is one considerable region where a combination of circumstances has acted to preserve the Canadian character of the country. This lies within Tucker, Randolph, and Pocahontas Counties, West Virginia, and includes a series of high mountain ridges and elevated plateaus known locally, and rather loosely, as Cheat Mountains. Actually the range is made up of Cheat Mountain, Shavers Mountain, Back Allegheny Mountain, and a number of other spurs and ridges.

Much of the Cheat Mountains area was lumbered under selective cutting methods, and fires in the region have not been extensive. With abundant rainfall (the nearest comparable station has recorded an average yearly precipitation of about sixty inches), reforestation of the original spruce has occurred extensively, and plant and animal life has

been subjected to a minimum of disturbance. About one hundred square miles of the Cheat section lie above 4000 feet, and there are extensive areas above 4500 feet. The maximum elevation is 4842 feet. The region is, perhaps, the nearest thing to a true Canadian forest which can be found in eastern North America south of the Catskills.

The high ridges of the Cheat Mountains catch the moisture-laden winds from the west, and a heavy precipitation results. Equally high ridges, notably Allegheny Backbone and Allegheny Front, which lie directly to the east are thrown into a rain shadow, and on these no extensive reforestation of Red Spruce has occurred. With the disappearance of the spruce, other Canadian species have also largely failed of survival.

Where red spruce within the Canadian zone does not occur in pure stands there are mixtures of spruce with yellow birch (*Betula lutea*), large-toothed aspen (*Populus grandidentata*), hemlock, and fir (*Abies sp.*)

In addition to the Cheat Mountains, there are several smaller areas where Canadian forms predominate. Cranberry Glades, Pocahontas County, is notable, as are Canaan Valley, Tucker County, and Canesville Swamp, partly in Preston County, W. Va., and partly in Garrett County, Md.

No warblers, save possibly the Nashville, are restricted in our area to the Canadian zone, although Cairns's, Black-throated Green, Mourning, Canada, and Magnolia Warblers, and Northern Water-thrush here reach their greatest abundance. A much better idea of the bird life of the area can be secured if we list the following breeding species which are, generally speaking, restricted in this region to the Canadian: Saw-whet Owl, Olive-sided Flycatcher, Red-breasted Nuthatch, Brown Creeper, Winter Wren, Hermit and Olive-backed Thrushes, Golden-crowned Kinglet, and Purple Finch. To these might be added Pine Siskin and Red Crossbill, both of which have been observed in summer in the Cheat range.

In pure spruce forests not a single one of the warblers whose centers of abundance are to the south (i.e., Kentucky, Hooded, Cerulean) occurs.

Recent Shifts in Bird Populations

Dr. W. C. Rives, pioneer student of the birds of the Virginias, states (1898),

> ". . . I spent the period from June 4 to June 12, 1891, at Davis, [Tucker County, W. Va.] finding the general aspect similar to that of Maine or northern Wisconsin, rather than in accordance with one's preconceived ideas of a southern State, and the avifauna, as might have been anticipated, markedly Canadian and Alleghenian in character . . ."

On this and subsequent visits, Dr. Rives found large areas of virgin spruce still standing, but he notes that lumbering was well under way in the region. During a number of trips to the region he lists only

the following warblers: Black-throated Blue (noting that some were typical Cairns's), Magnolia, Black-throated Green, Chestnut-sided, Mourning, and Canada Warblers, Northern Water-thrush, and Maryland Yellow-throat. Of these he records that Chestnut-sided and Mourning Warblers were found in the clearings, not in the spruce forests, and that the Yellow-throat was not noted in 1891, but was observed in 1897. Thus, only five warbler species were found in the spruces.

In the years since Dr. Rives visited this portion of West Virginia the whole area has been lumbered by extremely destructive methods, and much of the land has been burned over. No substantial spruce reforestation has taken place, and most of the territory is now covered with a brushy deciduous growth. Despite the sharp vegetational transition, all of the warblers recorded by Dr. Rives may still be found in the neighborhood (some of them in rather restricted areas), and the following additional species have been noted: Black and White, Worm-eating, Golden-winged, Nashville (George M. Sutton and William Lunk), Parula, Yellow, Blackburnian, and Hooded Warblers, Louisiana Water-thrush, Oven-bird, Yellow-breasted Chat, and Redstart. It seems certain that Dr. Rives and his companions would not have overlooked all of these, and I believe it is a fair assumption that most, if not all, of these species have moved into the area since the original spruce was cut.

During the summer of 1914 an ornithological party camped for ten days along Shavers Fork of Cheat River, in Randolph County, W. Va. The notable thing about the whole experience was the abundance of a very few species of birds found in the dense red spruce forest, and the small number of species found. Our warbler list read much as did that made by Rives in an adjoining county, save that Chestnut-sided and Mourning Warblers, and Yellow-throat were absent. We did note Blackburnian Warblers.

Although this territory is in the Cheat range, where favorable lumbering methods obtained, and good spruce reforestation has occurred, warbler lists made during recent summers have included all species mentioned in the paragraph above, together with Black and White, Worm-eating, Parula, and Hooded Warblers, Oven-bird, Yellow-breasted Chat, and Redstart. It seems certain that most of the additional species are recent arrivals (as breeding birds) in the region.

Failure of the red spruce to reseed in the less abundantly watered mountains just to the east of the Cheat ranges has already been mentioned. In these, even at high altitudes, all warbler species previously noted as occurring in the Alleghenian zone may be found.

Just as many Alleghenian species have occupied territory once Canadian in its associations, so have species, predominantly Carolinian, been able to occupy parts of the Alleghenian. This movement of

southern association species has been particularly striking in central West Virginia. Within the last few years such species as Cerulean and Prairie Warbler, heretofore unknown in the territory, have become common breeding birds at French Creek, Upshur County, W. Va., at elevations from 1400 feet to 1800 feet.

As a result of the removal of the original forest stands, therefore, the Carolinian zone has been somewhat extended in the territory which this paper covers, the Alleghenian zone has been greatly enlarged, and the Canadian has been sharply reduced. As natural and artificial spruce reforestation takes place, the Canadian zone may increase in size, with a corresponding decrease in the size of the Alleghenian area. On public lands at least it is doubtful if clear cutting on so extensive a scale will ever again be the prevalent lumbering method. It will be a matter of interest for future ornithologists to note which of the changes mentioned above are temporary in nature, and which represent more permanent shifts in bird populations.

Breeding Warblers in the Region

In preparing notes on the warblers which breed in the central Alleghenies, two striking circumstances early became apparent. They are:

1. Certain warblers are to be found breeding here in habitats which are very different from those occupied in other portions of their ranges.

2. Many warbler species are here nesting in a greater variety of habitats within a single area than is, seemingly, the case in other portions of their ranges.

Notes on individual species which follow will demonstrate the basis for these conclusions. Reference might be made here to two striking examples; the Golden-winged Warbler which in Ohio and Michigan is restricted almost entirely to swampy areas, but which is abundant in West Virginia only on dry upland ridges; and to the Black-throated Green Warbler, breeding only in coniferous forest throughout most of its range, but nesting in a variety of deciduous associations as well in the central Allegheny region.

Mniotilta varia. Black and White Warbler. Resident at present throughout the region covered by this paper; formerly scarce or absent in the Canadian red spruce belt. This species reaches its greatest abundance at medium elevations in the Alleghenian zone, and is less common at lower elevations in the large river valleys. It is a characteristic bird of the "chestnut sprout" association. Recorded at elevations up to 4600 feet on Spruce Knob, Pendleton Co., W. Va.

Nesting dates: French Creek, Upshur Co., W. Va., May 24, 1926, four eggs (M. Brooks); Mt. Lake, Giles Co., Va., May 26, 1937, five eggs (D. R. Hostetter); Pleasants Co., W. Va., May 29, 1938, young birds (C. Conrad).

Protonotaria citrea. Prothonotary Warbler. There are very few records of this bird from our region and those few are largely uncertain. Doan (1888) reports a specimen taken near Buckhannon, Upshur Co., W. Va., on August 3, 1887,

but his collections have never been found, and much of his work is regarded as unreliable. Hicks (1935) states that the species is known to breed in Washington Co., Ohio (directly across the Ohio River from West Virginia), and it will probably be found nesting along some of the larger streams of the region with which this paper is concerned.

Limnothlypis swainsoni. Swainson's Warbler. Since the early days of American ornithology this little-known warbler has been considered a resident of the cane brakes and coastal swamps of the deep South. However, recent discoveries are forcing us to re-orient our thinking as to the species.

When Bibbee (1934) took an adult male Swainson's Warbler at Buzzard Rocks, Monongalia Co., W. Va., on June 14, 1924, his bird was regarded as of purely accidental occurrence, particularly as it was taken in a region of hemlock, rhododendron, and mountain laurel, only a few miles from the Pennsylvania border. Somewhat later, Mr. F. M. Jones, of Bristol, Tenn., collected a nest and eggs which he identified as of this species in the mountainous portion of southwestern Virginia, but, even with this evidence, the find was not accepted by ornithologists in general.

Williams (1935) called attention to the presence of the species near Tryon, in the mountains of western North Carolina, in May, 1934 and 1935. He notes that the birds were found in open places as well as in laurel thickets. During his work in West Virginia, Wetmore (1937) collected a male near Fourteen, Lincoln Co., at the swampy border of a little upland stream. Wetmore (1939) also collected a male, and observed two other individuals, in the mountains of eastern Tennessee, at elevations between 2600 feet and 3000 feet. He notes that they were in a swampy area heavily shaded by hemlock and rhododendron. Legg (1939) found birds which seem to have been of this species in rhododendron and mountain laurel thickets in Nicholas Co., W. Va., at points about three miles apart. Murray (1939b), in the light of other recent records, has accepted as valid the southwestern Virginia record made by Jones, and mentioned in the preceding paragraph.

With so much evidence at hand, it is becoming clear that a portion of the Swainson's Warbler population must be looked for over a wide area in the central and southern Appalachian region. Although Jones' nest is the only one actually recorded to date, there are so many additional summer records from the territory that the more extensive breeding of the species is strongly indicated.

Helmitheros vermivorus. Worm-eating Warbler. Distributed in regions of deciduous woods throughout the area; more common at lower elevations in the Alleghenian zone. It has not been recorded in the spruce belt, although it reaches elevations of 3600 feet in northern hardwoods association on the slopes of the Cheat mountains, Randolph Co., W. Va.

Nesting dates: Orlando, Lewis Co., W. Va., May 27, 1914, five eggs (E. A. Brooks); French Creek, Upshur Co., W. Va., May 24, 1917, five eggs (F. E. Brooks).

Vermivora chrysoptera. Golden-winged Warbler. As noted earlier in this paper, the Golden-winged is a characteristic bird of the dead chestnut ridges throughout the central Allegheny region. It is much less common in the larger river valleys, and has not been found in pure spruce, stands, although Wetmore (1937) found it breeding at 3300 feet at Cranberry Glades, Pocahontas Co., W. Va.

Shunning the swamps which it frequents in other portions of its range, it is highly characteristic of the "chestnut sprout" association, where the males choose dead chestnuts for perches from which to sing. It is also fairly common in the pitch and scrub pine regions on the hills just back of the Ohio river, but becomes less common toward the eastern portion of the territory with which this paper deals. It ascends to at least 4000 feet in Giles Co., Va.

Nesting dates: French Creek, W. Va., May 30, 1919, five eggs (M. Brooks); Pleasants Co., W. Va., May 29, 1938, two young just out of nest (Tom Shields).

Vermivora pinus. Blue-winged Warbler. In our area seemingly restricted to the Carolinian zone in the lower river valleys. There are scattered migration records at points of higher altitude, but no actual breeding records. My notes indicate that these birds are locally common in the West Virginia counties along the Ohio River, but that they do not reach the eastern portions of the high Alleghenies. It is quite possible, however, that this view will require revision, since Sprunt (1930) found the species at elevations of 3000 feet in western North Carolina.

In the Ohio valley counties the birds inhabit mixed southern hardwoods, oak-hickory, and scrub pine areas. I do not know of their occurrence above 1200 feet. Males have a liking for dead trees as singing perches, a tendency in which they closely resemble the Golden-winged Warblers.

Nesting date: Cedar Rocks Country Club, Marshall Co., W. Va., June 10, 1932, four young (C. B. Upton).

Vermivora leucobronchialis. Brewster's Warbler. There are comparatively few places within our territory where Golden-winged and Blue-winged Warblers meet as breeding birds, and there are no actual nesting records for this warbler, or for the other hybrid. Lawrence's Warbler. Sutton has collected in Brooke Co., W. Va., a specimen of Brewster's Warbler which was in breeding condition, and Lunk (1938) tells of seeing a male Brewster's apparently feeding a young bird and associating with a female Golden-winged Warbler near Fairmont, Marion Co., W. Va. This bird, seen by a number of persons, occupied a brushy hillside throughout the summer. It sang regularly, and gave all indications of nesting in the neighborhood. If breeding actually occurred, it constitutes one of the most southern records for the species.

Vermivora ruficapilla ruficapilla. Nashville Warbler. Restricted in summer to the higher parts of the territory. It has been noted at Cranesville swamp, Preston Co., W. Va., by A. B. Brooks and Mr. and Mrs. Harold Roush, and in nearby parts of Garrett Co., Md., by Karl Haller and the writer. S. S. Dickey has reported it from Cranberry Glades, and is certain that it has bred in this locality. Dr. Sutton and Lunk have found it on Canaan mountain, Tucker Co., W. Va., the only place outside of an extensive swamp where it has been found in the region with which this paper deals. No nest has been recorded.

Compsothlypis americana pusilla. Northern Parula Warbler. Specimens taken within our area have been referred to this race. The bird breeds locally in an astonishing variety of situations. It occurs in southern mixed hardwoods, in oak-hickory associations, in northern hardwood types, in oak-pine scrub, in hemlock ravines, in almost pure stands of white pine, and, at the edges at least, of spruce stands. I have seen nests in white oak and in sycamore (*Platanus occidentalis*). It occurs at 3500 feet on Elk Mountain, Pocahontas Co., W. Va.

Where there is standing live timber of some size, these birds are not uncommon in areas of dead chestnut, although the species should hardly be included in the "chestnut sprout" association.

Nesting dates: Dunkard Creek, Monongalia Co., W. Va., June 19, 1897, fragment of one egg in nest (J. W. Jacobs); French Creek, W. Va., May 29, 1916, four eggs (M. Brooks).

Dendroica aestiva aestiva. Eastern Yellow Warbler. Abundant in the river valleys; common in the lower parts of the Alleghenian zone, becoming less so at higher elevations. Not recorded in spruce forests. The species now occurs at Davis, Tucker Co., W. Va., at 3100 feet, an area that was in the original spruce belt as described by Rives (1898).

Nesting dates: French Creek, W. Va., May 24, 1919, five eggs (M. Brooks); Ice's Ferry, Monongalia Co., W. Va., May 17, 1935, four eggs (M. Brooks).

Dendroica magnolia. Magnolia Warbler. Common, often abundant, in Garrett County, Md., the mountainous counties of eastern West Virginia, and on the higher ridges of the Virginia counties which this paper discusses. The species shows a fairly wide choice of breeding habitats; it is found regularly in the "chestnut sprout" association, occurs in northern hardwood types, and is often abundant in virgin or second-growth spruce. Even on the comparatively dry eastern slopes of the Alleghenies (Pendleton Co., W. Va.) I have found the birds in summer at elevations as low as 1800 feet, in beech-maple forest. In Giles County, Virginia, the birds have been noted as low as 2500 feet.

Nesting date: Terra Alta, Preston Co., W. Va., June 24, 1933, four eggs (M. Brooks).

Dendroica caerulescens cairnsi. Cairns's Warbler. Common in western Maryland, the Virginia counties of this paper, and West Virginia counties with elevations above 2000 feet. Like the Magnolia Warbler, this bird is a characteristic resident of the "chestnut sprout" association, is found in northern hardwoods, and in spruce at all stages of growth. It is also found in white pine stands. Murray (1936) has noted the species at elevations of 1500 feet in Virginia, and I have seen it at 1600 feet in West Virginia.

Wetmore (1937) considers that all the specimens which he has seen from the region (with the possible exception of some from western Maryland) are referable to this race, although Hicks (in correspondence) was unable to distinguish any differences between specimens taken in Preston Co., W. Va., and Garrett Co., Md., and those from New Jersey and other more northern points. It is certainly true that some northern West Virginia birds could easily be referred to *D. c. caerulescens.* There is no sharp dividing line between the northern and southern races, the two meeting at points very near the northern boundary of the area which this paper discusses.

Nesting date: Terra Alta, W. Va., May 27, 1935, four eggs (M. Brooks).

Dendroica virens virens. Black-throated Green Warbler. This species, in its distribution within our area, presents one of the most puzzling problems with which we have to deal. It occurs everywhere at high elevations, in spruce, hemlock, northern hardwoods, white pine, oak-pine scrub, and oak-hickory. In Monongalia Co., W. Va., (in hemlock, along Cheat River) it nests at 1000 feet elevation, and Murray (1936) has found it at 1200 feet in Virginia.

Jumping over much of central and western West Virginia, it reappears at comparatively low altitudes (800-900 feet) in the scrub pine forests along the Ohio river. Hicks (1935) has pointed to a similar situation in Ohio, where the birds nest in a number of the unglaciated counties in the southeastern part of the state.

Since this species is so commonly thought of as being restricted in its breeding range to coniferous forest, it might be well to emphasize the fact that a number of West Virginia nests have been found in beech and other deciduous trees.

Nesting dates: French Creek, W. Va., June 2, 1926, four eggs (F. E. Brooks); French Creek, W. Va., June 11, 1933, three eggs (M. Brooks).

Dendroica cerulea. Cerulean Warbler. A characteristic bird of the counties along the Ohio river in West Virginia, rare or absent from western Maryland, the higher mountains in West Virginia, and the higher Virginia Alleghenies, but reappearing sparingly at lower elevations eastward. Murray (1936) and Freer (1939) have found it uncommon or rare in western Virginia at elevations up to 1200 or 1400 feet. This is one of the species which seems to be spreading into the Allegheny zone in central West Virginia, since it has occurred regularly at French Creek (1700 feet elevation) in recent years. In fact, at this place Cerulean and Black-throated Green Warblers nest in the same small woodland.

To find the bird in maximum abundance however it is necessary to visit

the southern mixed hardwood and oak-hickory forests in west-central West Virginia. No other resident warbler sings regularly so late in the summer, and so persistently during the hottest parts of July and August days.

Nesting date: Jackson's Mill, Lewis Co., W. Va., July 27, 1936, four young (M. Brooks).

Dendroica fusca. Blackburnian Warbler. This species is equally at home in the lush spruce forests and on the dry, deciduous-forested Allegheny ridges within our territory. Like the Golden-winged Warbler, it often selects dead chestnut trees from which to sing. Murray and Freer report it as common above 1500 feet in western Virginia, with occasional birds found in summer as low as 1200 feet.

It does not occur over most of western West Virginia, but may breed locally in Hancock County, at the extreme tip of the state's Northern Panhandle.

Despite its abundance and wide distribution, I have no nesting records from the region of this paper.

Dendroica dominica albilora. Sycamore Warbler. Most of the records for this bird within our territory come from the larger river valleys, and we have no evidence of its having nested outside the Carolinian zone. Scott (1872) tells of a breeding pair taken by W. S. Edwards near Coalburg, Kanawha Co., W. Va., in July. A. B. Brooks and others have found the species in Ohio Co., W. Va., and Margolin and the writer have seen it in Kanawha and Mason Counties, W. Va.

C. O. Handley reports a bird seen on April 29, 1935, near Covington, Alleghany Co., Va., which he identified as a Yellow-throated Warbler (*D. d. dominica*).

No nesting data from the region under consideration are at hand, although Hicks (1935) states that Sycamore Warblers breed in Lawrence, Gallia, and Athens counties, Ohio. These counties adjoin West Virginia along the Ohio river.

Dendroica pensylvanica. Chestnut-sided Warbler. One of the most abundant warblers in mountainous cut-over areas. It is a characteristic bird of the "chestnut sprout" association, and reaches the edges of the spruce forests. In northern West Virginia it breeds down to 1200 feet, and it occurs up to 4800 feet where the habitat is suitable. Mountain laurel thickets offer a favorite nesting place, and dead chestnut trees are often used as singing places.

Absent from most of the western part of our region, the species reappears in northern Hancock County, W. Va.

Nesting dates: Lewisburg, Greenbrier Co., W. Va., June 12, 1913, one egg (C. O. Handley); Rawley Springs, Rockingham Co., Va., May 29, 1931, five eggs (M. Brooks).

Dendroica pinus pinus. Northern Pine Warbler. Found in the region of this paper wherever there are pine forests, from the Ohio river lowlands to the Allegheny crests at 4000 feet or more. I have not seen the species in summer in spruce, hemlock, or pure deciduous stands, although it is abundant in the oak-pine scrub of the eastern portions of the area. It seems to be distinctly less common in the white pine district than in stands of pitch pine or scrub pine.

Nesting date: Mt. Storm, Grant Co., W. Va., June 5, 1935, young birds (M. Brooks).

Dendroica discolor discolor. Northern Prairie Warbler. One of the species which seemingly has greatly extended its range within recent years. The Prairie Warbler is, with us at least, preeminently a bird of the brushy ridges, and the removal of the original forest has facilitated an increase in the breeding range of the species.

Occurring from the Ohio river to the eastern borders of the area under discussion, the birds skip over the heavily wooded mountains, but occur at 4000

feet on Potts mountain, Craig Co., Va., a comparatively dry and open locality. For some reason the range does not include northwestern West Virginia, where the species is rare, or not recorded.

Nesting dates: French Creek, W. Va., June 12, 1929, five eggs (F. E. Brooks); Pleasants Co., W. Va., May 29, 1938, three eggs (H. McGill and L. Tighe).

Seiurus aurocapillus. Oven-bird. One of the most abundant, and widely distributed, warblers of the Allegheny ridges, absent from the older spruce stands, and less common at lower elevations in the river valleys. There are some sections in the upper Ohio valley where the birds are unaccountably missing.

Oven-birds are to be found everywhere in the "chestnut sprout" association, and ascend to elevations above 4000 feet where the timber has been removed.

Nesting dates: French Creek, W. Va., May 21, 1928, five eggs (M. Brooks); Junior, Barbour Co., W. Va., May 26, 1930, five *pure white* eggs (F. E. Brooks); Mt. Lake, Giles Co., Va., May 23, 1937, five eggs (D. R. Hostetter).

Seiurus noveboracensis noveboracensis. Northern Water-thrush. This species, found along some of the mountain streams and in swamps at high altitudes, reaches its known southern breeding limits at Cranberry Glades, within the area with which this paper deals. It is confined to the Canadian and upper Alleghenian zones, nesting as low as 2500 feet at Cranesville swamp in West Virginia and Maryland. Eifrig (1933), writing of western Maryland, observes, "The same stream may harbor the Louisiana and Northern Water-thrushes as breeding birds. . . . ."

These warblers show a preference for streams that are lined by spruce, hemlock, or rhododendron, or a combination of these, but they may occasionally be found in northern hardwood forest. Grinnell's Water-thrush (*S. n. notabilis*) has been taken in West Virginia during migration, but there is no present evidence to indicate its breeding within our area.

I have no local nesting data for Northern Water-thrush.

Seiurus motacilla. Louisiana Water-thrush. Normally the first migrant warbler to arrive in the spring, widely distributed below 3000 feet, and occurring sparingly up to 3500 feet. In the lower river valleys the birds seem less abundant, possibly due to a smaller number of suitable breeding habitats. In the lower and middle portions of the Alleghenian zone, however, there is scarcely a woodland stream without one or more pairs.

Nesting dates: French Creek, W. Va., April 19, 1935, three eggs (M. Brooks); Tomlinson's Run, Hancock Co., W. Va., June 5, 1938, two young (R. Murray).

Oporornis formosus. Kentucky Warbler. A common bird in the western portions of the area, absent from the spruce regions of the higher mountains, and becoming much less common on the eastern slopes of the Alleghenies. Wetmore (1937) found it in eastern Hardy County, W. Va., and there are a few western Virginia records. It occurs up to 3600 feet, in northern hardwoods, on Cheat mountain, Randolph County.

The birds seem at home in a number of forest types, southern mixed hardwoods, scrub and pitch pine mixtures, oak-hickory, and northern hardwoods. Nests are often placed close to the borders of a woodland trail or road. As with many other sylvan birds, ravines seem especially to attract them.

Nesting dates: French Creek, W. Va., May 19, 1926, four eggs (M. Brooks); Pleasants Co., W. Va., May 29, 1938, two nests, one with three and one with five eggs (B. Quantze, H. Bergner, R. West).

Oporornis philadelphia. Mourning Warbler. Resident in the higher portions of the area at least as far south as Cranberry Glades, W. Va., and Top of Allegheny, Highland Co., Va. Through western Maryland and northern West Virginia the line of distribution follows the 3000 foot contour mark with surprising accuracy. Cranberry Glades is the most southern known breeding station for the bird.

Mourning Warblers are completely at home in the higher parts of the "chestnut sprout" regions. Tangles of laurel and rhododendron, and blackberry thickets are often selected as nesting sites. The birds invade the edges of spruce cuttings, but are seldom found in stands of mature timber, either deciduous or coniferous.

Nesting date: Cheat Bridge, Randolph Co., W. Va., June 26, 1935, young birds (P. Wyss and R. West).

Geothlypis trichas brachidactyla. Northern Yellow-throat. Perhaps the most widely distributed warbler in the entire region. Since the spruce has been cut, Yellow-throats have invaded the highest mountains and are now abundant at all altitudes.

Wetmore (1937) concludes that the breeding birds (at least throughout most of our area) are of the present race, although he suggests that the Maryland Yellow-throat (*G. t. trichas*) may breed in extreme eastern West Virginia, just at the border of our territory.

Nesting dates: Pleasants Co., W. Va., May 30, 1935, one egg (T. Shields); Cranesville, Garrett Co., Md., June 3, 1935, five eggs (M. Brooks).

Icteria virens virens. Yellow-breasted Chat. Of surprisingly wide distribution; found in every part of the entire area except in heavy timber. Thickets of blackberry vines and black locust sprouts are favorite nesting sites. The birds are at home in the "chestnut sprout" association, even at comparatively high elevations. At Cranberry Glades they may be found nesting with such northern association species as Northern Water-thrush and Golden-crowned Kinglet. Murray (1939) records them from Middle mountain, Highland Co., Va., at 4000 feet.

Nesting dates: Warm Springs, Bath Co., Va., May 31, 1924, five eggs (M. Brooks); Covington, Alleghany Co., Va., June 1, 1926, four eggs (M. Brooks).

Wilson citrina. Hooded Warbler. These birds show a preference for areas of deciduous timber, light or heavy. They occur in southern mixed hardwoods, oak-hickory, northern hardwoods, and in "chestnut sprout" areas. On Cheat mountain they nest at 3500 feet, and in Giles Co., Va., they breed at 4000 feet. As with some of the other southern association warblers, these are somewhat less common in northwestern West Virginia.

Nesting dates: French Creek, W. Va., June 3, 1919, four eggs (F. E. Brooks); Rawley Springs, Rockingham Co., Va., May 30, 1929, three eggs (M. Brooks).

Wilsonia canadensis. Canada Warbler. A spruce belt species which has been able to adapt itself to cut-over areas, where it is now an abundant and characteristic bird of the "chestnut sprout" association. It also occurs in northern hardwoods at high elevations. In Preston county, W. Va., it nests at 2000 feet, and Murray (1936) lists it as abundant above 3000 feet in western Virginia. A favorite haunt is a ravine with dense hemlock overstory and an understory of tangled rhododendron.

Nesting dates: Terra Alta, W. Va., June 27, 1932, four eggs (R. West); Mt. Lake, Va., June 24, 1937, four eggs (D. R. Hostetter).

Setophaga ruticilla. American Redstart. Found at all elevations and in every major plant association in the area, but much less common at high elevations in the spruce belt. Probably did not occur at all in the original red spruce stands. The species is often an abundant one in the "chestnut sprout" association.

Nesting dates: Warwood, Ohio Co., Va., May 19, 1935, four eggs (H. Bergner); Pleasants Co., W. Va., May 30, 1935, four eggs (T. Shields).

Summary

This paper presents an ecological discussion of the breeding warblers of the central Allegheny mountain region, the area including extreme western Maryland, West Virginia, and portions of western Virginia counties west of the Shenandoah valley, and south to the southern border of West Virginia.

Evidence is presented to show that breeding populations of birds in the area have had to face two critical problems within a very short time; the virtual destruction of all original timber stands, and the death of the American chestnut from the chestnut blight.

Chestnut sprouts, and other brushy growth, now occupy millions of acres of mountainous country where, only a few years ago, virgin forests stood. The name "chestnut sprout" association is proposed for this temporary growth. In this association a highly diversified group of warblers breed. The group has representatives of both northern and southern affiliations, and includes Black and White, Golden-winged, Magnolia, Cairns's, Chestnut-sided, Mourning, Hooded, and Canada Warblers, Oven-bird, Yellow-breasted Chat, and Redstart.

The Carolinian, Alleghenian, and Canadian life zones, with their breeding warblers, are discussed, and evidence is given to show that the Alleghenian is the most extensive, and perhaps the most significant, biotic division of the area.

Range extensions of various warblers since the removal of the original timber are discussed, the discussion showing that many species have greatly increased the extent of their breeding grounds in the area.

Many warblers in the area under consideration nest in habitats which are strikingly different from those occupied in other portions of their breeding ranges. Also a number of species here occupy a greater variety of habitats than in other parts of their ranges.

Evidence is presented to show that a portion of the breeding population of Swainson's Warbler (*Limnothlypis swainsoni*) is to be found in the central and southern Appalachian mountain region, at elevations up to 3000 feet. Here it occupies hemlock and rhododendron thickets.

The breeding of 27 warbler species, with some additional races and one hybrid (Brewster's Warbler), is discussed.

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THE SEX RATIO IN NESTLING EASTERN RED-WINGS [1]

BY J. FRED WILLIAMS

A NUMBER of studies have been made of sex ratios in birds, and the information available on the subject has been recently summarized by Mayr (1939). He classifies sex ratios as follows: "The primary sex ratio relates to the proportion of the sexes at the time of fertilization, the secondary sex ratio at the time of birth and the tertiary sex ratio during adult life." On the basis of genetics the expected ratio is 50:50 but as shown by Mayr, departures from this are not rare among birds, especially in the tertiary ratio. Of the three ratios the primary is probably of the greatest interest because of its bearing on problems relating to the mechanism of sex determination as well as on those involving details of life history. The existence of an unbalanced primary ratio, if definitely established, would present a problem of fundamental biologic interest. It is also evident that many interesting peculiarities of life history, such as polygamy, the development of social habits, and brood parasitism may be linked with unbalanced sex ratios.

The Red-wing (*Agelaius phoeniceus*) offers a number of advantages as the subject of a study of sex ratios. The species shows striking sexual dimorphism, the differences between the sexes involving size as well as color. It is often highly gregarious in nesting, an important practical point, since studies of this sort require an abundance of data. Lastly, it belongs to a group, the family *Icteridae*, in which unbalanced sex ratios and interesting life history patterns have frequently been found. For example, in Wagler's Oropendola (*Zarhynchus wagleri*) Chapman (1928, p. 135) observed an excess of females and a condition which he termed "limited monogamy," in which the sexual bond was of short duration and each male had several mates in the course of the breeding season. A surplus of females has also been reported by McIlhenny (1940, p. 88) in the Boat-tailed Grackle (*Cassidix mexicanus major*), a species in which there is no pairing and the mating is promiscuous. Friedmann (1929, pp. 77, 173) presents some evidence which indicates that there is an excess of males in the Common Cowbird (*Molothrus ater ater*), which is a brood parasite. Lack and Emlen (1939) found that the Tricolored Red-wing (*Agelaius tricolor*), which nests in large colonies, is polygynous or promiscuous, and that the sex ratio is strongly unbalanced among the adults, with about 47 males for each 100 females.

The Eastern Red-wing (*Agelaius phoeniceus phoeniceus*) exhibits much of the behavior of a territorial species, although there is a strong gregarious tendency and the territories may be very small. Thus the males arrive first, display and sing at rather definite stations, in the

[1] Contribution from the Franz Theodore Stone Laboratory of the Ohio State University, Put-in-Bay, Ohio.

neighborhood of which other males are attacked and driven off. Most of the feeding, however, is done away from the territory. Due to this habit of feeding elsewhere and to the close approximation of the individual territories, it is difficult to determine the sex ratio of the adults and the exact relations that exist between the sexes. Allen (1914, pp. 90-92) records instances of both polygyny and polyandry but apparently believes that the normal relation is one of monogamy. My own observations, in cases where two nests were located in close proximity, have given me the impression that monogamy is the prevailing condition. In the extensive literature, however, one encounters quite different opinions. For example, Roberts (1932, Vol 2, p 306) states that the Giant Red-wing (*Agelaius phoeniceus arctolegus*) is usually polygynous, and Linsdale (1938, pp. 128, 140) found polygyny in small colonies of the Nevada Red-wing (*A. p. nevadensis*). Surprisingly, McIlhenny (1940) says that the Gulf Coast Red-wing (*A. p. littoralis*) is monogamous despite the fact that there is a large surplus of males in the population. The explanation of this apparent anomaly may be found in a statement by the same author that the females breed in their first spring after hatching while the males do not breed until their second year.

In cases where the sex ratio is known to be unbalanced among adults it becomes a matter of no little interest to determine the ratio in the young. This has been attempted in a very few species, the Red-wing among others. McIlhenny (1940) gives a ratio of 3.3 males per 1 female in a large number (420) of Gulf Coast Red-wings, using only data from nests in which the full complement of three eggs hatched. This constitutes a primary ratio in the definition of Mayr (1939). Unfortunately the methods used in sexing the nestlings are not described. Herman (1938) has published ratios for the Eastern Red-wing, based on rather small samples of birds that were trapped and sexed sometime after having been banded in the nest. There were recovered 29 males and 13 females, and the totals for those cases in which complete sets of siblings were recovered were 14 males and 6 females.

Since the Red-wing exhibits a marked sexual dimorphism it might be expected that it would be possible to distinguish the sexes at an early age. Packard (1936) was able to sex individuals in the fully developed juvenal plumage, but not in the nestling stage. In my own work at Put-in-Bay, Ohio, during the summer of 1939 I was unable to find any plumage character or other external mark by which the nestlings might be sexed. In reply to an inquiry from me Mr. E. A. McIlhenny, Avery Island, Louisiana wrote as follows: "The sex of the Gulf Coast Red-wing nestlings can be told with certainty at any time after the fifth day from external appearances of the bill, torso, and general body size." The present paper reports the results of an attempt to find a satisfactory method of distinguishing the sexes of nestlings, together with a brief analysis, by a simple statistical method, of the sex ratios that were found in the nestlings of a single colony.

Methods of Study

The area in which the present study was made consists of a cat-tail (*Typha latifolia*) marsh, about ten acres in extent, located at the northeastern corner of Indian Lake, Logan County, Ohio. It is the site of a refuge maintained by the Ohio Division of Conservation. The water in the marsh is sufficiently shallow so that an observer equipped with sporting boots is able to gain access to all but a very few of the Redwing nests in the area. Regular field work was begun here on June 18, 1940. Nesting activities had begun some time before this date, and it is known that a few young had already been fledged.

Each nest that was found was marked with a numbered cloth tag, and daily visits were made to it sometime between 8:00 A.M. and 1:00 P.M., with a few exceptions due to weather conditions or other circumstances beyond control. For each nest a separate record was kept, showing number of eggs or young, date of hatching, weights and measurements of young. As soon as a newly hatched bird was found in the nest it was marked by tying a colored thread around the tarsus. During the first few days of nest life these threads frequently slipped off. Since it rarely occurred that more than one thread was lost in a given nest few records were lost due to this cause. At the age of four or five days it was found necessary to replace these threads due to the growth of the nestlings.

The age of the nestlings was recorded in terms of days. Each nest was visited at approximately the same hour from day to day, and this method obviously involved an error of almost one day in the recorded age. Efforts were made to correct this error by close observation as to the condition of the bird when it was first found hatched. Wet or moist down was accepted as evidence that hatching had taken place shortly before the nest was visited, and in such cases the birds were not considered one day old until one day after the thread had been attached to the tarsus. The presence of dry, fluffy down together with relatively large bill and tarsal measurements was considered as evidence that the bird in question had hatched sometime the previous day but following my visit. In such cases birds were recorded as one day old. Pipped eggs were also recorded when found, and this was often found useful in helping to estimate the time of hatching.

A few nestlings were dissected in order to determine the sex. At the time of hatching the ovary is a flat, oval-shaped organ about 1.5 millimeters in length. At this age the testes are typically shaped and about .8 millimeters in length. The gonads do not grow at a rate proportional to the rest of the body, but at ten days of age have approximately doubled the dimensions at hatching.

The weights of the nestlings were taken with spring scales having a capacity of 250 grams, marked in 10 gram divisions. The division marks are about 2.5 millimeters apart and estimates were made to the

gram. This permits a large error of measurement, but with practice a fair degree of accuracy is possible. A check was made by taking a few weights with both the spring scales and platform balances. Of ten weights used there was no case in which the two readings varied more than one gram. The spring scales were used because of the difficulty of carrying the more accurate platform balances into the marsh. A small piece of fish line was used to suspend the birds from the scales. It was looped around the base of the wing, or in the case of very young birds, around the wing and neck. Insofar as could be observed no injury was done to the birds, which usually remained motionless while being weighed unless they were old enough to attempt flight.

Measurements of the culmen and tarsus were made with a Vernier caliper. These measurements are very easily made but there is some danger of injury to the young nestlings unless care is exercised in removing the locked caliper from the leg. After many measurements of the culmen had been made it was decided that the differences were too small to be of any great value in distinguishing the sexes and this measurement was discontinued.

Since the complete record of each nest was carried into the field it was possible to determine whether or not the individual birds were gaining weight from day to day. After observing a few birds that had lost weight from the previous day, I noted that these individuals generally died. Later, in order to avoid the loss of valuable records, nestlings which had lost weight from the previous day were removed from the nest and dissections were made to determine their sex. Although as a general practice weights and measurements were taken on all birds, there were unavoidable exceptions to this routine, and consequently the data on weights do not relate to precisely the same numbers and individuals as the data concerning tarsal measurements. It was my privilege to measure and dissect some additional nestlings collected by Mr. Otis Allen in the neighborhood of the Stone Laboratory, Put-in-Bay, Ohio. Data from these birds have been used to supplement my own notes in studying the relation of tarsal length to sex. The material on sex ratio applies exclusively to the Indian Lake colony.

Weights of Nestlings

At hatching the average weight of the Red-wing nestling is approximately five grams. A histogram showing the weights of one day old birds indicates a normal distribution. Although the range increases greatly during the second and third days, it is not until the fourth that a bimodal distribution becomes clearly apparent (Fig. 1). At the fifth ray there is a break definitely separating a light from a heavy group, and this break remains in the graphs for older nestlings, increasing in extent. In the ten day old birds there is a difference of six grams between the heaviest bird in the light group and the lightest individual

of the heavy group. From the eighth day on sixteen birds of known weight were sexed by dissection, and in each case the females fell into the light and the males into the heavy group. It thus seems quite apparent that there is complete differentiation between the sexes with regard to weight during nest life.

In order to trace the development of this dimorphism twenty-five individuals of each sex were selected and their daily weights during nest life were plotted (Fig. 2). The graph offers convincing evidence

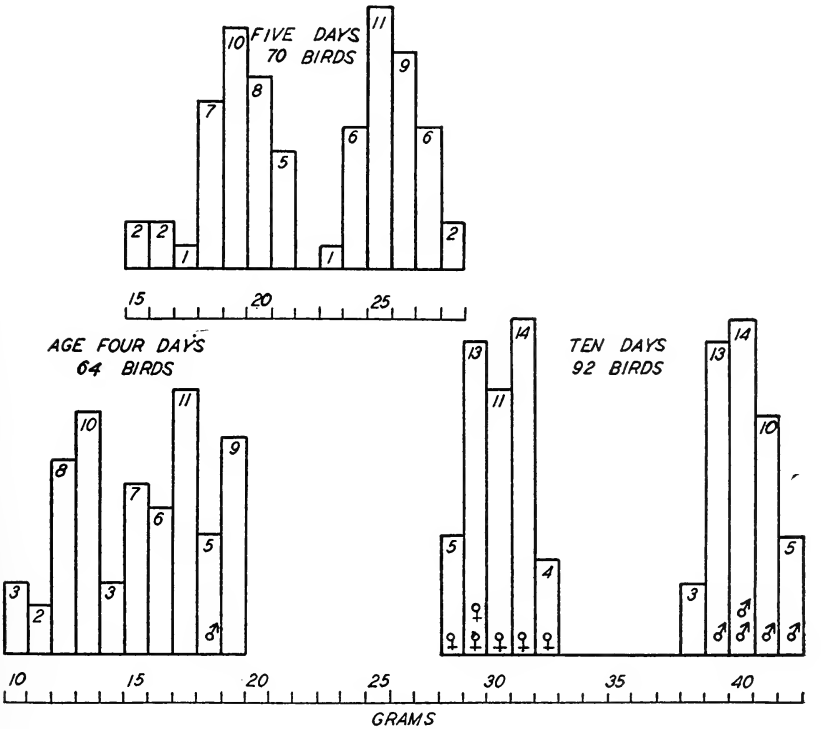

Figure 1. Weights of nestling Red-wings at four, five, and ten days of age. Frequency indicated by figure at top of each column. Each sex symbol represents an individual sexed by dissection.

that the difference in weight between the sexes begins early in the nestling stage. Due to the crude method of weighing used, it did not prove feasible to obtain statistically satisfactory means from these data. It is evident, however, that these samples show no overlap in weights after the fourth day. Since in this study nests were visited at daily intervals, there is a possible error in the method of aging the young which may amount to nearly a day. It can be seen from the data presented graphically in Figure 2 that this possible source of error in aging can

involve error in sexing until the eighth day, since some seven day old males weigh as little as the lightest of the eight day old females. On the ninth day the gap between the two groups is large enough to overcome this source of error in sexing. With more accurately aged nestlings and more refined methods of weighing doubtless the sexes could be distinguished at an earlier age.

Tarsal Lengths of Nestlings

The data on tarsal length were treated in much the same way as those on weights and they show the same general trends (Fig. 3). A

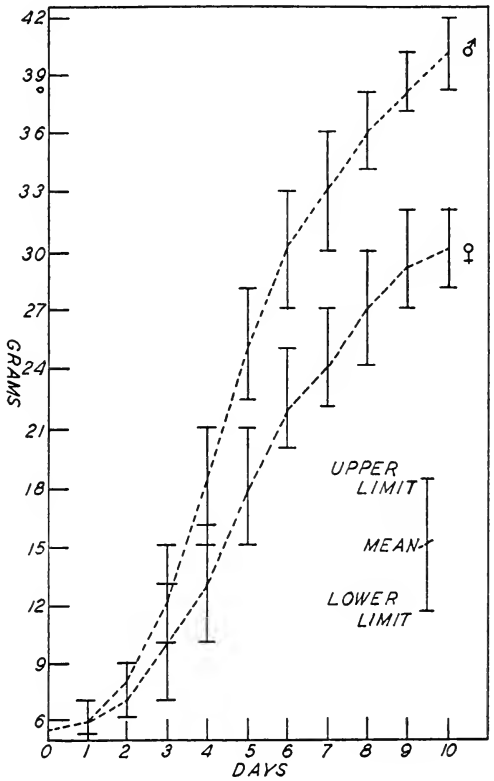

Figure 2. Daily weights of 25 male and 25 female Red-wing nestlings whose identity was known throughout the nestling period. The extent of individual variation is indicated by the length of the vertical bars. The broken line connects the means.

bimodal distribution is indicated at three days, but there is no break between the large and small groups until the eighth day. Even in the ten day old birds the gap is small. That the division into two groups

is associated with sex seems certain, since in a total of fourteen individuals of eight days or older that were sexed by dissection all of the females had tarsal lengths within the range of the small group for the corresponding day, while the tarsal lengths of the males were consistently those of the large group.

These data are based on a more accurate method of measurement than was used in weighing, and are subject to statistical analysis. At ten days the gap between the male and female groups is so small that one might suspect that an overlap would be found in a larger sample. The probability of this can easily be determined to a degree sufficiently accurate for practical purposes. The mean length for the ten day old

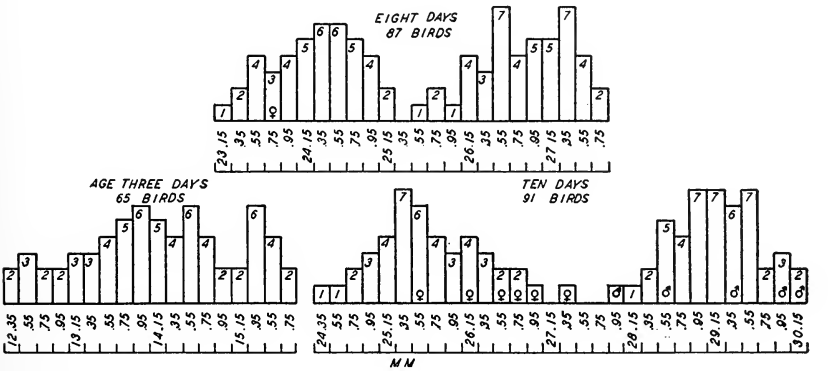

Figure 3. Tarsal lengths of nestling Red-wings at three, eight, and ten days of age. Frequency indicated by figure at top of each column. Each sex symbol represents an individual sexed by dissection.

females is 25.68 millimeters and the standard deviation is .66. For the males the mean is 29.15 and the standard deviation .51. Since in a normal distribution three times the standard deviation taken on either side of the mean includes about 99.75 per cent of the individuals (Simpson and Roe, 1939, p. 118), it follows that the probable limits of tarsal lengths in this population are: for the females, 23.70 to 27.66; for the males 27.62 to 30.68 mm. A negligible amount of overlap is indicated which would affect the accuracy of sexing by this criterion in less than one case in a hundred. It happens that in my data those individuals with tarsal measurements close to this theoretical area of overlap were among those sexed by dissection.

The range of individual variation is sufficiently great that an error in aging might involve an error in sexing even after the ninth day, since some nine day males have tarsi as short as some ten day females. Due to the larger hiatus between the sexes it seems evident that weights offer a more reliable criterion of sex than tarsal measurements.

The relative ease of securing the latter tends to overcome the advantage of using weights, and if the age of the nestlings is accurately known there would seem to be no appreciable error in sexing these nestling Red-wings on the basis of their tarsal length.

Sex Ratio

In his review of sex ratios among birds Mayr (1939) states: "The primary sex ratio of birds is easily obtained because it equals the secondary sex ratio in all those broods where the complete clutch of eggs hatches." In the Eastern Red-wing, however, and in other birds where there is variation in the egg complement it is not easy to decide what constitutes a "complete" clutch. According to Allen (1914, p. 99): "The usual complement is three or four, the one number being as common as the other. Not infrequently five eggs, and rarely six, are found in a nest." In practice however it may occur that an egg is laid outside of the nest or taken by a predator. Departures from the normal complement due to these causes are not easily detected, and in a single sample it is quite possible that such losses might result in a difference between the sex ratios at the time of fertilization and at hatching, that is between the "primary" and "secondary" ratios of Mayr.

In the 67 nests used for this study there were 7 with two eggs, 40 with three eggs, and 20 with four eggs, making a total of 214 eggs and an average of 3.19 per nest. Data concerning the fate of these are summarized in Table 1. In attempting to arrive at a primary sex

TABLE 1

Mortality in 67 Nests Containing 214 Eggs

	Number	Percentage
Eggs stolen or deserted	32	15
Infertile or died in embryo	26	12
Hatched but not fledged	51	24
Fledged	105	49

ratio it seems advisable to eliminate from consideration all nests with two eggs, since it is doubtful that they represent complete sets. Those nests for which records are incomplete, due to presence of sterile eggs, loss of eggs to predators, or loss of young before they reached an age at which sexing was possible, must also be eliminated. My records include complete histories of 35 nests in which there were three or four eggs, all of which hatched. Since undetected losses may have occurred from some of these nests the sex ratio obtained from my records is not to be regarded as a primary ratio but only as the closest possible approximation. The sex ratios in these 35 nests are presented in Table 2. A conspicuous random variation in individual nest combinations is apparent. The ratio of the entire group is 57 males to 62 females (47.9 per cent males, 52.1 per cent females; or 92 males per 100 females). Is the slight excess of females in this sample necessarily in-

dicative of an unbalanced ratio in the population? If we apply the Chi-square method (Snedecor, 1938, Chap. 1) and test the 57:62 ratio against the expected 50:50 the resulting value of Chi-square be-

TABLE 2

SEX RATIO IN 35 NESTS WITH 3 OR 4 YOUNG

Nest ratio	Frequency	Males	Females
4 to 0	1	4	0
3 to 1	4	12	4
2 to 1	9	18	9
2 to 2	8	16	16
1 to 2	7	7	14
0 to 3	5	0	15
0 to 4	1	0	4
Total	35	57	62

comes .210, far below the conventional level of significance. The conclusion is that the 57:62 ratio could easily occur as a random sample in a population with a true ratio of 50:50.

The ratios published by McIlhenny (1940) for the Gulf Coast Redwing are so widely at variance with the ratio found in the Indian Lake birds that it is almost inconceivable that the populations in the two localities are homogeneous with regard to sex ratio. Granting the accuracy of the method of sexing of the Louisiana birds, one can only conclude that conditions as regards sex ratio may be extraordinarily variable among the geographic races of a single species. A comparison with the ratios found by Herman (1938) again yields a striking discrepancy, since he states that in his birds there was a large excess of males (more than two males for one female). In this case a point of technique must be raised. As stated above, Herman's ratios were derived from birds which were banded as nestlings but not sexed until they were trapped sometimes after leaving the nest. There are reasons to question that this method is valid to disclose the sex ratio existing in a group of nestlings. First, the sex ratio in the population at the time of trapping will influence the returns. A surplus of males might result from a higher death rate among the females in the interval between banding and trapping. Another factor which might cause an apparent surplus of males is a greater susceptibility to traps on the part of the males. The existence of either of these hypothetical conditions might affect not only the total returns but also the sibling returns. There is ample evidence in Table 2 of variation in sex ratios among sets of siblings. It seems quite clear that a higher death rate among the females would favor the chance of the return of those sets of siblings which are predominantly males, and a difference in behavior between the sexes which resulted in males entering traps more readily than the females would have the same effect.

During the period from June 18 to July 22 there was fledged from the 67 nests under observation a total of 105 birds. It is possible that this number might have been slightly larger had I not removed certain nestlings which had lost weight. My experience, however, leads me to believe that such birds rarely survive. In arriving at a sex ratio among fledged birds all nests were included from which any birds of known sex were fledged. Of the 105 fledged young the sex was determined in 94 cases, either by weight or by tarsal length. The sex ratio among these birds was exactly balanced, with 47 males and 47 females.

Among the 51 casualties during nest life many losses occurred before the nestlings had reached an age at which sex could be determined by weights or tarsal measurements, and the dead nestlings, which could have been sexed by dissection, were seldom found. The proportion of this loss that was due to predators is not known. Of the 51 young which did not survive to be fledged the sex is known in only 21 cases. Of these 9 were males and 12 females. This suggests that the death rate may have been higher among the females. Testing the 9:12 ratio against the hypothetical even ratio by the Chi-square method yields a value of .428. Since this is far below the level of significance we conclude that the existence of a different death rate between the sexes cannot be established by these figures.

In general the results of the present inquiry fail to demonstrate any marked departure from a balanced sex ratio. It is by no means certain that sex ratios will prove to be the same in other localities within the range of the Red-wing, nor even at Indian Lake in other years. Before general valid conclusions can be reached further studies must be made. Ideally such studies should cover an entire nesting season. It is believed that the technique of sexing the young used in the present investigation should be of value to other workers. Due to the geographic variation in size within the species it will probably be necessary to determine the actual limits of the weights and measurements of the sexes independently in other localities.

Summary

In a study of nestling Eastern Red-wings made at Indian Lake, Ohio from June 18 to July 22 it was found that the young could be sexed by dissection at any time after hatching.

With the age of nestlings known to the nearest day it proved possible to distinguish between the sexes by means of weights after the fifth day, and by means of tarsal lengths after the eighth day.

The following sex ratios were found:

Among 119 young, representing the full egg complements of 35 nests, 57 males: 62 females.

Among 94 young which were successfully fledged, 47 males: 47 females.

Among 21 young which died during the nesting period, 9 males: 12 females.

The apparent deviation of the first and third of these ratios from the expected 50:50 could easily be due to random variation in sampling.

Acknowledgments

I am indebted to Dr. Charles F. Walker of the Stone Laboratory of the Ohio State University at Put-in-Bay, Ohio for advice during the course of the investigation, and for assistance in the preparation of this paper; to Mr. Otis Allen for the use of preserved specimens; and to Mr. E. A. McIlhenny for his courteous reply to my inquiry as to his methods of sexing young Red-wings.

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Lakeview, Ohio

GENERAL NOTES

Egg Weights of some Arctic Nesting Birds.—During the early summer of 1940 the writer accompanied Mr. Lawrence I. Grinnell of Ithaca, New York, on a trip to Churchill, Manitoba, for the purpose of collecting data on certain birds and mammals of that region. Mr. John Cruttenden of Quincy, Illinois, was also at Churchill during part of our stay there, collecting a limited number of eggs of various species of birds. With his kind permission I recorded in grams the weights of certain of the sets which he secured, as follows.

Pacific Loon (*Gavia arctica pacifica*), two sets: 101.3, 100.4 and 93.4, 98.6 (average, 98.4), both taken on June 17 and partly incubated.

Semipalmated Plover (*Charadrius semipalmatus*), three sets: 9.4, 9.4, 9.9, June 17; 8.7, 8.9, 9, 9.3, June 18; and 9.9, 10, 10.3, June 21 (average, 9.5). A fourth egg of the third set was blown by mistake before being weighed. Stage of incubation of these sets not recorded.

Hudsonian Curlew (*Phaeopus hudsonicus*), one set: 42.4, 45.7, 46.6, 48 (average, 45.7), taken June 18, slightly incubated.

Least Sandpiper (*Pisobia minutilla*), three sets: 4.2, 5.4, 5.7, 5.7 and 5.6, 5.7, 6.2, taken June 17; and 4.7, 4.9, 5.1, 5.1, taken June 18. The lightest egg of the first mentioned clutch was cracked and therefore, omitting this one, the remaining ten average 5.4 grams. None were very far advanced in incubation.

Dowitcher (*Limnodromus griseus hendersoni*), one set of three about three days after completion of the clutch: 16.7, 17.3, 17.6 (average, 17.2), taken June 18. I personally collected and sexed the incubating bird, which proved to be a female.

Stilt Sandpiper (*Micropalama himantopus*), one set: 10.4, 10.9, 10.9, 11 (average, 10.8), taken June 21 when slightly incubated.

Semipalmated Sandpiper (*Ereunetes pusillus*), two sets: 7.2, 7.2, 7.5, 7.6, taken June 17; and 6.7, 6.9, 7, 7.1, taken June 18 (average, 7.2). The former were incubated about one week, while the latter were fresh.

Northern Phalarope (*Lobipes lobatus*), two sets: 5.8, 6.2, 6.3, 6.4 and 6.2, 6.2, 6.4, 6.5 (average, 6.3), both taken June 17 and stage of incubation not noted.

Arctic Tern (*Sterna paradisaea*), two sets: 16.9, 17.4 and 16.5, 17, 17.2 (average, 17), taken June 17. Both sets were slightly incubated.—RALPH S. PALMER, *Ithaca, New York.*

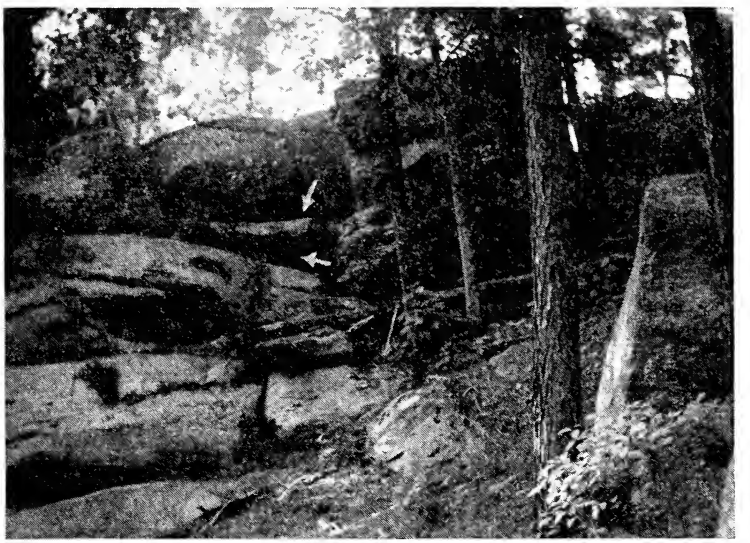
Black Vulture and Red Fox Found in Unusual Association.—On June 17, 1939, Mr. J. W. Webb, an employee of the Alabama Cooperative Wildlife Research Unit, found an occupied den of the red fox (*Vulpes fulva*) in a large rocky outcrop about ten miles west of Auburn, Lee County, Alabama. While searching for other entrances to the fox den, he discovered a nest of the Black Vulture (*Coragyps atratus atratus*) containing a nestling approximately a week old. The rocks, known locally as "Buzzard Rocks," have provided nesting sites for Black Vultures for years.

The nest was situated on a rock shelf overhung by a huge boulder, a location typical of Black Vulture nesting sites in this region. On being approached, the young bird paid little attention to the observer, neither attempting to hide in the deeper recesses of the pocket nor showing other evidences of fear. Judging from the size of the nestling and the fact that it exhibited no fear, it was estimated to be from four to eight days old. Young Black Vultures over a week old almost invariably display fear and defiance when their nest is visited for the first time.

Under the rocky slab was a large crevice extending directly beneath the nest and continuing an undetermined distance into the outcrop, gradually narrowing to a passage about 12 inches in diameter. Just back of the nest the slab ended,

allowing the upper and lower crevices to unite. This arrangement provided two avenues by which the adult birds could leave the nest; the first, by the upper entrance; the second, by way of the lower opening (see photograph). To use the lower exit the birds had to leave the nest from the rear, jump down some two feet to the crevice floor and then pass to the outside. There was some evidence that both avenues were being used.

Upon examination it was discovered that the lower entrance was being used regularly by foxes and that the lower passageway was apparently one way of entering their den. This opening showed considerable recent use and den refuse was scattered nearby.



The nest was visited again on June 29, at which time an adult vulture was flushed from the nest. The nestling at this time was approximately one-fourth as large as a mature bird but was still entirely covered with yellow juvenile down. On this visit, the young bird ran to a corner of the crevice, hissed loudly and regurgitated its latest meal of a DeKay's snake (*Storeria dekayi*) and some well digested, unidentifiable meat particles. The foxes were apparently still using the lower entrance. The fallen tree just below the lower arrow (see photograph) showed evidence of having been gnawed extensively by the foxes while they played or searched for insects. The remains of a chicken and several rabbits which they had captured since the first visit were found nearby.

Since the fox is supposed to be very fond of eating birds' eggs, young birds, and even grown ones, it is interesting to note that these foxes had not disturbed the nestling or the parent birds, even though they had easy access to them. Not only had they not been disturbed, but the birds had been allowed to use part of the den entrance. The foxes apparently preferred to catch and transport chickens from a farm house some three-fourths of a mile or more away rather than eat the Black Vultures—a preference for which the foxes could hardly be blamed!—Frederick S. Barkalow, Jr., *Department of Conservation, Box 469, Auburn, Alabama.*

Snow-killed Bobwhite Covey—While making the routine spring check-up at the Faville Grove game management area at Lake Mills, Wisconsin, on April 22, 1940, in company with Arthur S. Hawkins of the Illinois Natural History Survey, we came upon a covey of Bobwhite Quail (*Colinus virginianus*) that had died during the previous winter.

The hapless covey was found in a small copse of second-growth oaks with an undergrowth of wild raspberry, grape, and dried weeds. The copse is triangular, bounded by grazed pasture, tamarack swamp, and oat stubble on its three sides. The birds had evidently gone to roost on the leeward side of the copse, and on the leeward side of a grape tangle, in an open growth of raspberry and weeds. The date of their demise must have been after January 5, 1940, for on that date Hawkins flushed a covey from this same copse and counted sixteen birds. On January 14 an 8.7 inch snow fell during the night and then drifted. It seems likely that our covey was unable to dig out of the drift and fell victim to starvation in their "snow prison." Eight bodies were found, still arranged in rosette formation. What happened to the other eight birds? Some may have died between the date last seen and the date of the storm. Some certainly were removed from the roost by scavenging animals, for one wing and a few breast feathers were found eight feet from the "death circle."

A feeding station that had been operated during the winter stood, as if in mockery, but 25 yards to the south of the dead covey.

Both crop and gizzard contents were too far gone to be identified. The plumage was used to sex and age the birds. The sex ratio was four males to five females. Five of the eight birds were young ones, of which three were males.

But for this one storm, the winter of 1939–40 was comparatively mild. It would appear, therefore, that sudden storms may prove to be as disastrous as continuously severe weather. Few snow-killed coveys have been recorded. Douglas E. Wade (*Bird Lore*, 40, 1938: 7–10) has traced the separate fates of a covey scattered during a blizzard, but we know of no published account of an entire covey found dead on the roost.—Robert McCabe and Aldo Leopold, *University of Wisconsin, Madison, Wisconsin.*

Red Phalarope and Other Water Birds at Lexington, Virginia.—The following notes are supplementary to two former papers in *The Wilson Bulletin* (47, 1935: 59–67 and 49, 1937: 48–9). The two previous papers listed 56 forms for Rockbridge County. Since then five additional species have been recorded. Of land birds, 180 forms have been recorded, making a total of 241 species and subspecies for this mountain county.

King Rail. *Rallus elegans elegans.*—On May 15, 1940, one of these birds, alive and in good condition, was brought to me. It had been captured while trying to get through a fence in a chicken yard on South Buffalo Creek, eight miles from Lexington. The friend who showed the bird to me promised to release it.

Yellow Rail. *Coturnicops noveboracensis.*—One was captured on September 29, 1937, and brought to me alive. It was later released. The man who captured it saw others at the same time.

Purple Gallinule. *Ionornis martinica.*—One, of which I have the skin, was captured on May 16, 1940, on South Buffalo Creek, about ten miles from Lexington (*Auk*, 57, 1940: 566). A more unlikely place for such a bird than this mountain stream could scarcely be imagined.

White-rumped Sandpiper. *Pisobia fuscicollis.*—My daughter, Jane, and I found one of these birds at a rain pool in a field two miles north of Lexington, on September 30, 1940. I had close views of the bird for some time with 8X glasses, flushing it several times to observe the white rump. The next day I tried without success to collect the bird. At times it was in company with Killdeers, and again with a small flock of Pipits. This species is extremely rare in western Virginia.

Red Phalarope. *Phalaropus fulicarius*.—On September 30, 1940, my daughter and I found a phalarope swimming about in shallow water at Cameron's Pond, a mile north of Lexington. I thought that it was a Northern Phalarope, but it seemed too large, so I went home for a gun and collected it. The heavy bill and blue-gray back identified it as a Red Phalarope. The moult to winter plumage was not complete, the bird being considerably darker than typical winter specimens. It was a female, and fairly fat. There are only three previous records for Virginia, all of them curiously enough being inland records (Montgomery County; 50 miles up the Potomac from Washington, D.C.; and Charlottesville).

Additional records on certain other birds have been made during the four years since the last paper was published. I have one summer record, July 27, 1937, for the Pied-billed Grebe (*Podilymbus podiceps*). Professor R. S. Freer saw another Double-crested Cormorant (*Phalacrocorax auritus*) in James River at Snowden, just outside our area, on May 8, 1937; and I saw an immature bird on North River inside the city limits of Lexington on October 19 and 22, 1939. The American Egret (*Casmerodius albus egretta*) now occurs not uncommonly from June 22 to October 1. Several years ago a Black Duck (*Anas rubripes*) joined a flock of domestic ducks at Big Spring Pond, and has mated regularly with one of the females each summer since. A female wild Mallard (*Anas platyrhynchos*) at the same place mated with a domestic drake and nested successfully in 1938 and 1939. The Sora (*Porzana carolina*) is much less common than formerly, because of the drying up of suitable small marshes. I now have a number of records for the Ring-billed Gull (*Larus delawarensis*) in September, December, February, and several years in April; and several additional March and April records for the Bonaparte's Gull (*Larus philadelphia*).—J. J. Murray, *Lexington, Virginia.*

Community Bathing of the Cedar Waxwing.—While waiting at Glen Haven, Michigan, on June 7, 1940, for the boat to South Manitou Island, we noticed an interesting habit of a flock of Cedar Waxwings (*Bombycilla cedrorum*). Between 55 and 60 Waxwings were in a small aspen tree next to a pool of stagnant water in a depression on the beach of Lake Michigan. Some of the birds were bathing in the water while others were sitting quietly or preening themselves in the tree. Periodically one or several of the bathing birds would fly up into the tree and almost immediately they would be replaced at the pool by others from the tree. Thus there were always about 15 or 20 birds from the flock bathing at any one time. A considerable portion of the pool was never used by the birds, and the bathing individuals kept close together. The weather was cloudy and cool with occasional light rain. The flock was still bathing when we left, nearly an hour after we had first noticed them.

On July 5 during another visit to Glen Haven a flock of about the same size as before was noted bathing in the pool. Their behavior was the same as on the previous occasion for they not only used the same tree but the same end of the pool. The day was clear and warm, and the flock spent most of the afternoon bathing. The nesting activities of mid-summer may have brought to an end the community bathing habits of the Waxwings as observations made on July 29, 30, and August 1 disclosed no birds bathing at the familiar pool.—Arthur E. Staebler and Leslie D. Case, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

EDITORIAL

The twenty-sixth Annual Meeting of the Wilson Ornithological Club, held November 21 to 23 at the University of Minnesota Museum of Natural History in Minneapolis, was one of the largest and most successful we have ever had. Details and proceedings of the meeting will appear in the March *Bulletin*.

The Club needs very much copies of the December, 1908, and March, 1916, *Wilson Bulletin*. Members who know of copies which are not being used are asked to communicate with the Editor.

In response to the requests which have come in, we are having made a few reprints of the "Short Papers" section of this issue. These copies will be printed on only one side of the paper so that they may be cut up to form card index bibliographies of current literature or special topics. We will have a limited number of extra copies to supply those who have not ordered them in advance.

The Wilson Ornithological Club wishes to thank Mr. J. B. Semple of Sewickley, Pennsylvania, for his generous gift which makes it possible to publish the handsome colored plate that illustrates this issue.

A gift from William Youngworth of Sioux City, Iowa, enables us to publish two more large photographs in this issue than would otherwise have been possible.

We wish to express here our sincere thanks for the editorial assistance received during the past year from Maurice Brooks, Helen T. Gaige, Harry W. Hann, Harrison F. Lewis, Waldo L. McAtee, Theodora Nelson, and Max M. Peet.

OBITUARY

Francis H. Herrick died on September 11, 1940, in his eighty-second year. He was the leading authority on Audubon and was the author of the definitive biography of that great naturalist. Professor Herrick was one of the very early leaders in the field of bird photography and published in 1901 one of the first books on the subject. He also spent a number of years studying the nest life of the Bald Eagle, but even more important in the development of American ornithology were his invaluable, pioneering papers on the psychology and nesting habits of birds.

Frank S. Hall died on July 7, 1940, while returning by train from Puget Sound to Spokane. After serving on the staff of the University of Michigan Museum from 1907 to 1909, he went to Washington to serve as curator of the Washington State Museum and later as director of the Spokane Public Museum. Long a leader in natural history work in the Pacific Northwest, he was principally responsible for the founding of the Pacific Northwest Bird and Mammal Society and its excellent journal, *The Murrelet*.

Willis W. Worthington, noted naturalist and bird collector, died at Shelter Island, New York on October 4, 1940, in his seventy-ninth year. He was famous for his skill in the field, and his excellent bird skins are familiar to every museum worker. He had made many trips, especially for Carnegie Museum, to Mexico, the West Indies, and various parts of the United States.

Robert W. Williams, Chief Counsel of the U. S. Fish and Wildlife Service, died in Washington, D. C., on September 19, 1940. He had served the United States government in various kinds of conservation work for nearly forty years and had a notable record of accomplishment.

ORNITHOLOGICAL LITERATURE

LIFE HISTORIES OF NORTH AMERICAN CUCKOOS, GOATSUCKERS, HUMMINGBIRDS AND THEIR ALLIES. ORDERS PSITTACIFORMES, CUCULIFORMES, TROGONIFORMES, CORACIIFORMES, CAPRIMULGIFORMES AND MICROPODIIFORMES. By Arthur Cleveland Bent. United States National Museum Bulletin 176, 1940. viii + 506 pp. 73 plates. $ .75. Supt. of Documents, Washington, D. C.

This is the thirteenth of Mr. Bent's valuable volumes on life histories of North American birds and a very fine volume it is. The six orders included offer such a variety in their habits that the volume makes fascinating reading. Notable chapters have been contributed by Messrs. E. C. Stuart Baker, Alexander Skutch, George Sutton, and others. Very interesting is the account of the Khasia Hills Cuckoo (*Cuculus canorus bakeri*): the sexes are "promiscuous in their sexual relations"; the female sometimes adopts a territory from which she excludes all other females "parasitic on the same foster parent," but not females "parasitic on a different species"; eggs were collected from one cuckoo for 11 years; incubation usually takes 12 or 13 days. "The period the nestling remains in the nest is 4 to 6 weeks, but in many cases the nest is far too small to retain the young cuckoo until it is full grown," and this is often disastrous to the bird. Unlike our Cowbird, "The young Khasia Hills cuckoo ejects the fosterer's eggs or young from the nest in the same way as its English cousin does, possessing the same interscapulary pit to assist it in doing so. This structural aid to ejection is found in all such genera as *Cuculus*, *Cacomantis*, *Penthoceryx*, and others that eject their foster brothers and sisters, but not in the young of *Clamator*, *Eudynamis*, and those cuckoos that do not commit such murders. In the cuckoos that possess it, the pit soon fills and young cuckoos lose the impulse to eject after a very short time, sometimes within 4 days and almost invariably within a week of being hatched."

Ringed Kingfisher (*Megaceryle t. torquata*) parents take turns of 24 hours each when incubating the eggs, each bird taking a single recess in the afternoon. The young stay in the nest about 35 days, some 10 days longer than young Belted Kingfishers. Dr. Gross gives a long account of nesting of the Eastern Nighthawk on the roof of a building, Dr. Sutton a lively chapter on the Roadrunner.

A charming life history is given by Mr. Skutch of the White-eared Hummingbird (*Hylocharis l. leucotis*), "one of the most abundant and familiar hummingbirds" of the Guatemalan highlands. After the rainy season from May to October, in "November and December, the first months of clear sunny weather, there is a greater profusion of bright, conspicuous blossoms than at any other period of the year. Hummingbirds of all kinds nest during this flowery season, despite frequent cold, biting winds, and the frosts that from November to the end of March form almost nightly on open fields above 7,500 feet." All the other birds wait till spring to nest. Male White-ears congregate into "singing assemblies," each bird perched from 60 to 100 feet from his neighbor; some of these groups gave a "clear, silvery tinkle," others a "chirping note." "The territorial rights of each white-ear were respected by the others, and as a rule each sounded his little tinkle without much interference from his neighbors." "The female white-ear built her nest alone, without the assistance or even the encouragement of one of the males that sang so tirelessly beyond sight and hearing." "If ever nestlings seem to need the ministrations of a father, to help feed them and to warm them while the mother takes her recesses and seeks her food, it is these little hummingbirds; yet no male ever appears to aid in their care, for this is not the custom among hummingbirds." One mother still fed her 40 day old son of the first brood, although she was now incubating her second set of eggs. The chapter should be read and enjoyed in toto.

It would sometimes be better if Mr. Bent did not quote quite so widely, or if he quoted more reliable authorities. For instance, the account of Bralliar of the mother Belted Kingfisher teaching her young to catch fish until "she was convinced of the skill of each of her brood" is a bit too plausible to be convincing. It is too bad to cite erroneous statements as to the length of the incubation period of the Ruby-throated Hummingbird (14 and 11 days) and omit two of the reliable observations that show it to be at least 16 days, or to repeat the wild statement that the young of this species may stay in the nest only 6 days when they really stay some 3½ weeks.

The index and full bibliography are of great value, while the hundred and forty odd photographs deserve the highest praise. Mr. Bent is to be heartily congratulated upon his thirteenth volume.—M. M. Nice.

Birds of Lucas County [Ohio]. By Louis W. Campbell, Bulletin Toledo Zoological Society, 1, No. 1, October 1, 1940: 6 x 9 in., 1–225, folding map. $.50.

This report of the birds found in a county in northwestern Ohio concerns an area of approximately 342 square miles of land and 275 square miles of water. The field work covered a period of 13 years, from January 1, 1926 to December 31, 1939. There is an introduction containing brief accounts of the physical geography of the county, various bird habitats, migration lanes, effects of weather on birds, and a history of bird life in former years. Following that is an annotated list of the recorded 285 species and 13 additional subspecies of birds, plus 3 hybrids (2 warblers and a junco); a hypothetical list of 5 species, and a list of 16 birds of possible occurrence. There are 5 appendices, in tabular form, which include important data on extreme and average dates of arrival and departure of transient and summer resident forms. An index of the scientific and common names of birds completes the report. Typographical errors are few and the format is pleasing. Unfortunately there are 2 shades of paper, divided into 4 sections, which detract from the otherwise pleasing appearance of the book. Despite this, the Toledo Zoological Society has produced, in this new series, a nicely printed publication.

Mr. Campbell states that the purpose of the report is (1) to acquaint the people of northwestern Ohio with the bird life of the area, and (2) to include sufficient scientific data to make it of value to ornithologists. To do this it was necessary to combine popular appeal with scientific accuracy, a difficult "carrying of water on two shoulders" which has been creditably accomplished. The writing is at all times clear, although occasionally one wishes an account had been more detailed. Although credit is given to many individuals and several organizations the majority of the field work obviously has been done by Mr. Campbell. Most of the unusual bird records made by him are validated by preserved specimens that are deposited in museums, and one finds little to criticise and much to commend in his personal observations. However, at times he appears to have placed too much faith in the observations of others, by accepting sight records as positive which should be questioned (see Eastern Blue Grosbeak, p. 163).

The author is fortunate in living in Lucas County. This county, with its great diversity of habitats, is situated at the western end of Lake Erie, at the junction of at least two important migration routes, and it therefore unquestionably contains one of the richest avifaunas of any Ohio county. This region has been sadly neglected in the past, which aids in making Campbell's contribution of more than usual importance to ornithologists. It is a source of satisfaction, in this day of paid fellowships, grants, and other subsidies, to find a naturalist enthusiastic enough to expend freely so much of his own time and effort in the production of a thorough report like this one. Mr. Campbell is to be congratulated.—Milton B. Trautman.

THE ECOLOGY AND ECONOMICS OF THE BIRDS ALONG THE NORTHERN BOUNDARY OF NEW YORK STATE. By A. Sydney Hyde. Roosevelt Wildlife Bulletin, 7, No. 2:62–215, figs. 26–57, map. Oct., 1939 (Copy received May, 1940).

This paper deals with the birds inhabiting a narrow, 500-mile strip of territory along the south shore of Lake Ontario from Point Breeze to a point on the New York-Quebec boundary northeast of Chateaugay. The field work was done during June, July, August, and early September in 1935 and 1936.

The title is woefully misleading. Three fourths of the pages are devoted to an annotated list of 176 species plus a hypothetical list of 17 species of the summer, spring, and fall birds. The remaining pages are concerned with general descriptions of the area and its bird life; of these pages, *three* deal directly with ecology and *two* with economics. What therefore appears to be a fresh approach to the study of the birds of an extensive, rich area is actually an old-style annotated list!

The text is decidedly popular. For example, the Catbird (p. 167) is spoken of as a "slender slaty slinker." Original observations are numerous and commendable but all too often they are buried amid a jumble of remarks that have no specific application to the birds of the area in question. The information presented under each species follows no plan: the status may be mentioned under one but not the next; descriptions of coloration, plumage, song, and behavior are given under some species but not all of them.

The purpose of this paper is undoubtedly a guide to the birds of the region but it is shadowed by an inappropriate title and poor organization. The paper is profusely illustrated with many excellent photographs.— O. S. Pettingill, Jr.

SHORT PAPERS

AUSTIN, OLIVER L. Some Aspects of Individual Distribution in the Cape Cod Tern Colonies. *Bird-Banding,* 11, No. 4, Oct., 1940: 155–69, map.

BAKER, BERNARD W. Notes on Sandhill and Little Brown Cranes in Texas. *Jack-pine Warbler,* 18, No. 3, July, 1940:74–7, figs. 1–2.

BARTLETT, HARLEY H. The Reports of the Wilkes Expedition, and the Work of the Specialists in Science. *Proc. Amer. Phil. Soc.,* 82, No. 5, June, 1940:601–705. (Includes sections on the ornithological work of Peale and of Cassin. The new birds in Peale's extremely rare volume are listed, together with Cassin's disposition of each in his revised "edition" ten years later).

BIRD, C. G., and E. G. BIRD. Some Remarks on Non-breeding in the Arctic, especially in North-east Greenland. *Ibis,* 1940, Oct.:671–8.

BLAKEMORE, LEM A. Barred Owl Food Habits in Glenwood Park, Minneapolis, Minnesota. *Flicker,* 12, No. 3, Oct., 1940:21–3.

BOND, RICHARD M. Birds of Anaho Island, Pyramid Lake, Nevada. *Condor,* 42, No. 5, Sept., 1940:246–50, figs. 70–3.

BRAUND, F. W. Lincoln's Sparrow Breeding on the Upper Peninsula of Michigan. *Jack-pine Warbler,* 18, No. 3, July, 1940: 67–8, fig. 1.

BRODKORB, PIERCE. New Birds from Southern Mexico. *Auk,* 57, No. 4, Oct., 1940: 542–9. (New subspecies of *Sterna albifrons, Tapera naevia, Chordeiles acutipennis, Chloroceryle amazona* and *americana, Aulacorhynchus prasinus, Cissilopha yucatanica, Heleodytes zonatus, Dendroica graciae, Agelaius phoeniceus, Saltator atriceps, and Aimophila rufescens*).

BRODKORB, PIERCE. A New Hawk from Southern Mexico. *Univ. Mich. Mus. Zool. Occ. Papers No.* 425, Nov. 30, 1940:1–4. (*Buteo magnirostris petersi* subsp. nov. from "above Arriaga, Chiapas").

BROOKS, ALLAN. An Estimate of Our Hawks. *Field and Stream,* 45, No. 3, July, 1940:21–4, 61–5, 85. (Fully illustrated in black and white with the author's pictures).

BROWN, FRANK A. JR., and MARIE ROLLO. Light and Molt in Weaver Finches. *Auk,* 57, No. 4, Oct., 1940:485–98.

CHAPMAN, FRANK M. Señor Sparrow. *Nat. Hist.,* 46, No. 4, Nov., 1940:200–4, illus. (An excellent popular account of the author's geographical study of *Zonotrichia capensis*).

CHENAULT, TANDY P. The Phenology of Some Bob-white Food and Cover Plants in Brazos County, Texas. *Jour. Wildlife Management,* 4, No. 4, Oct., 1940: 359–68.

CRILE, GEORGE, and DANIEL P. QUIRING. A Record of the Body Weight and Certain Organ and Gland Weights of 3690 Animals. *Ohio Jour. Sci.,* 40, No. 5, Sept., 1940:219–59. (Many diverse species of birds are included).

DAVIS, DAVID E. Social Nesting Habits of *Guira guira. Auk,* 57, No. 4, Oct., 1940: 472–84.

DEADERICK, WILLIAM H. An Annotated Bibliography of Arkansas Ornithology. *Amer. Midl. Nat.,* 24, No. 2, Sept., 1940:490–96.

DEAR, L. S. Breeding Birds of the Region of Thunder Bay, Lake Superior, Ontario. *Trans. Royal Canadian Inst.,* 23, Pt. 1, Oct., 1940:119–43. (Address: 198 College St., Toronto, Ont.).

DEUSING, MURL. Bald Eagle Range and Population Study. *Passenger Pigeon,* 2, No. 9, Sept., 1940:103–6, photo, map. (In Wisconsin).

EDNEY, J. M. The Sandhill Crane in Middle Tennessee. *Jour. Tenn. Acad. Sci.,* 15, No. 4, Oct., 1940:401.

EMLEN, JOHN T., JR. The Midwinter Distribution of the Crow in California. *Condor,* 42, No. 6, Nov., 1940:287–94, figs. 79–80.

ENGLAND, E. G. A Nest of the Arctic Three-toed Woodpecker. *Condor,* 42, No. 5, Sept., 1940:242–5, fig. 69. (In Sierra County, Calif.).

ENGSTROM, HUGH R. 1940 Minnesota Nesting Records. *Flicker,* 12, No. 4, Dec., 1940:46–52.

ERICKSON, ARNOLD B. Editions of Wilson's "American Ornithology." *Flicker,* 12, No. 4, Dec., 1940:44–6.

FLEETWOOD, RAYMOND J. Birds of the Piedmont National Wild Life Refuge. *Oriole,* 5, No. 3, Sept., 1940:25–8. (A nominal list of the 137 species recorded in this Refuge in Jones and Jasper counties, Ga.).

GANIER, ALBERT F., and ALFRED CLEBSCH. Summer Birds of Fall Creek State Park. *Migrant,* 11, No. 3, Sept., 1940:53–9. (In Van Buren and Bledsoe counties, Tenn.).

GROSS, ALFRED O. The Migration of Kent Island Herring Gulls. *Bird Banding,* 11, No. 4, Oct., 1940:129–55, 1 photo, 2 maps. (Also treats in some detail the returns from 1,409 gulls banded on the Great Lakes).

HIBBERT-WARE, MISS A. An Investigation of the Pellets of the Common Heron (*Ardea cinerea cinerea*). *Ibis,* 1940, July:433–50.

HOWARD, WILLIAM J. Wintering of the Greater Snow Goose. *Auk,* 57, No. 4, Oct., 1940:523–31.

KENDEIGH, S. CHARLES. Factors Affecting Length of Incubation. *Auk,* 57, No. 4, Oct., 1940:499–513.

KIRKMAN, F. B. The Inner Territory of the Black-headed Gull. *Brit. Birds,* 34, No. 5, Oct. 1, 1940:100–4.

LACK, DAVID. Variation in the Introduced English Sparrow. *Condor,* 42, No. 5, Sept., 1940:239–41.

LACK, DAVID. Habitat Selection and Speciation in Birds. *Brit. Birds,* 34, No. 4, Sept., 1940:80–4.

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