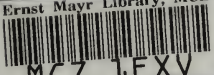


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THE
WILSON BULLETIN

A Quarterly Magazine
of
Ornithology

Edited by
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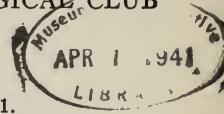
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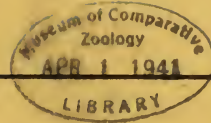
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THE PROTHONOTARY WARBLER, A COMPARISON OF NESTING CONDITIONS IN TENNESSEE AND MICHIGAN

BY LAWRENCE H. WALKINSHAW

REELFOOT LAKE, a great resort for the hunter and fisherman, its shores dotted with camps and cabins, is located in the extreme northwest corner of Tennessee. Here extensive bottomland borders, heavily shaded park areas, numerous old buildings near the water's edge, and even protruding stubs from the lake itself, offer suitable nesting habitat for the Prothonotary Warbler (*Protonotaria citrea*). Here, in contrast to areas farther north, the species is abundant and mosquitos during day time are almost absent, an excellent area for ornithological investigation. The canal at Spillway, immediately south of the lake, offers the most comparable area to the one where I have studied the species in Michigan. Whereas, the Battle Creek River winds through a wooded bottomland and has areas of both shallow



Figure 1. The Spillway, Reelfoot Lake, Tennessee. April 9, 1939. At high water stage.

and deep water, this Tennessee canal, straight in course, is deeper, but also has shaded banks, one side especially having a bottomland region similar to the northern area. The widths of both streams are about the same. After studying the Prothonotary Warbler for two summers, 1937-38, along the Battle Creek River in Calhoun County, Michigan (studies published in 1938 and 1939) where conditions proved extremely adverse to the nesting of the species, I selected this Reelfoot Lake area for a comparative study.

On April 9, 1939, when Wayne Tice and I arrived at the lake, the Prothonotary Warblers were already present and some were even nesting. We erected thirty bird houses along the canal, all placed on bordering trees three or four feet above the water, excepting one placed on a tree in a park-like area of a local camp. With the aid of a young man, Carlos Woods, of Spillway, news of the happenings during the next few weeks in these bird houses was forwarded to me in Michigan with the result that the next visit was timed during the latter part of May and a third visit during the latter half of June. During the rest of the time many early morning hours and week-ends were spent during May and June visiting the region in southern Michigan where 36 bird houses had been placed along the river near Battle Creek.

During 1940, I visited the area at Reelfoot Lake for only a short period (April 24 to 26, and July 7 to 9). The usual hours were spent studying the area in Michigan.

The canal south of Spillway, Tennessee, normally about 75 feet wide, but wider with the high water conditions of early 1939 and 1940, forms the boundary between Lake and Obion counties. The trees on the area west of this canal had been somewhat cut over so that the east or Obion County bank offered the most shade. In 16 houses in Obion County in 1939 were found 16 nests of the Prothonotary Warbler, while 7 nests were located in the wooded bottomland regions along the lake shore. In Lake County only 8 nests were found in the remaining 14 houses, but 10 additional nests were under observation at one time or another. On April 25, 1940 seven male Prothonotary Warblers were found building nests in the bird houses along the canal. Many of these houses were at least two-thirds full of moss and cypress needles, yet there was no sign of a female bird about except in 3 cases where the nests were nearly complete. The spring of 1940 was very cold, even as far south as the Gulf states, consequently nesting started much later. Since I was unable to visit the area during May and June, the main portion of the nesting season was missed during 1940 in Tennessee, but when Bernard Baker and I visited the area in July we found that nearly every bird house had been occupied and that 6 still contained nests with eggs or young. In addition to these, 8 other nests were found. Only 5 of these nests (2 in bird houses) were located in Lake County, the remainder were located in Obion County.

In Michigan during 1939, 19 nests were found, only 8 of which were in bird houses. During 1940, 29 nests were located, of which 18 were in bird houses. During the warbler nesting season only 6 houses were occupied by House Wrens as compared with 18 during 1939.

Whereas only three birds were observed at Spillway, Tennessee on April 9, 1939, an average of 42 birds (26 to 53) per day were observed during the six-day period May 15 to 20, 1939 when an average of 12 hours per day were spent in the field. During late June, 1939 the number observed per day still ranged about 40 birds. At Walnut Log on the northeast corner of the lake 18 birds were observed along the Bayou du Chien on May 17, 1939 during a short visit to that area. Eleven male Prothonotary Warblers were observed during one hour on April 24, 1940, 31 birds during 14 hours on April 25 and about 50 adults on July 8, 1940 as well as an estimated 25 full-grown young. During the summers of 1939-40, 139 hours were spent in the field at Reelfoot Lake, during which time 529 adult birds were observed, an average of 3.8 birds per hour. At Battle Creek, Michigan during the summers of 1937 through 1940, 679 hours were spent in the field during which time, 2262 adult birds were observed, an average of 3.33 birds per hour. These observations are summarized in the following table:

TABLE 1

MICHIGAN

Year	Hours in field	Number of adult birds observed	Average number of birds per hour
1937	204	820	4.02
1938	241	717	2.97
1939	110	358	3.25
1940	124	367	2.96
Total	679	2,262	3.33

TENNESSEE

1939	92	341	3.7
1940	47	188	4.0
Total	139	529	3.8

NESTING

During 1939, the first nest at Reelfoot Lake was shown to me by R. W. Morris on April 9, where it had just been accidentally tipped out of an overturned motor-boat. It contained three eggs, the first of which must have been laid by April 5 or 6. The first young left a neighboring porch on May 11, giving the approximate date of the first laid egg as April 17 in that nest. The known dates of first laid eggs in nests

in that region during 1939 were as follows: April 30, May 1, 1, 1, 5, 6, 7, 13, 14, 16, 16, June 3, 11 and 23. Although I did not visit the Tennessee area during July and August, 1939, Carlos Woods stated there was a nest in bird house No. 30 in the Morris yard from which the young left about August 10. He captured the female parent, a banded bird that had previously raised a brood in nest box No. 1, some 150 yards away. The first egg in this nest must have been laid about July 15. In 1940 no nests were ready for eggs when we left the area April 26, yet several nests were ready for eggs when we left the area on that date. On July 9, 1940, when we left the area for the last time, three nests still contained eggs. The young in those nests would have left between July 21 and August 1.

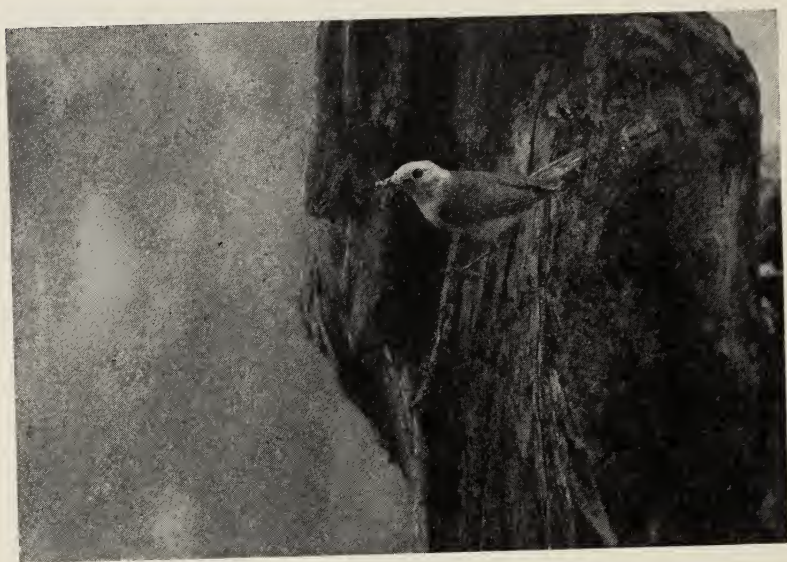


Figure 2. Prothonotary Warbler at the nest hole. Reelfoot Lake. July 8, 1940.

In Michigan during 1939 the first laid eggs were as follows: May 18, 21, 22, 24, 24, 27, 31, 31, June 6, 7, 8, 11, 15, 15 and 27. The last nest was terminated July 6. During 1940 the first eggs of sets were laid May 22, 25, 26, 27, 29, June 2, 6, 7, 8, 10, 12, 13, 15, 18, 23, July 1 and 5. The last nest was terminated on July 14.

Usually Prothonotary Warblers were much more leisurely with their nesting operations at Reelfoot Lake than in Michigan. First nests in both Michigan and Tennessee required longer than second or third

nests in both time of construction and rest following construction before the first egg was laid. These averages were as follows:

TABLE 2

MICHIGAN

Year	Number of nests	Average time required for nest construction	Average period of rest before laying of first egg
1937	19	3.68 days (1-11)	3.2 days (1-5)
1938	16	2.13 " (1-7)	1.69 " (1-5)
1939	10	4.2 " (1-6)	1.4 " (1-4)
1940	9	3.3 " (1-12)	1.1 " (1-2)
Average		3.26 "	2.07 "

TENNESSEE

1939	8	8.8 days (6-12)	8.0 days (2-17)
------	---	-----------------	-----------------

Comparison of the breeding season at Reelfoot Lake, Tennessee with that at Battle Creek, Michigan is presented below:

TABLE 3

Year	Date first nest was started	Date of first egg	Date of termination of last nest	Date when young would have left last nest	No. of days between first egg and termination of last nest	No. of days between beginning of first nest and date when young would have left last nest
MICHIGAN						
1937	May 15	May 22	July 14	July 23	53	69
1938	May 4	May 8	July 7	July 23	60	80
1939	May 13	May 18	July 6	July 21	49	69
1940	May 18	May 22	July 14	July 29	53	73
Average	May 12	May 17	July 10	July 24	53	73
TENNESSEE						
1939	April 4 (est.)	April 6	August 10	August 10	126	128
1940	April 22 (est.)	May 1 (est.)	July 30 (est.)	August 1 (est.)	91	101
Average	April 13	April 18	August 4	August 5	108	114

Probably few birds in either Michigan or Tennessee nest during the entire breeding season. In fact no bird was found attempting two nestings after they had had one success. No birds have ever been found successful with two nestings in Michigan although one was found and in all probability more in Tennessee. No birds were found laying more than 9 eggs in Tennessee nor have any in Michigan been found laying more than 13 in one season. In the following table are the records for the average breeding seasons in Michigan for different females followed through the entire breeding season, from the time of beginning nest building in the first nest until the last nest had terminated: (Averages given, extremes in parenthesis).

TABLE 4

MICHIGAN

Year	Number of females	Nests attempted	Number of eggs laid	Number young produced	Number of days nesting
1937	6	2 (2-3)	8 (7-10)	1 (0-6)	39 (30-51)
1938	6	3 (2-5)	11 (9-13)	3 (0-5)	48 (38-57)
1939	1	2	9	3	52
1940	3	2.6 (2-4)	9 (7-11)	2.6 (0-5)	42 (39-47)
Average		2.5	9.3	2.1	43.7

Female No. 37-103940, a return from 1937, was followed during two nestings during 1939 in Michigan, over a period of 52 days, from May 14 until July 6. She raised three young in her first brood then attempted a second nest which failed. She happened to be the first bird captured during 1940, nesting about a quarter of a mile from her 1939 site and about a half mile from where she was originally banded in 1937. This nest was destroyed, evidently by House Wrens, on June 2 and I did not find another nest belonging to her. It was interesting that the same day, only a few hundred yards downstream, I captured No. 39-54051, her daughter raised the year before. No. 39-54051 during 1940, her first year as a breeder, attempted four nests, laid 11 eggs and failed to produce any young. Her nesting sites were not very well chosen at times, although one was where a brood of young had been raised by a different female during 1939.

In Tennessee the following four females were followed through most of the breeding season of 1939:

TABLE 5
TENNESSEE

Female	Nests attempted	No. of eggs laid	No. of young produced	Nesting season	Number of days
39-54103	2	9	5 #	April 18- June 24 #	67 K 83 est.
39-54104	2	9	5 #	April 18- June 24 #	67 K 83 est.
39-54105	2	9	5 #	April 18- June 24 #	67 K 83 est.
39-54147	2	9	7	May 27- Aug. 10	*75 K
Average	2	9	7	April 28- July 6 appr.	81 est.

#Outcome of last nest unknown, but it contained eggs on June 24.
Estimated young would have left these nests about July 10.

K—known.

est.—estimated.

*This female probably had an earlier nesting which was unobserved.

The nesting seasons for the above Tennessee birds were from the time of beginning nest building in the first nest until the last date the bird was noted nesting.

Eggs were deposited during the very early hours of daylight, usually between 5 and 7 A.M. (Eastern Standard Time) in Michigan and between 6 and 8 A.M. (C.S.T.) in Tennessee. Incubation started invariably the night prior to the laying of the last egg. The markings on the Tennessee eggs appeared thicker and darker than those on eggs in Michigan. Weights and measurements of eggs when fresh are listed below:

TABLE 6
MICHIGAN

Year	Number of eggs	Length in mm.	Width in mm.	Weight in grams
1937	78	18.47	14.55	2.07
1938	40	18.68	14.8	2.11
1939	31	18.33	14.88	2.07
1940	47	18.68	14.75	2.12
Average		18.53	14.70	2.09
TENNESSEE				
1939	88	17.87	14.25	1.94
1940	10	17.94	14.78	1.95
Average		17.88	14.29	1.94

The average number of eggs per set during the different years have been as follows:

TABLE 7
MICHIGAN

Year	Number of sets	Average number of eggs per set	Average weight of set in grams
1937	16	5.06	10.4742
1938	18	4.94	10.4234
1939	13	5.07	10.4949
1940	15	4.93	10.4516
Average		4.98	10.4590

TENNESSEE			
1939	32	4.65	9.0210
1940	12	*4.18	8.1510
Average		4.53	8.7976

*These were all late nests.

At Battle Creek, Michigan over a four-year period the following averages of egg sets were recorded:

TABLE 8
MICHIGAN

Year	May 1-15		May 16-31		June 1-15		June 16-30		July 1-15 1 set
	No. sets	Average no. of eggs	No. sets	Average no. of eggs	No. sets	Average no. of eggs	No. sets	Average no. of eggs	
1937			7	5.85	5	5.0	4	4.0	
1938	6	5.33	5	5.0	6	4.66	1	4.0	
1939			7	5.14	5	5.2	1	4.0	
1940			5	5.4	5	5.6	4	4.0	3.0
Average	6	5.33	24	5.37	21	5.09	10	4.0	3.0

In the following table are listed the sizes of sets of eggs in Tennessee in each period of time given:

TABLE 9
TENNESSEE

Eggs per set	1939						*1940	
	April 15-30	May 1-15	May 16-31	June 1-15	June 16-30	July 1-15	June 1-15	June 16-30
3			1				1	
4				2	5	1	3	6
5	1	13	5	3	1		1	
6								1
Average	5.0	5.0	4.66	4.6	4.16	4.0	4.0	4.28

*These dates were estimated from conditions in nests found July 7 to 9.

In the following table are listed the per cent of different size egg sets in both Michigan and Tennessee:

TABLE 10

MICHIGAN

TENNESSEE

	1937		1938		1939		1940		1939		1940	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
3 eggs	1	6.25					2	13.33	1	3.12	1	8.33
4 eggs	3	18.75	5	27.77	3	23.07	2	13.33	8	25.00	9	75.00
5 eggs	5	31.25	9	50.00	6	46.14	6	40.00	23	71.87	1	8.33
6 eggs	7	43.75	4	22.22	4	30.76	5	33.33			1	8.33

The incubation periods in Tennessee and Michigan were very similar. Nineteen eggs with a known incubation period at Reelfoot Lake, Tennessee averaged 12 days and 10 hours, varying from 12 to 13½ days during 1939. In Michigan during 1937, 1938, 1939, and 1940, the incubation period obtained on 64 eggs averaged 12 days and 17 hours (12 to 14 days). Fourteen young at Reelfoot Lake averaged 11 days of age when leaving the nest in 1939, while 21 young in Michigan during 1939 and 1940 remained in the nest for a period of 10¾ days.

In Tennessee after the young had left a nest, the period between that date and the first laid egg in the next nest for four females during 1939 was 14, 15, 18 and 21 days, averaging 17. In Michigan for three females for the same year, the periods were 4, 4, and 8 days, averaging 5.3 days.

At Reelfoot Lake during 1939, eighteen young averaged in weight at hatching time 1.88 grams; while during 1937 and 1938 in Michigan 26 young also averaged 1.88 grams.

SURVIVAL OF THE YOUNG

For more than any other reason I made the trips to Reelfoot Lake during 1939 to discover whether the Prothonotary Warbler had any better success in its nesting than it did in Michigan. Although I have studied many species of birds, keeping records of a large number of nests, I have found no species to have as low a survival ratio of young produced from eggs laid as the Prothonotary Warbler in Michigan. Many a day I have visited nests in Michigan finding as high as four out of ten destroyed. In Tennessee during a period of one week in late May 1939, 22 nests were under observation, of which two were deserted because of human interference and only one was destroyed. Following are the figures of nests and eggs in Michigan and Tennessee:

TABLE 11

Year	Nests	Number successful	Per cent	No. eggs	No. eggs hatched	Per cent	No. young left	Per cent
MICHIGAN								
1930-6	6	3	50.00%	25	17	68.0%	17	68.0%
1937	27	2	7.42%	98	24	24.47%	9	9.18%
1938	40	7	17.50%	106	35	33.01%	21	19.81%
1939	19	7	36.84%	78	31	39.74%	19	24.36%
1940	29	9	31.03%	106	52	49.05%	40	37.73%
Mich. total	121	28	23.14%	413	159	38.47%	106	25.66%
TENNESSEE								
1939	30	19	63.33%	139	78	56.11%	78	56.11%
1940	6	6	100.00%	24	22	91.66%	22	91.66%
Tenn. total	36	25	69.44%	163	100	61.35%	100	61.35%
MICHIGAN AND TENNESSEE								
Total	157	53	33.75%	576	259	44.98%	206	35.76%

In Tennessee 25 nests out of 36 were successful, while 28 were successful out of 121 in Michigan. Yet out of the 28 nests in Michigan, only 106 young were produced, an average of 3.7 per nest; while in Tennessee 25 nests produced 100 young, an average of 4.0 birds. One must also consider that egg sets in Michigan during the shorter breeding season averaged larger too. A number of eggs disappeared from Michigan nests during the period of incubation so that there were fewer eggs at hatching time than at the completion of laying. This was probably the work of the House Wren (*Troglodytes aedon*). Nothing like it happened in Tennessee where the House Wren does not nest.

The following table shows comparable figures for the different years, of nests and eggs in Michigan and Tennessee, showing both complete and partial success:

TABLE 12

	1930-36		1937		1938		1939		1940		1939		1940	
	Nests	Eggs	Nests	Eggs	Nests	Eggs	Nests	Eggs	Nests	Eggs	Nests	Eggs	Nests	Eggs
	MICHIGAN										TENNESSEE			
Completely successful	3	17	1	6	3	14	1	4	5	26	11	54	5	20
Partially successful	0	0	1	3	4	7	6	15	4	14	8	24	1	2
Total successful	3	17	2	9	7	21	7	19	9	40	19	78	6	22
Unsuccessful	3	8	25	89	33	85	12	59	20	66	11	61	0	2
Total	6	25	27	98	40	106	19	78	29	106	30	139	6	24

All nests, whether they had had eggs laid in them or not were considered as either successes or failures according to their outcome. Three nests during 1937, eight during 1938, and two during 1940 were completed but no eggs were ever laid in them in Michigan. During 1939, in Tennessee one nest was completed but for some reason no eggs were laid.

Following are tables of the loss of both eggs and young in both Michigan and Tennessee nests, classified as nearly as possible according to the destructive agencies:

TABLE 13
MICHIGAN

Year	Accident to eggs by man	Cow- bird	De- serted	Female killed	Flooded	House Wren	In- fertile	Predatory			
								bird	mam- mal	un- known	
Hatched young which never left the nest											
1937					3	7			5		
1938						4				7	
1939	1							6	10		
1940									5	1	
Total	1				3	11		6	20	8	Total- 49

Eggs that never hatched											
1930-6			3			2?		3			
1937			6		24	16	6		12	9	
1938	1	1?	6		5	33	3	4	16	6	
1939			2			14	17		10	5	
1940			7			25	8	3	5	6	
Total	1	1?	24		29	90	34	10	43	26	Total- 258

TENNESSEE

Eggs that never hatched											
1939	3		18	5			13	5	19		Total- 63

In Tennessee during both 1939 and 1940, all eggs that hatched were successful. During 1940, with what meagre notes I had, only two eggs failed to hatch, both because they were infertile. In Michigan the House Wren is probably the worst enemy of the Prothonotary Warbler. Although I have never seen them actually destroy a nest, I have found the eggs underneath a nest box the entrance of which was too small for anything but a small bird, mouse, or snake. The eggs in all cases had small bill holes in them. Always after this type of nest destruction, a male wren was in possession of the box the following day. Evidently a certain procedure was regularly followed by the male wren. When the warblers were away from their nest, the wren would approach the nest box or cavity, stealthily enter the nest, then throw the eggs out, piercing them with his small bill as he did so. On one occasion I watched a wren cautiously approach a house, reach the door, then find a very angry Prothonotary Warbler at the entrance. Both warblers immediately drove him away, showing considerable concern.

The female warblers which sat the closest on the nest were the most successful but even then wrens occasionally found them away. During laying time the female Prothonotary Warbler was seldom found at the nest. If a male wren was in the neighborhood the eggs sometimes disappeared as fast as laid, the Prothonotary finally deserting her nest. This procedure occurred in the region of certain individual male wrens more often than near others. After taking possession of a house or cavity, the male wren would throw out all of the moss and nesting material before filling it with sticks. Of 413 Michigan eggs, we credited the House Wren with destroying 90 eggs and 11 young, or 24.45 per cent. During 1940, although 25 eggs were evidently destroyed by House Wrens, the Prothonotary Warbler had the best success for any complete summer since the study was started, fledging 37.73 per cent of the eggs laid. Only 6 pairs of House Wrens nested in the bird houses as compared to 18 during 1939. I believe the hard winter of 1939-40 in the southern states may have accounted for this decrease. Following are the percentages of the destructive agencies in both Michigan and Tennessee:

TABLE 14
MICHIGAN 1939-1940 (413 eggs)

	Success- ful	House Wren	Predatory mammals	In- fertile	Flooded	Man	Un- known	De- serted	Cow- bird	Preda- tory bird
No.	106	101	63	34	32	2	34	24	1?	16
%	25.66	24.45	15.26	8.23	7.75	.48	8.23	5.81	.24	3.87

TENNESSEE 1939-40 (163 eggs)

No.	100		19	13		26				5
%	61.35		11.65	7.97		15.95				3.07

Twenty-six eggs in Tennessee failed due to desertion, the death of the parent, or molestation caused directly or indirectly by man. The success of the remaining 137 eggs was 72.99 per cent. Man had little effect on the breeding area in the north. In Michigan raccoons as well as mink were noted on the area. On one occasion a bird house was emptied of its family of young House Wrens by a raccoon whose tracks were observed going up the log to the house. The pin feathers of the young were found on the end of the log. Once a mink was noted with something in his mouth as he swam across the river. Mice were occasionally found in houses and once a milk snake was found in a House Wren's nest from which several eggs had disappeared. Opposums were found on both areas, as were red squirrels, Blue Jays, and Grackles. Many snakes were found on both areas. A large unidentified snake was found dead in the canal at Reelfoot Lake while I was trying to capture the parents in bird house No. 1. I loosened its body, expecting it to float

downstream, but it caught in a lower branch of the willow tree directly beneath the bird house. Both parents scolded and refused to enter the house until I removed the snake. When that was done the parents were captured in a very few minutes. One bird at Reelfoot Lake was killed on the highway by an automobile, but this probably produces only a very small percentage of casualties.

Little appears to have been learned of the survival of the other species of American warblers. Dr. Harry W. Hann, with his intensive work on the Ovenbird, (1937:198) probably has by far the most complete data on the survival of young of any of the warblers. He found that of 161 eggs, 102 hatched and 70 young (43.5 per cent) left the nest. The Prothonotary Warbler is, of course, the only one of our warblers to nest in a hole in a tree or in a bird house.

Mrs. Margaret M. Nice (1937: 143-4) gave a summary of the survival of young of a number of studies including her own with the Song Sparrow (*Melospiza melodia beata*). The general average for Passerine birds nesting in the open was 43.0 per cent of the eggs and 45.9 per cent of the nests. For hole-nesting birds she gave the average as about 65.0 per cent for a number of studies. Following is a summary of a number of studies of hole nesting species giving the survival of fledged young and the percentage of success in each case:

TABLE 15

Observer	Year	Species	Number eggs laid	Number young hatched	Number young matured	Number nests	Number suc- cess- ful	Percent success		
								Hatch	Fledg- ling	Nests
Musselman	1933-35	Bluebird	1223		839				68.6	
Laskey	1938	Bluebird	460		265	102	67		57.6	65.7
Walkinshaw	1919-38	Bluebird	203	131	127	50	33	64.5	62.5	66.0
Chapman	1933-35	Tree Swallow	469	421	334				89.7	71.2
Low	1931-33	Tree Swallow	1406	1176	694				83.6	49.0
Weydemeyer	1928-35?	Tree Swallow	363	358	340				98.6	93.6
Walkinshaw	1920-38	Tree Swallow	24	17	17	6	4	70.8	70.8	66.0
Walkinshaw	1919-39	House Wren	333	199	161	64	35	59.7	48.3	54.7
Walkinshaw	*1930-40	Prothonotary W.	413	159	106	121	28	38.5	25.7	23.1
Walkinshaw	†1939-40	Prothonotary W.	163	100	100	36	25	61.3	61.3	69.4
Total			5057		2983	379	192		58.8	50.6
Total, excluding Michigan Prothonotary Warbler			4644		2877	258	164		61.9	63.5

*Michigan

†Tennessee

Since the Prothonotary Warbler in Michigan was so atypical in its success of both nests and young fledged it is not added into the last line above. One notes in the above studies that the percentage of success of young fledged from eggs laid varied between 48.3 and 93.6, with the exception of the Michigan Prothonotary Warblers.

WEIGHTS

In the following table are a few weights and measurements of Prothonotary Warblers taken at both Battle Creek, Michigan and Reelfoot Lake, Tennessee. It will be seen that the Tennessee birds are smaller and lighter in weight:

TABLE 16

BATTLE CREEK, MICHIGAN (1937-1940)

Sex	Number of birds	Date	Weight in grams	Wing in mm.	Culmen in mm.	Tarsus in mm.
Female	45	May 12-July 5	17.69	68.93	13.77	18.44
Male	14	June 2-July 13	14.85	73.71	14.3	19.14

REELFOOT LAKE, TENNESSEE (1939-1940)

Female	33	May 15-July 9	15.45	67.5	13.83	18.65
Male	13	April 25-July 9	14.27	70.96	14.41	18.7

Female birds varied in Michigan during the summer between 13.6 grams and 20.0 grams; in Tennessee between 12.0 and 18.7 grams. Males in Michigan varied between 13.6 and 15.5 grams; those in Tennessee between 12.6 and 15.8 grams. Wing measurements were taken with a straight-edge ruler from the bend of the wing to the tip of the longest primary.

Comparable weights of females for different periods during the summer follow below:

TABLE 17

MICHIGAN (1937-1940)

TENNESSEE (1939-1940)

Time	Number of individuals	Average weight	Number of individuals	Average weight
May 12-31	11	17.23 grams	17	16.23 grams
June 1-15	24	18.43 "		
June 16-30	9	16.76 "	7	14.38 "
July 1-9	1	13.4 "	9	14.85 "
Average	45	17.69 "	33	15.45 "

BANDING

I banded my first Prothonotary Warbler in Michigan in 1930 (when a female and her five young were banded) but I did not do very much banding until 1937 when I captured a number of females and young on the Battle Creek River area. Since that time I have banded 54 adults and 100 young in Michigan and 42 adults and 78 young in

Tennessee. The following table gives the yearly distribution as to sex and age:

TABLE 18
MICHIGAN

Year	BIRDS BANDED			RETURNS				
	Adult female	Adult male	Young	Female			Male	
				1st year after banding	2nd year	3rd year	1st year	2nd year
1937	11	0	9					
1938	9	5	21	2				
1939	11	4	27*	2	1		3	
1940	9	5	43**	2	2	1	3	1
Total	40	14	100	6	3	1	6	1

TENNESSEE

Year	Adult female	Adult male	Young	1st year after banding	2nd year	3rd year	1st year	2nd year
1939	23	7	60					
1940	8	4	18	2			3	
Total	31	11	78	2			3	

* Eight young banded during 1939 did not leave the nest.

** Nine young banded during 1940 did not leave the nest.

In addition to the above returns one female returned during 1940 in Michigan which had been banded as a nestling during 1939 and one male in Tennessee did the same. The remainder of the returns were banded as adults. One female in Michigan was banded during 1937, was not recaptured during 1938, but again returned during both 1939 and 1940.

Adults during 1938, 1939, and 1940 in both Michigan and Tennessee were marked with colored bands in addition to Biological Survey bands. Young were marked on the right leg with Survey bands only.

TERRITORY

The Prothonotary Warbler is a very strongly territorial species. When a male takes possession of a certain area he continually drives off all opponents if he is able. At certain areas in Michigan I have watched these birds battle intermittently for two or three days, usually for the same bird house, one male finally taking possession. In addition I have observed them to drive off House Wrens (*Troglodytes aedon*), Black-capped Chickadees (*Penthestes atricapillus*) and Yellow Warblers (*Dendroica aestiva*). On one occasion a pair of Prothonotary Warblers built their nest and laid 6 eggs over that of a Black-capped Chickadee with seven eggs. Soon a male House Wren took possession, clearing

out the entire contents of the house. Then the wrens built a nest and laid 6 eggs.

The male Prothonotary Warbler selects the territory, selecting the nesting site before he becomes mated for the first nest, but thereafter both birds inspect the new nest sites. Usually birds along the Battle Creek River in Michigan followed definitely along the banks. In 1937, I watched one pair, which had had a nest destroyed, inspect several bird houses on the river bank, then disappear upstream. A few days later I found their nest three-quarters of a mile upstream from the first, about 68 feet from the river bank. Most pairs remained in the immediate region of the first nest for successive nests but occasionally they moved, as did this pair, a considerable distance. Three pairs in Michigan, which have attempted second nestings after one successful one, moved; one directly across the river; another across and 150 feet downstream; the third across and 500 feet downstream. None were successful, yet none attempted another nesting after the second nest failed. During 1939, three females raised broods in Tennessee, then built their second nests in the same bird houses. In all cases studied, parents remained mated for the season. During 1937, it was possible that one male had two mates, but no other cases of suspected bigamy were noted. At one bird house in Tennessee during 1939 both male and female were banded at a nest in May when they raised four young. A second nest in the same house in June was made by another pair which then raised four young. Both old and young were banded. Then late in June and early July a third pair nested there and I banded the female. The first pair was not found after their first success, but the second pair moved about 150 yards to another house where they raised their second brood. During 1940 in Michigan a female, banded as a nestling, returned to nest within a half mile of where she was raised in 1939. She nested in a bird house for the first time. The nest was destroyed, evidently by House Wrens. Her second nest was directly across the river in a fifteen-foot stub and was destroyed. She then attempted a third nest in a small stub 35 feet from the original bird house. This nest was also destroyed and she then returned to the original bird house for her fourth failure of the year. A male Prothonotary Warbler was captured in Tennessee during April, 1940 while he was building a nest in one of the bird houses. He did not yet have a mate but was found to be a nestling of 1939 from the area. He was raised about a half mile from the bird house where he was building his nest. These two birds are the only nestlings which I have found returning to their original areas to nest.

During 1937, 1938, 1939, and 1940 Michigan birds were found attempting to nest in the same house where a previous nest of their own had met with failure due to some predator. Only one of these nests was ever successful.

During 1939 in Michigan there returned two pairs of birds which had been banded the previous year. One of these pairs remated for the

season, attempting their first nest in the very bird house that had produced their successful nesting during 1938. The male of the second pair returned to the same identical territory that he had occupied during 1938 but with a new mate. His mate of 1938 was found nearly a mile downstream with a new mate. Another male nested in the same stub as during 1938 but had a new mate. His 1938 mate was not found during 1939. Probably the three return males out of five banded during 1938 give some definite idea of the number of birds returning, since the females were found to nest occasionally some distance from their past season's site. One female banded during 1937 was not captured during 1938 but returned to the original area during 1939, spending the entire season only a short distance from her 1937 nest. During 1940 she was again captured during her first nesting about a half mile from the 1937 nest but she was not found during the remainder of the season.

CONCLUSIONS AND SUMMARY

Comparable studies of the Prothonotary Warbler were made at Reelfoot Lake, Lake and Obion Counties, Tennessee and the Battle Creek River, Calhoun County, Michigan. In Michigan 121 nests were observed over an eleven year period, 1930-1940. In Tennessee 44 nests were observed during the two years, 1939-1940.

In Michigan, at the northern edge of the range of the species, the birds are larger (Bergmann's Rule), nesting starts later, less time is spent in preparatory activities before laying, eggs and egg sets are larger (9 per cent during 1939), the species is typically single-brooded, only occasionally attempting second broods (providing that the first attempt is successful).

In Tennessee the nesting season is longer, due to an earlier start, more time is spent before laying each set in preparatory activities, and the species is typically double-brooded.

The 1939 breeding season in Michigan lasted over a period of 49 days, from May 18 until July 6, while in Tennessee it lasted from April 6 until August 10, or 126 days. The first date given was the date of the first laid egg and the last the date of the termination of the last nest. In Michigan during 1940 the breeding season lasted 53 days, from May 22 until July 14. In Tennessee during 1940 no nests contained eggs by April 26 but the breeding season was estimated to be from May 1 until August 1, or 91 days.

In Michigan from 1930 through 1940, 121 nests of the Prothonotary Warbler were observed. Only 28, or 23.14 per cent, were successful. Out of 413 eggs, 159 (38.47 per cent) hatched and 100 young were fledged (.87 per total nest; 3.78 per successful nest). The fledging success was 25.66 per cent of eggs laid. More failures in Michigan resulted in more nestings by individual birds.

In Tennessee during 1939, 30 nests were observed until terminated or successful; 19 were successful (63.33 per cent) while out of 139 eggs, 78 hatched and all the young lived to leave the nest or 56.11 per cent fledging success of eggs laid; 2.6 young were fledged per total nest; 4.1 per successful nest.

In Michigan there is a much greater demand for nesting sites among hole-nesting birds than in Tennessee, with the result that the Prothonotary Warbler meets with better success in Tennessee. The House Wren in Michigan is the most aggressive opponent of the warbler. During the first year on the Michigan area fewer wrens were nesting, increasing each year through 1938 and 1939 and occupying more bird houses each year. The Prothonotary Warblers moved back into the bottomland regions more during 1939 as a result. During 1940 there was a tremendous decrease in the House Wren population in Michigan probably due to the very hard winter of 1939-1940 in the southern states. Where there had been 18 pairs on the nesting area during 1939 there were only 6 during 1940. As a consequence more Prothonotary Warblers moved back into the bird houses and the Prothonotary Warbler had the best nesting success in Michigan that had been recorded. Even though the warbler nesting success in Michigan was much less than in Tennessee, the numbers of adult birds varied little from year to year.

Fifty-four adults and 100 young were banded in Michigan and 42 adults and 78 young were banded in Tennessee. Few birds banded as young were retaken in subsequent years but a fair number of adults, especially males, were retaken later. These adults had usually returned as nearly as possible to their previous nesting territory.

In both Michigan and Tennessee pairs of Prothonotary Warblers attempted to nest in the same general region each year, often nesting the second or third time in the same bird house. In Michigan this was true whether the first nest was successful or not.

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BOB-WHITE POPULATIONS AS AFFECTED BY WOODLAND MANAGEMENT IN EASTERN TEXAS. By Daniel W. Lay. *Texas Agric. Exper. Sta. Bull.* 592, Aug., 1940: 37 pp., 13 figs., 4 tables.

This is an informatively illustrated publication based chiefly upon records of numbers and distribution of Bob-white coveys in relation to plant succession in forest habitats. Studies were carried on by means of stomach analyses, field observations, quadrats, inquiry into the histories of cutover, burned, and grazed woodlands, and through supervised driving by C.C.C. enrollees for census purposes.

Thick woods did not constitute favorable environment for the species. Also few birds were found during the years immediately following logging; between the fifth and ninth years, quail populations generally reached peak levels, to begin their decline about the tenth year. The status of a Bob-white population, however, is more significantly linked with vegetative types than with the age of the cutover. Burning disturbed plant succession more than did timber cutting; less than clearing or cultivation.

Final paragraphs of author's summary:

"Recommendations for management of quail in the cutover shortleaf-loblolly pine-hardwood type include plowing and brush clearing in spots and along trams, protection from heavy grazing and overshooting, little or no restocking of quail or control of so-called predators except locally as needed, some burning of slash under certain carefully regulated conditions, optional planting of feed patches, and careful regulation of hunting."

"Favorable environmental change could be induced by land owners under a rotational system of harvesting timber. They could favor the interspersing of various timber age-classes that is essential to continuous quail production. Foresters should give consideration to such silvicultural practices as will be compatible with both timber and wildlife management."

The bulletin should be a useful reference for all persons interested in the ecology or management of south-central Bob-whites. It leaves the impression of being conservatively written, with the author himself recognizing that some phases of the investigation require both more intensive and extensive work.

On the other hand, the use of "carrying capacity" in apparent synonymy with quail counts may be questioned, especially when populations were under observation for a period as brief as two years and were living on lands subject to unregulated shooting. It may likewise be questioned whether an exposition having the scope indicated by the title should have been presented without referring either in text or in bibliography to the researches of Stoddard on southeastern Bob-whites, which almost certainly laid a pioneering groundwork for the Texas study.—Paul L. Errington.

RING-BILLED GULLS OF THE ATLANTIC COAST

BY HARRISON F. LEWIS

THE principal breeding grounds of the Ring-billed Gull (*Larus delawarensis*) are on islands in lakes in the interior of North America, both in southern Canada and in the northern United States. The only nesting colonies of this gull now known to exist along the Atlantic coast of this continent are a half-dozen or so that are situated on the eastern part of the north shore of the Gulf of St. Lawrence, in Saguenay County, Province of Quebec.

The fact that the Ring-billed Gull nests in this region was first made known by John James Audubon, who investigated the bird life of this coast during his "Labrador trip" in the summer of 1833. On July 18 of that year, while Audubon's vessel, the "Ripley," was anchored in Hare Harbor, Little Mecatina Island, some of his party, headed by John Woodhouse Audubon, found a Ring-billed Gull colony containing some 200 nests on an island in a bay in the vicinity. This colony is reported and described by John James Audubon in his account of the Ring-billed Gull in "Birds of America,"¹ and also in his Labrador Journal,² published by Maria R. Audubon. The Ring-bills that now nest in Mecatina Bird Sanctuary are probably the present-day representatives of this group of birds.

Apparently the next ornithologist to report Ring-billed Gulls nesting on the north shore of the Gulf of St. Lawrence was M. Abbott Frazar, who, in 1884, fifty-one years after Audubon's trip to this region, found a few moderate-sized colonies of this species in the vicinity of Cape Whittle.³ He reported that, owing to their being frequently disturbed, they kept shifting about. These colonies are probably represented today by the Fog Island nesting group of Ring-billed Gulls.

Still a third nesting group of these gulls was reported from this coast by Charles W. Townsend,⁴ who, on July 16, 1915, visited the small island near Pointe au Maurier where a colony of this species is accustomed to nest. He found about 400 Ring-billed Gulls nesting there but did not come upon any other colonies of these birds during his trips along that coast.

The Ring-billed Gulls of the north shore of the Gulf of St. Lawrence show, as Frazar stated, a tendency to shift their nesting areas at times from island to island, in some instances over a distance of several miles. Examples of the scattering of a large colony into several smaller groups, nesting on as many different islands, have also been noted. Sometimes these changes are due to evident causes, such as human persecution, and sometimes the reasons for them are obscure. In spite of these shifts, however, the Ring-billed Gulls of this coast have in recent years bred in six distinguishable groups, each of which is restricted to a determinable archipelago and shows a strong tendency

to nest in most years on one or two preferred islands. These groups are as follows:

1. *Kegaska River Group*.—In years when they are not disturbed, the tendency is for all members of this group, the largest on the coast, to nest on the outer island in the small group of islands a short distance west of the mouth of the Kegaska River. I have never known this island to be completely abandoned by these birds, but in some years detached sections of this group nest on islands farther eastward, sometimes as much as 12 miles from the parent colony. On June 25, 1940, I counted in this colony 1028 nests with contents (eggs or newly-hatched young) representing an adult breeding population of at least 2056.



Figure 1. Ring-billed Gull at Kegaska River, Quebec. (National Parks of Canada photograph).

2. *Fog Island group*.—This group shows a strong tendency to shift about, to split up into sections, and to vary in total observable numbers. Fog Island may be considered its headquarters, but nesting birds believed to belong to it have been found as far away as Triple Island, 8 miles to the west, and Wolf Island, 10 miles to the east. In 1940 this entire group is believed to have nested on Fog Island, where, on June 29, I counted 135 occupied nests of this species, representing an adult breeding population of at least 270.

3. *Pointe au Maurier group*.—This group is usually restricted to the small island where Townsend found it. Two small temporary nesting groups that have been observed near Harrington Harbour, one in 1924 and another in 1925, probably came from the Pointe au Maurier colony, but possibly from that in Mecatina Bird Sanctuary. On July 4, 1940, I counted, on the small island near Pointe au Maurier, 542 occupied or recently-used nests of Ring-billed Gulls, representing an adult breeding population of at least 1084.

4. *Mecatina Bird Sanctuary group*.—This group is very unstable. Sometimes it nests on an island in the eastern part of the sanctuary, sometimes on an island in the western part, while in some years we have not succeeded in finding its location. In 1940 it nested on an island in the eastern part of the sanctuary, where, on July 13, I counted 35 occupied or recently-used nests belonging to it, representing an adult breeding population of at least 70.

5. *St. Augustin Bird Sanctuary group*.—This group, as far as is known, was newly established in St. Augustin Bird Sanctuary in 1930. It then contained about 300 breeding birds. It increased and in 1932 was estimated to contain about 500 breeding birds. Subsequently its numbers fluctuated, but in some years were probably even greater than in 1932. In 1939, as will be explained later in this paper, it failed to nest in the usual area. In 1940 a careful search on July 17 revealed only 29 nests, representing an adult breeding population of 58.

6. *Belles Amours group*.—None of this group has been observed nesting elsewhere than on one of the islands called Flat Rocks, a short distance east of the entrance to Belles Amours harbor. On July 2, 1936, when I first visited this colony, I estimated that 200 breeding birds were included in it. In 1939 it suffered eclipse, to be described later in this paper. On July 19, 1940, I visited Flat Rocks, but could find no indication of nesting of Ring-billed Gulls there in that year. Re-establishment of the colony may yet occur.

The total number of adult breeding Ring-billed Gulls in the five colonies on the north shore of the Gulf of St. Lawrence that I found active in 1940 is at least 3538.

The six nesting groups that have been described above were all situated on the eastern part of the north shore of the gulf, distributed from the Kegaska River group (Long. $61^{\circ} 20' W.$) to the Belles Amours group (Long. $57^{\circ} 21' W.$), a distance of about 200 miles.

The islands on which these Ring-billed Gulls nest are usually of small to moderate size and twenty to sixty feet high. Like most of the abundant islands along this coast, they are granitic and treeless, but have a sparse vegetative covering of mosses, lichens, herbaceous plants and prostrate or semi-prostrate shrubs. The gulls often nest on grassy areas, but it is uncertain whether this is because they prefer such areas or because abundant deposit of their excrement, year after year, favors the growth of grass. Nettles, asters, and such coarse umbelliferous

plants as angelica and cow parsnip are also characteristic of long-established colonies of these gulls. They suit the gulls' requirements very well, for, early in the season, when space is needed for courting and nesting, these plants are too small to be in the way, but after mid-summer, when young gulls are running around, they afford abundant dense cover, two or three feet high. On newly-occupied islands, Ring-billed Gulls often nest among prostrate or semi-prostrate shrubs that do not conceal nests or young.

Herring Gulls, Great-backed Gulls, and American Eider Ducks frequently nest on the same islands with the Ring-billed Gulls. The Ring-bills never scatter their nests over all the space available on an island, but crowd together in a compact group, leaving much of the island unoccupied by them. The larger gulls mentioned and the eiders tend to scatter their nests widely over an island with little or no regard to the situation of the Ring-bills, so that some of their nests are in the dense Ring-bill colony, but many are apart from them. The Fog Island group, in its shifting about, nests often, but not always, in company with a nesting group of twenty-five to fifty pairs of Caspian Terns. When they are together, the Caspian Terns occupy the summit and upper slopes of some smooth rocky knoll, partly covered with vegetation, while the Ring-billed Gulls nest close to the terns, but somewhat lower on the slopes. Both Arctic and Common Terns nest in the immediate vicinity of the nesting Ring-bills in the Kegaska River colony. Friction among these various species of gulls and terns, usually in the form of minor clashes about nesting territory, appears to be general, but seldom harmful.

Prior to the application of The Migratory Birds Convention Act to this region, the Ring-billed Gulls, in common with many other sea-birds nesting there, suffered much from human persecution, both their eggs and their young being used extensively for human food. The most favorably treated colonies were then those at Kegaska River and Pointe au Maurier, each of which nested near a single human family that took, it is true, a regular annual toll of the eggs, but that carefully left some eggs for the birds to hatch and that tried, with little or no support of law, to keep people from other places from interfering with them. For many years past, however, the Ring-bills of this coast, in common with most of the other birds nesting there, have benefited from active, organized governmental bird protection. Three of the nesting groups, those of Fog Island, Mecatina Bird Sanctuary, and St. Augustin Bird Sanctuary, commonly nest in official bird sanctuaries guarded by salaried resident caretakers, employed by the Canadian Department of Mines and Resources, although birds of the Fog Island group display an unfortunate tendency to nest fairly often on islands outside the sanctuary boundary. All of the Ring-bills along this coast receive protection during the nesting season from regular patrols made in motorboats by

government officers. Co-operation of conservation-minded private citizens resident in the region is also very helpful.

It may be remarked incidentally that, while Ring-billed Gulls and Herring Gulls, despite their difference in size, look so much alike at a little distance as to cause some difficulty in distinguishing them, they can, when they are vocal, be identified quite easily by their cries. It is true that, as might be expected in birds so nearly related, the various notes of the one species correspond quite closely to those of the other, but the cries of the Ring-billed Gull lack the volume and full-throated effect of those of the Herring Gull, so that in contrast they seem weak and hollow, while most of them are also much shriller. This difference has so impressed residents of the north shore of the Gulf of St. Lawrence that they always refer to Ring-billed Gulls by the local name, "Squeaky Gulls."

In general, the farther to the eastward a point on the north shore of the Gulf of St. Lawrence, the later the development of spring and the cooler the summer climate. Therefore the colony of Ring-billed Gulls at Kegaska River, being the westernmost colony of these gulls on that coast, experiences the earliest spring and usually the earliest laying of eggs. In favorable years, some eggs are laid in this colony in the last week in May, but most of the females begin to lay in the first week of June, while many do not begin until the second week of June. The Pointe au Maurier colony, some 75 miles northeast of Kegaska River, is usually slightly later in laying, and the St. Augustin colony, 85 miles farther northeast, is still later. Hatching in undisturbed nests takes place in late June or in the first half of July. Some young are able to fly before the end of July and very few Ring-bills remain at the nesting area after August 25.

The food of Ring-billed Gulls in this region in the nesting season consists largely of small fish, such as capelin and sand-lance. Wild berries, especially the fruit of the bog bilberry, are eaten in quantities after they ripen. Variations in the supply of small fish available in different years in the vicinity of the nesting colonies at the time when the young are dependent on their parents for food provide one of the principal factors restricting increase of these and other gulls in this region. When such small fish are lacking, the adult Ring-bills seem to be able to obtain enough clams, refuse from human fish-cleaning, and similar foods to provide for their own survival, but not enough to meet, in addition, the needs of their growing young. Faced with this situation, they increase the quantity of berries supplied to the young, but apparently the young cannot live long on such a diet, and a large proportion of them soon die. Some appear to die as a direct result of receiving insufficient nourishment, but a great many, after becoming weak from lack of nourishment, are killed by blows delivered by the adults. Human residents of the region often hold the view that the adult gulls thus intelligently meet a condition of food shortage by deliberately reducing

the number of young that they have to feed. It seems, however, more reasonable to suppose that scarcity of food tempts young gulls to trespass much more than usual on the territory of adults other than their parents and to try to compete actively for food that such adults bring to the colony for their own young. Adult Ring-bills, when irritated by such activities, commonly react by striking the offending young birds powerful blows with their beaks, with no attempt at moderation. Increase in trespassing and theft committed by the young, combined with weakness from insufficient food, which reduces their ability to escape, would thus naturally lead to an increase in the number of severe blows received by them from the adults, and thus to increased juvenile mortality. I have previously referred to this matter elsewhere^{5, 6} and have recorded that 1932 and 1934 were both years when in this region young gulls had a high mortality rate attributed to scarcity of small fish, but that conditions in this regard were much more severe in 1935, when less than 10 per cent of the young gulls of the region were believed to have survived until they attained ability to fly.

In 1939 an exceptionally late spring caused the Ring-billed Gulls of this region another difficulty. The records of the Canadian meteorological station at Harrington Harbour, near the middle of that part of the coast on which Ring-billed Gulls nest, show that the mean temperature for May, 1939, was 36°F., which is two degrees below normal, and that the mean temperature for June, 1939, was 45°F., which is nearly two degrees below normal. A heavy snowfall had been experienced during the latter part of the preceding winter and snow remained on the land much later than usual. From a point a few miles east of Harrington Harbour eastward to the Strait of Belle Isle the sea was covered with closely-packed floe ice until June 17. When the Ring-billed Gulls of the north shore arrived, near the end of May, on their six nesting areas, they found conditions unsuitable for nesting. The groups at Kegaska River, Fog Island, and Pointe au Maurier, which are all southwest of Harrington Harbour, were able to make sufficient adjustment to meet this situation by nesting and laying eggs a few days later than usual, but the groups at Mecatina Bird Sanctuary, St. Augustin Bird Sanctuary, and Belles Amours, which are northeast of Harrington Harbour and on the part of the coast where floe ice remained until after mid-June, failed to make such adjustment.

A description of what occurred in the case of the group of these birds in St. Augustin Bird Sanctuary has been furnished by the Sanctuary Caretaker, Mr. J. Thomas Kennedy. He says that in 1939 the Ring-billed Gulls arrived at their nesting-ground in that sanctuary about May 26. It seemed to him that their numbers were greater than ever before. There was still much snow and ice on their chosen island, but there were also limited areas of bare ground. There was no open water in the vicinity. The Ring-bills stood about on their island, with much shrill crying, for several days. They built a few nests and laid a

few eggs, but all the eggs were promptly eaten by something, very likely a Raven. Mr. Kennedy saw a few fresh egg-shells lying about the nesting area, but never actually saw an entire egg. About a week after their arrival, all the Ring-bills suddenly left the vicinity. They did not return at any time during the summer of that year, nor were they discovered nesting elsewhere.

Concerning the groups pertaining to Mecatina Bird Sanctuary and Belles Amours it is known only that they arrived at their nesting grounds in the last week of May and left a few days later for parts unknown and were not seen again during the summer.

Apparently the physiological condition of these birds required nesting within a limited time—a time that, in this unusual spring, expired before conditions in their accustomed nesting areas had become such as to make their nesting there possible. Whether the unsuitability of the nesting area at the usual time for nesting consisted in the unusually low temperature itself, or in snow-covered nesting sites, or in the ice-covered sea, or in delayed arrival of fish required for an adequate supply of food, or in some combination of these conditions is not known.

This occurrence may be taken to indicate that possibly Ring-billed Gulls do not nest along the coast east or north of Belles Amours because a spring season developing a little later than is normal at Belles Amours fails to provide suitable nesting conditions in time to correspond with the physiological rhythm of these birds. Gradual modification of that rhythm to meet the conditions offered by a later spring may be theoretically possible but does not appear to have been made.

Within the limits of our present certain knowledge of the nesting-places of Ring-billed Gulls, the division of this species that forms the groups nesting on the north shore of the Gulf of St. Lawrence appears to be very isolated. The next nearest nesting colony of Ring-bills that is known with certainty is the one at Black Ant Island, Ontario, in the upper St. Lawrence River, more than 800 miles distant. There is, however, some evidence that seems to me to indicate that the isolation of the Ring-billed Gulls of the north shore of the Gulf of St. Lawrence may not be so great as our incomplete knowledge causes it to appear. The great and sudden fluctuations in numbers of some of the known nesting groups along the coast and the complete disappearance of the three eastern groups in the first part of June, 1939, when conditions on the coastal islands where they usually nest were adverse, both make it seem likely that the Ring-bills have other nesting-places not far away, in lakes in the southern interior of the Labrador Peninsula. It may be that the six nesting groups found along the coast are but outlyers of a widely distributed breeding population using chiefly inland sites. In this connection it is to be kept in mind that the Ring-billed Gull nests, for the most part, at sites in inland lakes, that the interior of the Labrador Peninsula contains a great many island-studded lakes, and that the summer climate of the southern part of the interior of that

peninsula is warmer than that of the coastal region inhabited by these gulls, which is cooled by a branch of the Labrador current. We have also to consider that Ring-billed Gulls have been reported by A. P. Low⁷ and J. M. Macoun⁸ as breeding at Lake Mistassini, Quebec, and that John Macoun and James M. Macoun⁹ published a report, attributed to A. P. Low, that this species breeds in the vicinity of Hamilton Inlet, on the east coast of the Labrador Peninsula. According to the records of the National Museum of Canada, the latter report has reference to Northwest River, near the head of Lake Melville, Newfoundland Labrador, 110 miles inland, rather than to Hamilton Inlet. Both of these reports may be founded on fact, but Mr. P. A. Taverner, Ornithologist of the National Museum of Canada, informs me that he does not think the available evidence warrants their being accepted without reserve. Additional ornithological exploration is necessary before we can be sure we know in full the breeding range of the Ring-billed Gull in eastern Canada and in the mainland territory under the jurisdiction of Newfoundland.

From 1923 to 1939, inclusive, I have banded 2,122 young Ring-billed Gulls on the north shore of the Gulf of St. Lawrence. Forty-eight distant recoveries are now available in consequence of this work. They indicate that, after the young Ring-bills fly from the nesting colonies, they first scatter quite widely. In September some of them are to be found to the northeast, on the southern part of the Atlantic coast of Labrador, while others stray up the St. Lawrence River, sometimes nearly to Montreal. Apparently very few visit the Island of Newfoundland. In October there is a general movement southward, through New Brunswick, Prince Edward Island, Maine, Massachusetts, Connecticut, New York, and New Jersey. I have no reports from Nova Scotia. By November the foremost young Ring-bills have reached North Carolina and in December they are in Florida. Records indicating winter distribution of first-year birds are: one shot at Wyoming, Delaware, on January 18, 1930; one found dead at Mayport, Florida, on December 2, 1939; one killed at Jacksonville, Florida, December 24, 1925; one recovered at Pensacola, Florida, on January 16, 1934; one captured at Crystal River, Florida, on March 18, 1927; and one found dead at Columbia, Mississippi, on December 1, 1936. Only eight birds were reported when more than a year old. The oldest of these was a Ring-billed Gull banded in Fog Island Bird Sanctuary, Saguenay County, Quebec, on July 15, 1926, and captured at Seal Cove, White Bay, Newfoundland, on August 28, 1934, when a little more than eight years old.

SUMMARY

The known history of the nesting colonies of Ring-billed Gulls on islands bordering the north shore of the Gulf of St. Lawrence, which are the only recorded colonies of this species on the Atlantic Coast of

North America, is briefly outlined.

Six distinguishable nesting groups of Ring-billed Gulls occurring in that region are described.

The total number of breeding Ring-billed Gulls recorded in these groups in 1940, when one group was not to be found, was at least 3538.

The manner of the nesting of these Ring-billed Gulls, their conservation, and their voices are briefly described.

The effects of periods of food scarcity and of an abnormally cold, late spring in reducing the reproductive success of these gulls and a possible relation between climate and their limit of range in this region are considered.

Indications that the breeding range of the Ring-billed Gull possibly includes part of the southern interior of the Labrador Peninsula are discussed.

A brief account of information about the migration and range of the Ring-billed Gulls of the Gulf of St. Lawrence that has been obtained as a result of banding 2,122 young in the colonies under discussion is provided.

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JOHN S. MAIN

BY ALDO LEOPOLD AND F. N. HAMERSTROM, JR.

JOHN S. MAIN died at his home in Madison, Wisconsin, on November 14, 1940.

His passing leads one to speculate on the criteria one uses to distinguish an outstanding ornithologist.

National figures like Audubon and Wilson are, of course, distinguished by their writings and paintings, for we of the rank and file have no other cognizance of them. Yet one finds, in some ornithological groups, individuals whose writings or paintings are limited, who hold no high office, who bequeath no considerable collections, but who are nevertheless recognized by all who know them as outstanding. Their earmark cannot be enthusiasm alone, for enthusiasm is common to our tribe. It cannot be skill and knowledge alone, for there are varieties of skill and knowledge of small import to anyone but their owner. It must be some as yet undefined combination of these ingredients which marks the outstanding naturalist.

Most vocations and avocations employ physical standards for measuring worth, but in ornithology, as in art or letters, the measure of a career is clearly some impalpable quality far removed from ordinary success. How else can we account for the pervasive influence of a man like John Main, who bequeaths to us only the memory of an intense and vivid personality, and the realization that a part of our own zest in birding and living is a gift from him?

John Main discovered birds at the age of thirty-five, and by himself. His youthful interest was mild and casual. Not until about 1914 did he become aware of the affinity between the world of field and fence-row, the world of natural history books, and the proclivities of his own scholarly mind. Within a decade he became an authority on birds of Wisconsin, the owner of a compact but fertile library, the leader of a growing ornithological group, and an eager student of the world literature of ornithology. By 1936 he had become a founder and president of the Kumlien Ornithological Club, and had specialized along two lines: the shorebirds as a group, and the study of bird behavior patterns, particularly the phenomena of migration and of mating displays.

It was hard for John Main, by nature a poet, to accept in toto the strongly mechanistic theories of bird behavior which now hold the center of the stage. He was an ardent (but not uncritical) disciple of the great bird-watcher, Selous. Hudson and Howard likewise held his allegiance, the first for his poetic prose, the latter for the nicety of his interpretations of field observations. No writer, however, was outside the reach of John Main's interest; he, as an amateur, knew the literature of birds as well as does many a professional ornithologist.

Despite the paucity of his published work, John Main was himself a writer of more than ordinary powers. His "Dance of the Prairie Chicken" is, in our opinion, the most accurate and colorful description of a booming ground so far published. His style combines a kind of victorian fluency with the reserve and the terse accuracy of the best "scientific" writing. Had he been spared for another decade, more papers of like quality would doubtless have followed.

To John Main, ornithology was a cause as well as a scientific field sport. Such problems as the protection of raptors and the preservation of rare species lay close to his heart. Every farmer who nailed a Redtail to his barn door drove a thorn into John Main's social conscience. He was the self-appointed custodian and trustee of every Sandhill Crane marsh and every Duck Hawk eyrie in the Madison region. Of such stuff, and of such only, can true conservation be built.

Living in a university town and in a state capital, John Main was in contact with many individuals occupying official positions in the natural history field, and also with many university students. It can, we believe, be fairly asserted that man for man, he contributed as much to the development of Wisconsin natural history and Wisconsin naturalists as those officially charged with this function. His influence is a monument to the spreading-power of that generosity of spirit which feeds on its own lack of material rewards.

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SEXUAL DIMORPHISM IN THE COWBIRD, *MOLOTHRUS ATER*

BY ALLAN J. STANLEY

THE study of the physiological basis of sexual dimorphism in birds has interested experimental biologists for a considerable time. The different control mechanisms employed within the class Aves and often by closely related species add interesting considerations to our general concept of phylogeny.

So far as the Icteridae are concerned there has appeared only one other paper which deals with an analysis of the differences between the sexes. Danforth and Price (1935), working with the Brewer Blackbird (*Euphagus cyanocephalus*), found that the control of the feather pattern was entirely due to genetic factors and that the administration of hormones had no effect on the basic coloration.

Other authors have found the same condition to exist in widely separated groups. Still others have found that various hormonal relationships control the feather coloration in the two sexes. In some cases these are sex hormones, in others, hormones produced in the pituitary gland. Other cases are known wherein the control is partly genetic and partly hormonal.

The Cowbird exhibits marked sexual dimorphism in color pattern as well as in size. The male has a bronze head and neck, a jet black bill, dark brown iris, and a band of purplish black feathers surrounding the lower neck region and separating the bronze neck feathers from the greenish black plumage covering the remainder of the body. The breast and belly are also greenish black, while the wings and tail are not so prominently iridescent. In contrast to this striking plumage, the female has but a faint iridescence barely visible, when the light is right, on the dorsal feathers. Her plumage is gray with an almost white chin and generally light gray underparts. None of the color pattern described above for the male is apparent in the female. The iris of the female is a shade lighter brown than that of the male, while the beak is blue slate as compared to the jet black bill of the male.

According to our observations on birds kept in the laboratory for 20 months, Cowbirds do not assume a special nuptial plumage in either sex. Two complete moults have occurred during this time, each new plumage being exactly like that which preceded it.

In the wild state, during the summer months the feathers fade considerably. In captivity, when given adequate protection from the sun, the feathers retain their lustre for the duration of the plumage.

Oberholser (1938) gives a meager description of the Louisiana Cowbird, *Molothrus ater buphilus*, but records no measurements of females and no data on weights of either sex. While our

material may be referred to this subspecies on the basis of comparisons with specimens in the Louisiana State University museum, the difficulty of comparing living material with museum specimens renders the subspecific identity of our birds uncertain, and for the purposes of this paper it is probably unimportant. It is also entirely possible that these birds are migrants of the subspecies *ater*.

MATERIAL AND METHODS

During the latter part of January, 1939, about 150 Cowbirds were captured in a drop-door trap used principally for taking English Sparrows during the remainder of the year.

Six or eight birds were placed together in hardware-cloth cages which allowed approximately one square foot of perching space to each bird. The sexes were kept apart in some cases, but both males and females were kept together in others. The two sexes of the experimental groups were kept separately and were also separated from the controls. They were easily maintained on a balanced chick-mash diet with fresh water daily. They soon became adjusted to captivity, as evidenced by their song and quiet behavior. These qualities make the Cowbird a satisfactory laboratory bird in contrast with the English Sparrow or Red-winged Blackbird which in our experience never become tractable.

The birds were weighed as soon as they were captured and it was found that the males averaged about 50 grams, ranging from 42 to 65 grams. The females averaged about 40 grams, ranging from 35 to 45 grams.

EXPERIMENTS

A series of males and females were castrated and parts of the sexually dimorphic tracts were plucked in the males along with the homologous tracts in the females. Depluming was performed at the time of castration and the regenerating feathers were observed.

In a second series, males and females were castrated, plucked as above and the plucked areas were swabbed daily for five consecutive days with theelin¹ in oil in the male castrates and perandren (testosterone propionate) in the female castrates. The regenerating feathers were noted. A series of normal males and females were plucked as above and served as controls. The results of these experiments² are listed below.

Examination of the results recorded in Table 1 shows that the female feathers in all cases regenerated the same type after castration as before. Perandren (testosterone propionate) had no effect. The male feathers

¹ We are indebted to Ciba Pharmaceutical Products, Inc. of Summit, N. J. for the perandren (testosterone propionate) and to Parke Davis Co., Detroit, Mich., for the theelin used in these experiments.

² Made with the technical assistance of J. A. Michaud and Harry Grubschmidt.

TABLE 1
CASTRATION EXPERIMENTS ON MALE AND FEMALE COWBIRDS

Sex	No.	Treatment	Feather regeneration
Male	5	Head, neck, breast, wing and tail plucked.	Normal with gray tips on breast feathers.
Male (castrate)	5	Head, neck, breast, wing and tail plucked.	Normal with gray tips on breast feathers.
Male (castrate)	5	Plucked as above and swabbed with theelin in oil.	Normal with gray tips on breast feathers.
Female	5	Head, neck, breast, wing and tail plucked.	Normal in each tract.
Female (castrate)	5	Head, neck, breast, wing and tail plucked.	Normal in each tract.
Female (castrate)	2	Plucked as above and swabbed with perandren (testosterone propionate).	Normal in each tract.

which came in after depluming were also alike in all homologous tracts; however, the new breast and saddle feathers in all cases came in with short gray tips which wore off in two months, leaving the normal feather. This seems to be a normal characteristic for these tracts in the male Cowbird, and is similar in this respect to the dark throat and breast tract of the male English Sparrow as figured by Miller (1935), except that the light tip is not nearly so long, does not mask the darker plumage beneath, and gives only a temporary mottled effect to the regenerated area.

The color of the irides of both sexes remained unchanged.

The bill color of 20-month castrates of both sexes is slightly lighter than that of controls, but no such striking change occurs as is found in castrates of the English Sparrow, in which the jet-black bill of the breeding male becomes light horn-colored after castration or after the quiescent testicular phase becomes established. (Keck, 1934; Witschi, 1936)

At the time of castration (from February 3 to March 1, 1939) the gonads were in the quiescent state. Testis weights were at the minimum and ranged from .6 mg. to 1.1 mg. for both glands. The gonads begin to enlarge gradually, however, at about this time, so that by April 15 they are from 50 to 100 times heavier than they were thirty to forty-five days earlier. Testis weights taken at this time ranged from 23.4 mg. to 108.4 mg. Captivity had no visible effect on the normal increase in size of the gonads. No singing was noted in the castrate birds, probably due to the low concentrations of the hormones used.

CONCLUSIONS

The Cowbird exhibits marked sexual dimorphism in both color pattern and size. The males were found to be 25 per cent heavier than females.

The color of male feather tracts is not suppressed by theelin, and likewise neither castration alone nor perandren (testosterone propionate) has any effect in female castrates.

Bill color of Cowbirds is only slightly affected by castration, and the color of the iris is unchanged.

Since the differences in the sexually dimorphic feather tracts of the two sexes of the Cowbird are not under the control of the sex hormones, sexual dimorphism in the Cowbird is considered to be determined genetically as was found for the Brewer Blackbird by Danforth and Price in 1935.

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NOTES ON CUBAN BIRDS

BY DAVID E. DAVIS

THE following notes were collected during May to September, 1937, and during April to November, 1938, while I was studying the social nesting habits of the Smooth-billed Ani (*Crotophaga ani*). Unless another locality is indicated the notes pertain to the region near Cienfuegos, where most observations were made at the Atkins Institution of Harvard University.

The nomenclature of James Bond (1940) is followed strictly, even when there is a difference of opinion. This is emphatically not a list of the birds seen; many common or rare birds are omitted. The object is to add information concerning the breeding habits of some birds and the status of certain migrant species.

The ecological conditions of Cuba today are vastly altered from the primaeval. In many parts half or more of the land is covered with cane, in which only one bird, the Grassquit (*Tiaris*), nests regularly. The rest of the land is pasture or plots of rocky land from which every sizable tree is cut for charcoal. Clearly the number of species and individuals is greatly limited by the lack of suitable environment. In the Trinidad Mountains coffee is grown on nearly every slope, but since the plant needs shade it is grown under a canopy of trees providing a very suitable environment for many species. Hunting is greatly limited due to the strict prohibition of firearms and the cost of ammunition. A wise set of hunting laws is in effect, but enforcement is extremely difficult.

Frank M. Chapman (1892) collected birds at Trinidad, 40 miles to the east and M. Rutten (1934) spent some time in Santa Clara Province. Thomas Barbour's "Birds of Cuba" (1923) is the standard reference on Cuban birds. Recently S. C. Brunner (1938-39) has published data on migratory birds, chiefly from Havana.

It is a surprise to find that the birds are nearly as active in mid-day as in the early hours of the morning. Two factors enter into this mid-day activity. The variation in temperature between dawn and 2 P.M. is only 14° C., and there are only 14 hours of daylight at the most. Thus in order to find food the birds must keep active and do not need to rest. Since the night is long enough for necessary sleep, no "siesta" is needed.

RESIDENT SPECIES

Podilymbus podiceps antillarum. Pied-billed Grebe. Breeds throughout the year in suitable ponds. One young, nearly adult in size, seen May 26, 1938.

Casmerodius albus egretta. American Egret. About 15 non-breeding egrets slept in the Arboretum throughout each summer. Commonly the birds feed in the fields around cattle.

Florida caerulea. Little Blue Heron. Starts to breed in the middle of April and completes nesting about the first of August.

Plegadis f. falcinellus. Glossy Ibis. One spent the week of May 10, 1938, in the Arboretum. Four were seen on May 6 and five on August 27, 1938 at Laguna Grande.

Mycteria americana. Wood Ibis. Five seen October 12, 1938, on Rio Caunao.

Guara alba. White Ibis. Three seen May 6, 1938, at Laguna Grande.

Ajaia ajaja. Roseate Spoonbill. Fifteen seen at Laguna Grande and near the coast May 6, 1938.

Dendrocygna arborea. West Indian Tree Duck. Breeds in June and July. Lays about 9 eggs.

Aix sponsa. Wood Duck. Three spent the week of May 8, 1938, in the Arboretum.

Cathartes a. aura. Turkey Vulture. Young nearly the size of adults found on April 10, and a nest with one young just hatched found on May 5, 1938. The vultures are frequently seen around a large specimen of *Stapelia nobilis*, a plant whose flowers reek of the smell of rotten meat.

Polyborus cheriway audubonii. Audubon's Caracara. Pair seen May 6, 1938.

Falco sparverius dominicensis. Sparrow Hawk. This species occurs in the light and red phases with some intermediate birds. Pairs composed of one member of each phase are common. Of the birds counted, 28 were in the light phase, 12 in the red, and 5 in the intermediate color.

Fulica a. americana. American Coot. A dozen seen at Laguna Grande May 6, 1938.

Jacana spinosa violacea. Central American Jacana. Two fully grown immature birds seen April 8, 1938. A nest with four eggs found September 25, 1938.

Zenaida m. macroura. Mourning Dove. This species begins to breed in March and continues till the first of October. About the middle of June the birds begin to roost in large flocks. The birds often use the same nest for several broods. and in one case used an old nest of *Mimus polyglottos orpheus*.

Aratinga euops. Cuban Paroquet. Flocks come down from the Trinidad Mountains occasionally in September and October.

Coccyzus a. americanus. Yellow-billed Cuckoo. A flock of ten was seen August 8, 1937. Many seen in May, June, and July, 1938, but none was seen in the spring of 1937. Two females collected on July 1, 1938; each had its ovary in breeding condition.

Chordeiles minor gundlachi. West Indian Nighthawk. This subspecies arrives about the middle of April and leaves in August.

Nephoecetes n. niger. Black Swift. A swift, considered to be this species, was abundant at San Blas, Trinidad Mountains, May 24, 1938. No specimen was collected.

Streptoprocne zonaris pallidifrons. Cloud Swift. Common in June and July flying over the fields. Several flocks of more than one thousand birds were seen.

Colaptes c. chrysocaulosus. Cuban Flicker. Common in the Trinidad Mountains.

Tyrannus d. dominicensis. Gray Kingbird. Incubation period is 14 days, and the young remain in the nest for 17 days. Two birds were seen October 10, 1938, but most individuals leave before that date for the south.

Corvus leucognaphalus nasicus. White-necked Crow. Four seen on September 9, 1937, in the foothills of the Trinidad Mountains.

Mimus polyglottos orpheus. Cuban Mockingbird. Of a total of 18 nests, 12 contained three eggs, and 6 contained four eggs. The incubation time is ten days, and the birds leave the nest after 8 to 13 days. Many nests are destroyed by snakes. The following species are mimicked in song: *Tolmarchus c. caudifasciatus*, *Crotophaga ani*, *Colinus virginianus*, *Tyrannus d. dominicensis*, and *Falco sparverius dominicensis*.

Holoquiscalus niger gundlachii. Greater Antillean Grackle. Nests in colonies in trees, beginning about the first of April. Nesting is over by the middle of June and the birds spend the rest of the year in large flocks.

Agelaius h. humeralis. Tawny-shouldered Blackbird. This species spends most of the year in flocks but separates into pairs for nesting.

Tiaris o. olivacea. Yellow-faced Grassquit. The flocks break up in the middle of May, when the pairs start to breed. The male frequently builds abortive nests.

MIGRANTS

Cuba is the winter home of many North American species. The following notes on migration were collected from May 8 to September 12, 1937, and from April 8 to October 15, 1938. The first date given is the latest date on which the species was seen in spring, and the second date is the earliest date on which the species was seen in the fall migration. The dates are given only for those species which were seen with sufficient frequency to indicate the migration period.

The warblers are the most abundant migrants and arrive in waves several days apart. A wave of warblers arrived with a cool spell from October 2 to 5, 1938. The relative number of individuals arriving was: October 2 twenty-four; October 3 nineteen; October 4 thirty-nine; October 5 nineteen; October 6 three; October 7 thirteen; October 8 twelve.

Chilodnius nigra surinamensis. Black Tern. Five seen August 8, 1938.

Chordeiles minor subsp. Nighthawk. One was seen on September 9, 1937. Since the Cuban birds had been gone a month, this bird was probably a North American migrant.

Megaceryle a. alcyon. Belted Kingfisher. Tolerably common. April 29, 1938; September 2, 1937.

Dumetella carolinensis. Catbird. April 21, 1938.

Poliophtila caerulea. Blue-gray Gnatcatcher. August 13, 1938. Not seen in April or May in either year.

Comptothlypis americana pusilla. Parula Warbler. April 28, 1938; September 5, 1938.

Dendroica c. caerulescens. Black-throated Blue Warbler. April 28, 1938; September 2, 1938. This species is extremely tame and enters houses frequently.

Dendroica dominica. Yellow-throated Warbler. April 15, 1938; August 12, 1938.

Dendroica discolor. Prairie Warbler. April 19, 1938; August 16, 1938.

Dendroica palmarum. Palm Warbler. May 6, 1938; September 14, 1938.

Seiurus aurocapillus. Ovenbird. April 23, 1938; September 10, 1938. A single individual was seen on May 20, 1937. The true migration is indicated by the dates.

Seiurus noveboracensis. Northern Water-thrush. May 7, 1938; July 27, 1937. A single individual was seen July 8, 1938, but it was probably a non-breeding bird. Two were heard singing on August 20, 1938.

Seiurus motacilla. Louisiana Water-thrush. October 4, 1938.

Geothlypis trichas. Common Yellow-throat. May 12, 1938; September 5, 1938.

Setophaga ruticilla. American Redstart. May 13, 1937; August 6, 1937. The adults arrive in the fall about two weeks after the immatures. Individuals started to sing April 20, 1938.

Dolichonyx oryzivorus. Bobolink. May 10, 1938.

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CHECK-LIST OF BIRDS OF THE WEST INDIES. By James Bond. The Academy of Natural Sciences of Philadelphia. 1940 (published July 25): 6 x 9 in., xi + 184 pp., map. \$2.00.

This very useful check-list incorporates a large amount of data within a few pages. Under each form the author gives a reference to the original description and to synonyms, if any, published since the first three volumes of Peters' "Check-list" and parts 2-13 of Hellmayr's "Catalogue." The range is stated in some detail. A very worthwhile feature, especially in a region in which there is a high degree of endemism and in which many forms are gradually being exterminated, is a statement of the occurrence and abundance of nearly every bird, based mainly upon the author's own experience in the field. Appendices list birds known only from subfossil remains, species known only from hearsay, and introduced forms. Of considerable interest are the numerous comments on the probable relationships of various birds, as suggested by similarity of voice and breeding behavior. The author takes a moderate stand in the matter of recognition of genera and species, and he even does not hesitate to synonymize some of his own races.

Bond recognizes 692 forms of birds as occurring in the West Indies. In 1892 Cory listed 585 forms from the same area, so that approximately 100 birds have been added within the last 50 years. This increase is partly due to the description of new subspecies and partly to the collecting of North American migrants. Very few actual "discoveries" have been made, however, since only five or six full species have been added during that period. In the author's words, "it may be said that systematic study of West Indian birds is almost completed."

This book is indispensable to anyone interested in the distribution of West Indian birds.—P. Brodtkorb.

GENERAL NOTES

American Egrets Observed from a Hudson River Steamer.—Since the late summer of 1937 when the American Egret (*Casmerodius albus egretta*) apparently reached the peak of its abundance in the Albany, New York region, we have been interested in the local status of this striking bird during the post-breeding season. While our observation dates are fairly uniformly distributed throughout late summer and early autumn, our longest and most satisfactory single period occurred on August 27, 1940.

In an effort to ascertain more precisely the number of egrets along the upper Hudson River, Mrs. Stoner and I engaged passage on the largest passenger steamer regularly plying between Albany and New York City. However, our voyage included only that part of the river between Albany and Kingston Point, a distance of 48 miles. The outward trip began with departure from Albany at 9:20 A.M. and ended at 1:20 P.M. on an incoming tide which reached its height about noon. The return trip from Kingston began at 2:20 P.M. and ended at 6:20 P.M. on an outgoing tide which was lowest upon arrival in Albany. The day was partly cloudy and a light southerly wind prevailed. Temperature at start 65°F.; barometer 30.15". All observations were made from the upper deck of the vessel, approximately 30 feet above the water. The average speed of the boat was about 15 miles an hour with stops *en route* at Hudson, Catskill, and Saugerties.

On the trip down river 45 American Egrets were noted at 14 different points between Coxsackie and Saugerties, a distance of approximately 20 miles. The birds were not seen north of the former nor south of the latter town. Single individuals were noted at 5 points; the largest group consisted of 8 individuals; other aggregations comprised one group of 7 and two groups of 5 and 4 individuals, respectively. Thirteen of the birds were on the east side of the river, 32 on the west side.

The greatest concentration of egrets occurred in the vicinity of Hudson and Catskill. It is here also that the most extensive, shallow, reedy flats occur. At low tide they are more or less exposed and offer favorable feeding grounds for these herons and their allies. A few of the egrets were perched in trees at the water's edge but most were standing in the shallows among the rushes. Boat traffic on the river gave them no concern. At Catskill one bird unconcernedly preened itself a few yards from a man working on a garbage dump.

On the trip up-river from Kingston Point to Albany, 93 American Egrets were noted at 15 different places between a mud flat three miles south of Saugerties and the village of Stuyvesant, a distance of approximately 25 miles. Egrets were not observed south of the former nor north of the latter observation points. Single individuals were noted at only two places; the largest group consisted of 15 individuals; other aggregations comprised single groups of 14, 12 and 10 individuals, two groups of 9 each, a group of 8, two groups of 3 each and four groups of 2 each. Seventy-nine of the birds were on the east side of the river, 14 on the west side.

As on the morning trip, the greatest concentration of egrets occurred in the Hudson-Catskill area; less than one-third of the observed population occurred outside those limits. It will be noted also that the gregarious tendencies of these birds are maintained even in their post-season wanderings. In only seven instances were single individuals observed, while in 16 instances three or more egrets were resting or feeding in close proximity to one another.

In all probability at least some of the American Egrets observed by us on the morning and afternoon trips were duplicates; just how many fall in this category it is, of course, impossible to state. However, we believe that we are within the limits of conservatism in stating that well over 100 different individuals were observed by us during the course of the day.

A brief summary of our observations on the American Egret in the Albany region, 1937 through 1940, may now be appropriate. Each season begins with the date on which the first individual was noted and closes with the last date on which the species was recorded: August 1 to October 12, 1937, 16 observation periods totaling $28\frac{1}{2}$ hours, 112 individuals; August 10 to October 14, 1938, 14 observation periods embracing $16\frac{1}{2}$ hours, 51 individuals; July 30 to September 16, 1939, 13 observation periods covering 9 hours, 58 individuals; and July 19 to October 9, 1940, 15 observation periods comprising $23\frac{1}{2}$ observation hours, 234 individuals.

We believe that the data here presented together with other information at hand provide sufficient evidence to warrant the following conclusions. First, while the numbers of the American Egret in eastern New York fluctuate somewhat from season to season, a general increase in the abundance of post-breeding individuals has become evident in recent years. Second, the main flyway from which dispersal occurs in the "Capital District" (roughly, the district within a 25-mile radius of Albany) is the Hudson River. The basis for this statement lies in the fact that the egrets in that territory first appear on the lower reaches of the Hudson; later a few are found along the Mohawk River and in other streams and ponds in the vicinity. However, dispersal of the birds into the surrounding territory was less marked in 1940 than in the three preceding seasons. Third, a definite concentration point occurs in the Hudson-Catskill area where extensive mud flats suitable as feeding grounds are exposed at low tide; bordering swampy woodlands offer attractive resting and roosting places.

In view of this combination of favorable circumstances we should not be surprised to find or to learn of a nesting of this fine heron along the lower Hudson in the not too distant future.—DAYTON STONER, *New York State Museum, Albany, New York.*

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The Ring-necked Duck in Southeastern Alaska.—The morning of February, 27, 1940, at Petersburg, Southeastern Alaska, I saw four female Ring-necked Ducks (*Nyroca collaris*) at a distance of about ten yards. The lack of white on the wings was plain, even without glasses; four-power field-glasses made the light ring around each bill distinct. The birds were in a mixed flock of numerous other species that were diving and tipping among the piles and rocks along the beach.

To the best of my knowledge, the only previous record for the Ring-necked Duck from Southeastern Alaska in a flock of twenty-five birds observed by A. M. Bailey in Kootznahoo Inlet on October 27, 1920. (*Auk*, 44, 1927:187).—J. DAN WEBSTER, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Bald Eagle Killed by Lightning While Incubating Its Eggs.—On December 26, 1940, Dr. A. A. Allen and the writer visited a nest of the Southern Bald Eagle (*Haliaeetus l. leucocephalus*) which was $6\frac{1}{2}$ miles south of Wilson on Merritts Island, Brevard County, Florida. The nest was 45 feet up in a large, living, long-needed pine standing in a small, open grove of pines growing among the low palmettos which cover most of this section of the island. Close scrutiny of the nest with binoculars disclosed the tail of an eagle protruding above the rim of the nest. Going to the nest we attempted in numerous ways to flush the parent from the nest but were unsuccessful. Lightning had recently struck the tree and it seemed probable that this had killed the bird on its nest.

The writer climbed the tree on December 29 and found a dead adult eagle with wings slightly spread lying over the hollow of the nest. In the depression beneath the dead parent was an egg which had a punctured shell. A second egg was found

lodged in the outer rim of the nest, its shell being intact. The damaged egg beneath the bird, the position of the second egg, and the partially opened wings of the adult suggest that it was not killed instantly but struggled some before dying.

A careful examination of the carcass failed to show any evidence that the bird had been shot as it sat on its eggs. There were no wounds found nor was there any blood on the plumage. No direct evidence of the effect of the lightning was discovered on the body of the bird.



As nearly as could be determined the death of the eagle and the striking of the tree occurred at the same time. Both events had taken place about three or more weeks before. Internal decomposition of the bird was evidenced by the strong odor, yet the skin was intact except in the region of the anus. The eyes were dried up and considerably sunken. The broken egg beneath the bird was spoiled and part of the contents gone. Much of the bark of the tree had been torn from the limbs immediately above the nest and the trunk just below the nest had been fractured by the lightning. From these wounds considerable pitch had oozed and it was in the form of gummy drops instead of the liquid state characteristic of fresh pitch.—JOSEPH C. HOWELL, *Contribution No. 79, Zoological Laboratory, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma.*

Goshawk Nesting in Michigan.—A nest of the Eastern Goshawk (*Astur atricapillus atricapillus*) was discovered June 17, 1940, by Porter one quarter mile from the northeast shore of North Fishtail Bay, Douglas Lake, Michigan, in the forested Bogardus Tract of the University of Michigan Biological Station, located about $9\frac{1}{2}$ miles southwest of the city of Cheboygan. Attention was drawn to the nest by the shrill cries of the adult female.

The nest was located in a dead poplar tree in an area consisting of a thick growth of cedar, sugar maple, black spruce, balsam, birch, balsam poplar, and poplar. The area was generally rather low and damp, indicating perhaps a filled-in beach pool of Douglas Lake.

Built in a double-branched fork against the trunk of the tree, the nest was 30 feet, 4 inches above the ground. Measurements were as follows: Outside diameter, 2 feet, 6 inches; inside diameter, 1 foot, 4 inches; outside depth, 1 foot, 6 inches; inside depth, 3 inches. The nest was made of dead branches lined with green tips of cedar and balsam.

As soon as the nest was identified, cleats were nailed to a nearby tree and observations by the writers were started. While the cleats were being spiked to the tree, the female protested vigorously by swooping down upon us. She actually struck us with her wings on several occasions.

When we looked into the nest from the observation tree, we found two downy young crouching very quietly in the cup of the nest.

During the early morning hours we usually found the female absent, but when we neared the area about 10 A.M. or thereafter, her presence was always indicated by her shrill cries and aerial attacks. The male was never observed at the nestside, but at times was attracted to the vicinity of the nest by the female's alarm notes. He would then add his higher pitched calls to those of the female and join in the attacks.

One young bird disappeared from the nest on June 29 but the cause was unknown. The remaining young bird left the nest July 28 but remained in the area for sometime, being seen as late as August 28.—T. WAYNE PORTER, *Oak Harbor, Ohio*, and HARRY H. WILCOX, JR., *Department of Zoology, University of Michigan, Ann Arbor, Michigan*.

Other Records of Snow-killed Bob-white Coveys.—In a note in the last *Wilson Bulletin* (December, 1940:280) the writers asserted that "few snow-killed coveys have been recorded." Dr. A. W. Schorger has called our attention to the following instances recorded from Wisconsin:

"I remember a particularly severe Wisconsin winter, when the temperature was many degrees below zero and the snow was deep, preventing the quail, which feed on the ground, from getting anything like enough of food, as was shown by a flock I found on our farm frozen solid in a thicket of oak sprouts. They were in a circle about a foot wide, with their heads outward, packed close together for warmth." (John Muir, "The Story of my Boyhood and Youth", N.Y., 1913, p. 134).

"Since, there has been a cold winter when many quail froze in their roosting places; hundreds were thus frozen in bunches of ten to fifteen." (P. R. Hoy, *Proc. Wis. Nat. Hist. Soc.*, March, 1885:8) The word "since" appears to refer to the winter of 1849-50.—ROBERT McCABE and ALDO LEOPOLD, *University of Wisconsin, Madison, Wisconsin*.

An Unusual Condition in a Ring-necked Pheasant.—On December 19, 1940, a sick male pheasant (*Phasianus colchicus torquatus*) was brought to the Wildlife Laboratory at University Farm in St. Paul, by Karl Kobes of the Mud Lake National Wildlife Refuge. The bird was easily captured on the refuge the day before. It was extremely emaciated (640 grams) and was so weak that it could not right itself without assistance. Response to stimuli, whether food or other, was slow and since it seemed only a matter of a few hours before it would perish, the bird was killed to determine the cause of the sickness.

A post-mortem examination in both the Wildlife Veterinary Diagnosis Laboratories revealed no external evidence of injury and nothing of significance except that the proventricular mucosa was heavily impregnated with the retrorsely barbed awns of *Bidens cernua*, a composite that grows abundantly in moist low places in the northwestern part of the state. The achenes of this species are armed with four, long, barbed awns.

Microscopic sections showed that some of the awns had pierced the muscular layers through to the visceral peritoneum. It is possible that the irritation by the spines during the peristalsis induced by the intake of food would cause the bird such pain and discomfort that it would refrain from feeding and eventually starve to death even though there was plenty of food available.

Achenes of the various *Bidens* species are all armed with barbed awns, which if taken in sufficient quantity in the absence of other foods may be harmful to a gallinaceous bird such as the Ring-necked Pheasant. The condition described, however, is rare for in the writer's study of the food habits of over 650 Minnesota pheasants, only five birds were found to contain small quantities of these achenes and awns mixed with other foods.—LOUIS A. FRIED, *Game Biologist, University of Minnesota and State Division of Game and Fish, St. Paul, Minnesota.*

Burrowing Owls Eat Spadefoot Toads.—Spadefoot toads (*Scaphiopus*) occur in much of the range of the Western Burrowing Owl (*Speotyto cunicularia hypugaea*) but their remains have not been found in the stomachs of Burrowing Owls examined in the research laboratories of the Fish and Wildlife Service of the U. S. Department of the Interior. Furthermore, the writer has found no reference in literature to spadefoots as an item in the owl's food. Disclosures in a recent examination of a large series of Burrowing Owl pellets are, therefore, of special interest. The material in question was part of a collection made in June, July, and August of 1937, 1939, and 1940 by Dr. William L. Jellison of the U. S. Public Health Service, Hamilton, Montana.

Detailed analyses of these pellets revealed the usual abundance of beetles, crickets, grasshoppers, and small mammals, along with an occasional bird, but also disclosed spadefoot toad remains in pellets from six counties in four states. Of the 35 pellets from 2 owl burrows in Beaverhead County, Montana, and the 345 pellets from 8 burrows in Okanagan, Whitman, and Yakima counties in Washington, all collected in June or early July, 9 per cent contained *Scaphiopus* remains. Spadefoot bones composed 30 per cent of one of the 8 pellets picked up in Prowers County, Colorado, on August 20 and were present in every one of the 9 pellets collected in Clark County, Kansas on the same day. A frequency of occurrence of 11 per cent (43 in 397 pellets) for an item not previously listed in the diet of Burrowing Owls is most unexpected, especially when recorded from material collected in widely scattered localities over a three-year period.—CHARLES C. SPERRY, *U. S. Fish and Wildlife Service, Denver, Colorado.*

Attack on Buffalo by the Magpie (*Pica pica hudsonia*).—Several notes have been published on the attacking of livestock by the Magpie (A. W. Schorger, *Auk*, 38, 1921: 276; T. C. Stephens, *Auk*, 38, 1921: 458; S. S. Berry, *Condor*, 24, 1922: 13; W. P. Taylor, *Auk*, 40, 1923: 126). The trait of attacking live animals is very old apparently and started with the buffalo. T. G. Anderson (*Coll. Wis. Hist. Soc.*, 9, 1882: 167) spent the winter of 1809-10 at Lac Qui Parle, western Minnesota. He shot an old buffalo against the advice of his companions who stated that it was scabby and worthless. He states further: "On examination, it was found that his back and the upper part of his sides were a mass of scabs and blood, where the magpies and other carnivorous birds had pecked and fed, as they do when these animals become too old and feeble to defend themselves."—A. W. SCHORGER, 168 North Prospect Ave., Madison, Wisconsin

Starlings in Central Colorado.—The first record for the Starling, *Sturnus vulgaris*, in Colorado was taken by Rockwell (*Wilson Bull.*, 51, 1939: 46) on December 17, 1938, at the Mile High Duck Club, about fifteen miles northeast of Denver. These first birds were seventy-five or one hundred in number. Since then scattered individuals and small flocks have been seen in and about Denver.

After a long and thorough search of the Pikes Peak region, seventy miles south of Denver and in east-central Colorado, I found eight Starlings at the Johnson Reservoir, ten miles south of Colorado Springs, on January 26, 1941. It is interesting to note that these birds sought the same sort of locality as did the Mile High birds, although they had to pass a major city to find it: an area of farm buildings near small sloughs and marshes and a large reservoir, and fields under cultivation or semicultivation. Significantly, there are no such areas of importance between the Denver area and the Johnson Reservoir.

As at the Mile High Duck Club, these Starlings were associated chiefly with Red-wings. In fact, this association may have led to an interesting call which one Starling gave. As I approached it, and while I had not yet gotten the flock into the air, this "look-out" uttered a number of Red-wing call notes. So realistic was the imitation that I might easily have passed him by entirely. It was more than a half-hour before I heard any typical Starling notes from the flock. In the meantime they were exceedingly hard to approach, but when left alone quickly returned to feeding with Meadowlarks and Red-wings.—SAM W. GADD, 1331 North Weber Street, Colorado Springs, Colorado.

Clay-colored Sparrow in Ohio.—A specimen of the Clay-colored Sparrow (*Spizella pallida*) taken on South Bass Island, Ottawa County, Ohio, on May 12, 1940 is noteworthy in that it apparently represents an addition to the avifauna of the state. When first observed early in the morning the bird was feeding in company with a group of warblers in a small hackberry tree near the lighthouse at the southern tip of the island. Late in the afternoon the bird was collected by Mr. Kenneth H. Doan and myself in a chokecherry thicket within two or three rods of the tree where it was first seen. The specimen proved to be a male with moderately enlarged gonads (5.2 x 3.3, 5.4 x 3.8 mm.) and weighed 10.9 grams. The central pair of rectrices had been recently renewed and were not fully grown. The skin has been deposited in the collection of the Ohio State Museum at Columbus.—CHARLES F. WALKER, Stone Laboratory, Put-in-Bay, Ohio.

Nesting Bluebirds of Nashville—a Correction

We find an error in our article on "The 1939 Nesting Season of Bluebirds at Nashville, Tennessee" as it was published in a recent *Wilson Bulletin* (52, No. 3, September, 1940:183-90). In the last line of both Table 1 and Table 2 the word "hatched" should be replaced by the word "fledged".—Amelia R. Laskey.

EDITORIAL

Miles D. Pirnie, Chairman of our Wildlife Conservation Committee, has asked to be relieved because of the pressure of his other work. Therefore President Hicks has appointed Frederick N. Hamerstrom, Jr. to succeed him but, fortunately, has persuaded Dr. Pirnie to continue as a member of the committee.

We are trying to make up a list of all complete sets of *The Wilson Bulletin*, whether in private hands or in public libraries. The number is apparently very small. If you have or know of a set which is complete or nearly so, please send the Editor a card with this information.

The Editor's office is increasingly becoming a clearing house for information on current research projects in ornithology. A number of times this exchange of information through our office has prevented duplication and has put research workers with similar interests in touch with each other.

Would it, perhaps, be desirable to print regularly in the *Bulletin* lists of studies in progress? Such lists would of course be carefully restricted to genuine projects already undertaken—not merely planned. Please send the Editor your opinions on this.

The next annual meeting of the Wilson Ornithological Club is scheduled for November 21 to 23 at Champaign-Urbana, Illinois, on the campus of the University of Illinois. The meetings will be held in Gregory Hall and expectations are that the Illini Union Building will serve as convention headquarters. Both of these buildings are new, being used for the first time during the present school year. The following organizations and their representatives will serve as sponsors of the meeting and as the Local Committee: S. C. Kendeigh (Chairman) and H. H. Shoemaker of the Department of Zoology, R. E. Yeatter and A. S. Hawkins of the Illinois State Natural History Survey, L. A. Adams of the Museum of Natural History, Mrs. A. F. Satterthwait and Mrs. R. R. Snapp of the Champaign-Urbana Bird Club, R. W. Fautin of the Ecology Club, and E. J. Koestner of the Wildlife Club.

OBITUARY

H. ELIOT HOWARD, the famous student of bird behavior and author of "Territory in Bird Life" and other classic works, died on December 26, 1940.

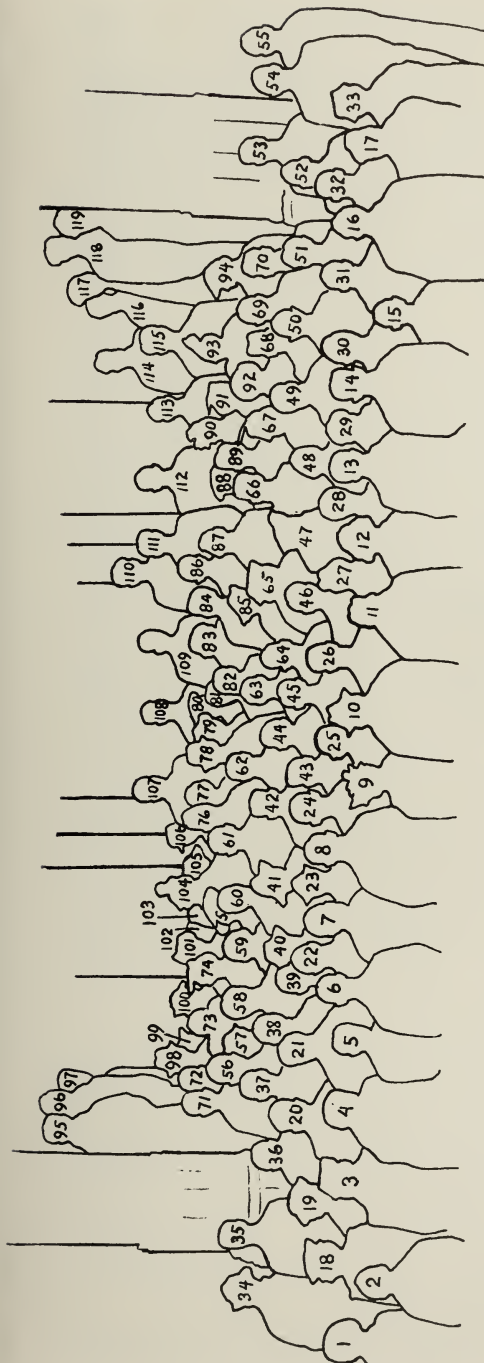
SAMUEL E. PERKINS III, one of the leading ornithologists of Indiana, died in Indianapolis on January 31, 1941. He had been a member of the Wilson Ornithological Club for eighteen years and served as its Treasurer very faithfully and effectively from 1936 to 1938.

W. OTTO EMERSON, pioneer ornithologist, died in California on December 24, 1940 at the age of eighty-five.

G. KINGSLEY NOBLE died in Englewood, New Jersey, on December 9, 1940, at the age of forty-six. His first ornithological papers were based on field work which he did for Harvard University in the West Indies, Newfoundland, and Peru. His latest papers were important contributions to the experimental study of bird behavior.

JOSEPH BEAL STEERE, noted explorer and naturalist, died in Ann Arbor, Michigan on December 7, 1940 at the age of ninety-eight. His expeditions between 1870 and 1888 resulted in the discovery of many new birds and new facts on their distribution, especially in South America and the Philippine Islands.





KEY TO THE WILSON ORNITHOLOGICAL CLUB GROUP PHOTOGRAPH AT MINNEAPOLIS, 1940

- 1, Mrs. Frank Bohn. 2, Lawrence Bohn. 3, Mrs. Rollo H. Wells. 4, Mrs. G. R. Magney. 5, Miles D. Pirnie. 6, George B. Thorp. 7, Earl G. Wright. 8, Lawrence E. Hicks. 9, Mrs. Thomas S. Roberts. 10, Thomas S. Roberts. 11, Catherine J. Wood. 12, Peggy Muirhead. 13, Earl Mitchell. 14, B. W. Baker. 15, Donald Baker. 16, Edwin T. Nelson. 17, Theodore Nelson. 18, Mrs. B. F. Myers. 19, Mrs. Harry W. Rice. 20, Murl Mitchell. 21, John L. George. 22, Maurice Brooks. 23, Mrs. F. W. Haecker. 24, A. F. Ganier. 25, Janet Buscho. 26, Hugh R. Engstrom. 27, Mrs. Clair T. Rollings. 28, Dorothy Mierow. 29, Eleanor G. Cooley. 30, David Damon. 31, Eugene Castle. 32, Harry H. Wilcox, Jr. 33, Margaret Drum. 34, Max L. Partch. 35, Thomas M. Street. 36, Louis A. Fried. 37, Ralph A. Woolsey. 38, R. Allyn Moser. 39, F. W. Haecker. 40, Mrs. C. O. Decker. 41, Mrs. Lawrence E. Hicks. 42, Kenneth H. Masters. 43, E. L. Moseley. 44, Ward Zimmermann. 45, Richard P. Grossenheider. 46, Clair T. Rollings. 47, Mrs. John A. Thompson. 48, Mrs. Seth A. Low. 49, Seth H. Low. 50, Lawrence I. Grinnell. 51, Milton D. Thompson. 52, Dean Tanner. 53, Karl E. Bartel. 54, Gustav Swanson. 55, O. S. Pettingill, Jr. 56, C. W. Plattes. 57, Mrs. Walter E. Rogers. 58, Urban C. Nelson. 59, Mrs. Cleveland P. Grant. 60, C. O. Decker. 61, Warren W. Chase. 62, William T. Cox. 63, Clarence S. Young. 64, T. Wayne Porter. 65, Mrs. Margaret M. Nicc. 66, A. T. Harris. 67, Mrs. A. T. Harris. 68, B. L. Hawkins. 69, E. T. Cox. 70, Henry C. Kyllingstad. 71, Byron E. Harrell. 72, William H. Longley. 73, Ella Heinke. 74, Mrs. Walter J. Breckenridge. 75, Perna M. Stine. 76, David Faegre. 77, Mrs. R. H. Mylin. 78, F. R. Zimmerman. 79, Mrs. Emil H. Jensen. 80, Mrs. D. B. Green. 81, Mrs. V. O. Wilson. 82, David Edgar O. Wilson. 84, J. Murray Speirs. 85, Mrs. Doris Huestis Speirs. 86, C. J. Henry. 87, Alfreid Lewy. 88, David Schmidt. 89, Robert Schmidt. 90, Constance Nice. 91, Mrs. O. S. Pettingill, Jr. 92, Nevada E. Schmidt. 93, Germaine Berent. 94, Leone Patricia Knox. 95, Robert B. Lea. 96, Dale W. Jenkins. 97, J. S. Lindquist. 98, O. A. Stevens. 99, Mrs. J. S. Lindquist. 100, Mrs. William Ure. 101, Mrs. R. N. Rosenwald. 102, Mrs. Hugh H. Owen. 103, Mrs. J. S. Lindquist. 104, Mrs. C. R. Nelson. 105, Mrs. Mary Lupient. 106, Mrs. A. D. Cornica. 107, Paul C. Gatterdam. 108, R. M. Berthel. 109, Lawrence H. Walkinshaw. 110, J. Van Tyme. 111, Cleveland P. Grant. 112, George Miksch Sutton. 113, Walter J. Breckenridge. 114, Ross Hanson. 115, G. A. Ammann. 116, Arnold B. Erickson. 117, George N. Rysgaard. 118, Jean Laffoon. 119, S. Charles Kendeigh.

WILDLIFE CONSERVATION

Pan American Convention

The United States is already party to migratory bird protection treaties with Canada and Mexico, ratified in 1916 and 1936, respectively. The Pan American Convention on Nature Protection and Wildlife Protection in the Western Hemisphere is a step toward a similar, but more inclusive, treaty between the United States and the South American nations. The following account is quoted from *Wildlife Review*, No. 29, January 1941: pp. 54-55.

On October 12, 1940, plenipotentiaries of six Latin American governments and the United States signed the convention on "Nature Protection and Wildlife Preservation in the Western Hemisphere" when it was deposited and opened for signature at the Pan American Union in Washington.

The Convention was drawn up by a Committee of Experts from the 21 American Republics, which met in Washington May 13 to 16, and was approved by the Governing Board of the Pan American Union at its June meeting. The formulation of the Convention was recommended in one of the resolutions of the Eighth Pan American Conference, held at Lima, Peru, in December, 1938.

The Convention consists of twelve articles. Article 1 defines the terms used in the Convention. Under Article 2, the contracting governments undertake to create national parks, national reserves, nature monuments, and wilderness reserves within their territories as soon as possible. They are to notify the Pan American Union of the establishment of any such parks, etc., and of any legislation adopted in connection therewith. Under Article 3, the governments agree to prohibit the destruction of the fauna and flora in national parks except under the direction or control of the proper authorities. Wilderness reserves, according to Article 4, are to be kept inviolate except for duly authorized scientific investigations or government inspection.

Under Article 5, the governments pledge themselves to adopt legislation which will assure the protection and preservation of the natural scenery, striking geological formations, and regions and natural objects of aesthetic interest or historic or scientific value. Cooperation among the contracting governments in promoting the objectives of the Convention is provided for in Article 6, and the adoption of appropriate measures for the protection of migratory birds, in Article 7.

Article 8 declares the protection of certain species to be of special urgency and importance and urges that permission for their killing, capturing or taking, be granted only in order to further scientific purposes. Rules for the regulation of the importation, exportation and transit of protected flora and fauna are set forth in Article 9. Articles 10, 11, and 12 deal with protocolary matters, and stipulate, among other things, that the Convention will come into force three months after the deposit of not less than five ratifications with the Pan American Union.

Gabrielson's "Wildlife Conservation"

Conservation in the United States is holding a pre-season inventory.

Natural resources used to be the concern of relatively few organizations and individuals; now that the cat is out of the bag, the general public is becoming interested. Two results have followed, almost together: the demand that something be done about it, and that the public be told what and why. Education, compulsory or otherwise, is thus definitely a part of the new order. Pre-digested materials have been lacking, hence the many new books which take stock of present conditions and make recommendations for the future.

Of these, the latest is Ira N. Gabrielson's "Wildlife Conservation" (The Macmillan Co., N. Y., 1941, xv + 250 pp., illus., \$3.50). Quite apart from the book's authority as a statement of the Chief of the Fish and Wildlife Service, it is required reading on the basis of content alone.

The purpose of the book, as stated in the preface, is not to give a complete analysis of all factors affecting wildlife conservation, but to present the basic

facts and to emphasize that conservation of soil, water, forests, and wildlife are phases of a single problem—the restoration and future wise use of renewable natural resources. The first seven chapters deal with these interdependences, the rest with the special problems of certain groups of wildlife to show that all must have suitable environment and that any use of wildlife must not remove more than the annual increase if populations are to hold up. The chapter headings give an idea of the ground that is covered: conservation of renewable resources, soil erosion and wildlife, water conservation, life of the waters, forest conservation, relationship between forestry and wildlife, grassland conservation and its relation to wildlife, some basic facts in wildlife conservation, resident game, migratory birds, fur animals, non-game birds and mammals, rare and vanishing species, predator relationships, wildlife refuges and their place in conservation, surmounting the obstacles to conservation.

Gabrielson has done an outstanding job of selecting and organizing materials from a field which is difficult to appraise at best, and which has become cluttered with odds and ends of incomplete data. To this essential winnowing he has added a distinctive interpretative ability and a clear, simple style of writing which are uncommon in the literature of conservation. Particularly good are the discussions of the inter-relationships of all renewable resources, the dependence of animals upon their environment, and the role of insect-eating birds, for example. The many photographs are unusually fine, although not well distributed through the text.

He may be criticized justly—and severely—for his failure to include an adequate bibliography. It might be argued that it was impossible to list every reference which contributed to such an inclusive synthesis, but a selected bibliography would have discharged his obligation much better than the eight footnote references which are given. This is all the more true since the book will doubtless be used as a text-book, as suggested by the publishers. On the same grounds, the index is also inadequate.

Occasionally, Dr. Gabrielson seems to have condensed too much. Fishes get less attention than is their due, and no inclusive discussion of fish populations is complete without reference to the work of Thompson and others of the Illinois Natural History Survey; the influences of large dams upon wildlife are passed over too lightly; only Federal refuges are shown in the figures, although others are included in the text; the problem of survival and recovery of small populations is treated only as affected by predators; the distinction between the mere presence of wildlife and its presence *in numbers*—a critical point, particularly in game management—is often not drawn. There is no treatment of farm wildlife comparable to the sections on forests and wildlife and grasslands and wildlife. Gabrielson does not propose that we give the country back to the Indians, nor does he ignore the problem of farm wildlife: but I suggest that farmlands as wildlife environment deserve as specific treatment as forests and grasslands. The sorts of forest management which Gabrielson describes—multiple use, sustained yield, selective cuttings, logging rotations—cannot be used in woodlots as readily as in large forests. Nevertheless, the main discussion of forest-wildlife relationships hinges upon such methods of large-forest management, even though his statistics (p. 55) show that about 41 per cent of the total acreage of "private commercial forest lands" is in units averaging about 40 acres each. In the same way, "grasslands" are primarily the Western range, leaving small pastures and meadows for incidental treatment elsewhere.

A few of his interpretations will probably be challenged. For example, the treatment of predation is unusually sane, taking equally to task the sportsman, conservationist, and biologist for the distortions of view particular to each, but I would question a few points of detail. In his summary of predation, Gabrielson

gives six principles (pp. 209-210). The first states that predators generally live on surplus populations, the last, that hunting may disturb the numerical ratio of game to predators, so that some reduction of predators may be necessary. I do not see why the mechanics of the removal of the surplus—whether by predators or by hunters—should greatly affect the predator-prey relationship of the remainder. Experimental work has indicated no such effect on Iowa Bob-whites, for example. And in his scrupulous care to present all aspects of the question, Gabrielson has perhaps left too much room for the argument that any case, anywhere, is one of the exceptions that permits—or demands—the killing of predators.

In one instance, Gabrielson has been dangerously lax in his use of "common names" of plants. "Wild camass" is cited as a food of early American Indians. According to Britton and Brown, "camass" relates to two genera, one of which (*Toxicoscordion*, with about seven North American species) is composed of poisonous perennials, the other (*Quamassia*, with about four species) of edible bulbs.

In the main, there is a refreshing absence of the sweeping generalities so common to the promotional literature of conservation. There are a few exceptions, as: "By conservative use, all the forest resources can be maintained and at the same time utilized for the benefit of the human race" (p. 55), and "As a matter of fact, good farm management alone, particularly where there is some waste land, will almost automatically improve conditions for the quail and other species that have somewhat similar food and cover requirements" (p. 122). His opinion of the results of wildlife management to date (see particularly p. 246) seems rather optimistic.

Most conservationists and ornithologists are still using the old so-many-birds-eat-so-many-insects argument for bird protection. It is significant that Gabrielson, as Chief of the Bureau which fostered it, so frankly admits its weakness. No equally flashy rallying call has yet been found. Gabrielson offers a more sober basic principle: the function of animals (i.e. wildlife) as "part of nature's age-old mechanism for building and maintaining soils and waters" (p. 131).

This same thing has been his aim throughout the book—to strip the problem of wildlife conservation down to its essentials in preparation for the work that must be done, instead of diverting attention from these fundamentals by a flourish of trumpets. He has done it remarkably well.—F. N. Hamerstrom, Jr.

Audubon Society Campaigns to Curb Feather Trade

The recent popularity of quills and other feathers in the millinery trade and the resulting threat to many wild birds has stirred the National Audubon Society and other conservation organizations to the most active bird protection campaign since the close of the earlier effort of this sort in 1913. "Massacred for Millinery", (the title of Circular No. 45, written by Richard H. Pough,) reports very vividly the threatened reduction of numbers of such birds as cranes, condors, the osprey, and eagles, unless the trend of fashion, public attitude, and corrective legislation can promptly be geared together in a sensible, effective manner to prevent current and threatened abuses.

In brief, the present crisis arises from the popularity of quills on hats and from certain defects in the customs regulations. A loophole in the tariff law permits hat feathers to be brought into this country as "fishing fly" feathers. Also it seems plain that many feathers of wild birds are entered falsely as "raised in domestication". New legislation is sought to help stop these leaks; but probably the best answer lies in the educational program to discourage the use of feathers. Even ornithologists cannot tell the origin of most feathers without extensive comparative material, so obviously the average buyer cannot be expected to discriminate.

Let us all actively cooperate in this very worthwhile campaign. Send for copies of "Massacred for Millinery" and keep posted. Already over 20,000 copies of this bulletin have been distributed. For pamphlets write to the National Audubon Society, 1006 Fifth Avenue, New York, New York. The National Audubon Society also has been responsible for articles in the *Reader's Digest*, *Collier's*, and many other publications. Letters have been sent to the 5,000 members of the National Retail Dry Goods Association. A form letter (to be modified appropriately) and a draft of a resolution for use by clubs have been widely circulated by the Society. The work to be accomplished, they say, includes the passage of the model "Audubon Plumage Law" in all states and the amendment of the Tariff law and Customs regulations to prohibit the importation of feathers for fishing flies and to stop the illegal entry of wild bird plumage allegedly coming from domesticated species.

At the North American Wildlife Conference at Memphis, John H. Baker announced that the National Audubon Society and the organized feather trade had reached an agreement on February 6 which paves the way for legislation to save native wild birds from the hazards of legalized plumage traffic. The details of this agreement will be explained later.—M. D. Pirnie.

WILDLIFE CONSERVATION COMMITTEE,
Frederick N. Hamerstrom, Jr., Chairman.

ORNITHOLOGICAL NEWS

Jean Delacour, the noted French ornithologist, has come to this country and is now serving as consultant on the future development of the New York Zoological Park.

Richard L. Weaver has been appointed ornithologist for the New Hampshire Nature Camp at Lost River, N. H.

With its first 1941 issue our distinguished contemporary, *Bird Lore*, changes its name and becomes the *Audubon Magazine*. Frank M. Chapman founded the magazine in 1899 and edited the first thirty-six volumes. He was succeeded by William Vogt who was the editor for four years. The present editor, Margaret Brooks, is now beginning her third volume. Fortunately *Bird Lore's* volume numbering is being continued. This will help to minimize the confusion with the earlier *Audubon Magazine* published in New York in 1887 and 1888.

Frederick N. Hamerstrom, Jr. has been appointed curator of the Edwin S. George Reserve, a division of the University of Michigan Museum of Zoology.

The Cooper Ornithological Club will hold its Fifteenth Annual Meeting at Berkeley, California, on April 11 and 12.

John W. Aldrich, formerly of the Cleveland Museum of Natural History, has taken on new duties as ornithologist of the Biological Surveys section of the Fish and Wildlife Service in Washington, D. C.

George Miksch Sutton and Olin Sewall Pettingill, Jr., left the middle of February on an expedition of several months duration to Tamaulipas and adjoining states of eastern Mexico. Assisting them are two students, Dwain W. Warner and Robert B. Lea.

The National Audubon Society has recently appointed a full time, resident representative, Mr. C. A. Harwell, to direct its expanding activities in California. Mr. Harwell was formerly Park Naturalist in Yosemite National Park. The first state meeting of California Audubon Clubs will be held at Pacific Grove on May 10 and 11.

Pierce Brodtkorb left February 13 on his third expedition to Chiapas, Mexico.

ORNITHOLOGICAL LITERATURE¹

A FIELD KEY TO OUR COMMON BIRDS. By Irene T. Rorimer. Pocket Natural History No. 8, Cleveland Museum of Natural History, Cleveland, Ohio. November, 1940: 4 $\frac{1}{8}$ x 6 $\frac{3}{4}$ in., 158 pp., 18 plates, 4 in color, 27 text figs. \$1.50.

The purpose of this booklet is to present a "simple formula" for identifying the common birds of northern Ohio in the field. Only "pertinent facts" are given, and in the order of their importance these are habitat, size, and color. The originality of this treatment consequently is that it *reverses* the order ordinarily used in keys in the past, which have been based on color and size, with occasional notes only on habitat. There is much in the author's claim as to the importance of habitat, and undoubtedly the stressing of this point will give useful information to many a beginner, who would otherwise acquire it by the slow process of accumulated experience. Turning to the table of habitats and sizes (p. 13) we find the following classification: I. Water Habitats (a) open water, lakes, ponds, streams; (b) beaches, mud flats; (c) marshes, reeds, wet meadows. II. Land Habitats (d) open country, grassy and cultivated fields, brushy fence rows and swamps; (e) semi-open country, scrubby fields and swamps, landscaped areas, orchards, farms, cities; (f) wooded country, a more or less closed growth of trees. The author is probably wise not to have attempted more than these six categories; indeed we can easily imagine a student about to identify a bird and wondering in just what habitat he is! Perhaps the absence of the "wooded swamp" is the most obvious mistake. Nothing could be more certain than that some birds are severely restricted in habitat. But the great difficulty with using it as a primary key character is that many birds occur commonly in two or more. Some birds will be found in two or more places in this key, but this has been done nowhere nearly enough. For instance, no hawks can be found in section F, though most of them nest there; the Woodcock is absurd in C, in spite of its convenient juxtaposition with the Snipe; it is properly in F, but lacking from E, perhaps the best place of all. While the Rusty Blackbird and Grackle can be found in two or three their habitats, while thumbing its pages. Actually there is no "simple formula" rather than E and F. The absence of the swallows from A and C where they are abundant, is noteworthy. The author is aware that innumerable woodland (F) land-bird transients occur on migration in several habitats in section E.

Many decades of experience has proved color more important than size. An appreciation of relative size, allowing for distance, poor light, etc., is the last technique acquired by the most expert, and no field ornithologist ever lived whose judgment of size was not at times seriously at fault. In many cases the author of this key has relied too much on the linear measurement of total length, leading to such misleading characterizations as the Pigeon Hawk "Robin-size" and the Little Blue Heron "Crow-size." It must be admitted that the key is a marvel of ingenuity in a great many respects. As it includes about 200 species of birds on pages 15-71, it is really highly intricate, anything but a "simple formula." The beginner, in endeavoring to use it, will undoubtedly learn a lot about birds and their habitats, while thumbing its pages. Actually there is no "simple formula" for learning birds.

In my judgment the user of the key would be completely lost without the descriptions on pages 88-154, arranged by families in the accepted sequence. These are an obvious imitation of the method invented by Peterson in his "Field Guide," a copyrighted book. Especially in the first half of the families, the actual clauses in Peterson's descriptions are often inverted only, or are given verbatim in a different order, and the highly original descriptive adjectives used by that author are carried over bodily, all to a degree which is improper without ample acknowledgement, and a statement to the effect that permission to do so has been secured.

¹ For additional reviews see pages 21 and 40.

In the mass the descriptions average more abbreviated, and too often more important diagnostic characters are omitted, while less important ones are retained. In certain cases bad judgment and ignorance result in absurdity. Thus Peterson, in comparing the immature Bay-breasted and Blackpoll Warblers, says "The fall Blackpoll . . . has more distinct streakings on the sides and *white* under tail-coverts instead of yellow." Mrs. Rorimer omits the second clause (which *can* be used) and alters the first character (which *cannot* safely be used, though correct) to read "The Blackpoll may have faint streaks on the breast which the Bay-breasted always lacks." In many cases where the description is wholly original, some important diagnostic character is omitted, while others are erroneous. The notes of the two Yellowlegs are reversed; the Olive-sided Flycatcher is not olive green above and not the largest of the flycatchers, as stated. Peterson's few minor inaccuracies are all faithfully repeated, and his few omissions of worthwhile characters are not repaired in the descriptions before me, which contain far too many errors of omission or commission. Another line gives the status of each species. Summer residents and transients are given an arrival date in spring, but no departure dates; winter visitants are given no dates at all; in all cases room exists for these on the one line. Habitat summaries are usually excellent, but sometimes do not coincide wholly with the Key habitat. (Example, Lincoln's Sparrow, D group in Key, E group on page 153.)

There is no table of contents, but an alphabetical index of the birds comes first, which refers to the illustration, if any, and the description. It should also have referred to the places in the key where the bird is found. The Key contains references under every bird to its description, but the descriptions contain no reference to the same bird in the Key. An appendix gives 30 "rare or uncommon" species, again by habitat, size, and color description. In those cases where a bird is listed under two habitats, the cross reference is erroneous in every case, referring to the second habitat in the appendix. Barring this editorial *lapsus*, the very difficult proofreading, especially the complicated numbering and indentations of the Key, is notably excellent, as in the paper, printing, and typography. The illustrations are by Roger T. Peterson, continuing his well known style, and all the figures have been conscientiously redrawn. In the four colored plates, the figures are often minute, in spite of which the reproduction is remarkably good. The illustrations are excellent, their reproduction does credit to artist and publisher, and greatly enhance the value of this attractive little booklet.—Ludlow Griscom.

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PROCEEDINGS OF THE WILSON ORNITHOLOGICAL CLUB

BY OLIN SEWALL PETTINGILL, JR., SECRETARY

The Twenty-sixth Annual Meeting of the Wilson Ornithological Club was held in Minneapolis, Minnesota, on November 21-24, 1940. Headquarters were in the Minnesota Museum of Natural History of the University of Minnesota; living and dining quarters were in an adjoining building, the Center for Continuation Study.

The Executive Council met on Thursday evening, Friday and Saturday were devoted to two short business sessions, three sessions of papers, a natural color motion pictures session, a symposium on wildlife management, a bird art exhibit, a show of motion pictures, and several social events including the Annual Dinner.

MEETING OF THE EXECUTIVE COUNCIL

Dr. Josselyn Van Tyne was reappointed Editor of *The Wilson Bulletin*.

The Council accepted the invitation of the Department of Zoology of the University of Illinois and the Illinois Natural History Survey to hold its 1941 Annual Meeting at Urbana-Champaign, Illinois. The meeting time will be Friday and Saturday, November 21 and 22.

Possible locations for the 1942 and 1943 meetings were discussed and Ithaca, New York, was tentatively scheduled for 1942.

To stimulate increase in the Club's endowment through additional life memberships, the Treasurer was authorized to offer life memberships to be paid in four installments of twenty-five dollars each, the balance to be applied toward active memberships if payments are not completed.

The need of more illustrative material in *The Wilson Bulletin* was brought to the Council's attention. The Council took immediate action by directing the transfer of all 1940 income from the endowment toward illustrations and authorizing the appointment of an Illustrations Committee to build up additional funds.

The Editor and Treasurer reported that the costs of publishing the *Bulletin* were rising, resulting in a reduction in the number of pages and the delayed publication or rejection of many important manuscripts. The Council responded by taking two courses of action: (1) Instructing the Treasurer to approach all Associate Members of five or more years standing and urge them to become Active Members. (2) Suggesting two possible amendments to Article II, Section 3, of the Constitution which now reads in part: "The annual dues of associate members shall be one dollar and fifty cents (\$1.50). The annual dues of active members shall be two dollars and fifty cents (\$2.50)."

One amendment reads: The dues of all associate members shall be raised from one dollar and fifty cents (\$1.50) to two dollars (\$2.00); the dues of all active members from two dollars and fifty cents (\$2.50) to three dollars (\$3.00).

The other amendment reads: All associate memberships shall be limited to five years, at the end of which time associate memberships automatically become active memberships.

These proposed amendments were placed in the table to be voted on at the next Annual Meeting.

In behalf of the Wilson Ornithological Club the Council accepted affiliation with the American Ornithologists' Union. This action permits the Wilson Ornithological Club to be represented on the Executive Council of the American Ornithologists' Union by one delegate. The Council instructed the President to appoint the delegate together with one alternate.

BUSINESS SESSIONS

The first business session was called to order by President Lawrence E. Hicks 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, and Librarian were read and approved.

The President appointed three temporary committees.

They were:

Resolutions: L. H. Walkinshaw, J. Murray Speirs, and O. A. Stevens.

Auditing: Albert F. Ganier and Theodora Nelson.

Nominating: Margaret M. Nice, Earl G. Wright, and W. J. Breckenridge.

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

The reports of the following committees were read and approved: Program, Endowment Fund, Affiliated Societies, Index, Library, Wildlife Conservation and Membership.

The second and final business session was called to order at 4:45 Saturday afternoon by Vice-President Sutton.

Persons nominated to membership during the current year were formally elected.

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

Resolved, that the Wilson Ornithological Club at its Twenty-sixth Annual Meeting on November 21-24, 1940, in Minneapolis, Minnesota, wishes to express its deepest thanks to its hosts who have made this meeting so pleasant and successful: to the University of Minnesota, especially to Dr. Thomas S. Roberts and staff of the Minnesota Museum of Natural History and to Mrs. Ruth Lawrence and staff of the University Gallery; the members of the Minneapolis Audubon Society, the Minnesota Bird Club, and the Public Library Bird Club; and to the members of the Local Committee.

Whereas, the Wilson Ornithological Club learns of extensive illegal traffic in the plumage of wild birds in connection with renewed popularity of feathers for millinery purposes, therefore, be it *Resolved*, that the Wilson Ornithological Club goes on record as opposed to the use for millinery purposes, of any wild bird plumage, coming from within or without the United States; be it further *Resolved*, that the officers of the Wilson Ornithological Club join with the National Audubon Society and other organizations to aid in disseminating information to the public and in seeking remedial legislative action and adequate enforcement; and be it still further *Resolved*, that the Wilson Ornithological Club asks for the cooperation of the individual members and affiliated clubs in conveying to the managements of leading department stores and millinery establishments in principal cities throughout the country information as to their opposition to such use of wild bird plumage.

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, 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 5:15 P.M.

PAPERS SESSIONS

The opening session on Friday morning began with an address of welcome by Dr. Thomas S. Roberts, Director of the Minnesota Museum of Natural History, and a response by President Lawrence E. Hicks.

The remainder of the Friday morning session, a portion of the Friday afternoon session and the Saturday morning session was devoted to the reading of papers. Altogether 19 papers were given. The majority were largely technical, being devoted to the following ornithological studies: life history, 6; distribution and migration, 5; historical 1; ecological, 1; morphological, 1; pathological, 1. Two papers were based primarily on Kodachrome slides of birds; one concerned an expedition.

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

OPENING SESSION. FRIDAY MORNING, NOVEMBER 22

1. MAURICE BROOKS, West Virginia University. *Swainson's Warbler in the Mountains of West Virginia*. (15 minutes).

The paper recorded the finding of Swainson's Warbler as a locally abundant summer resident in Nicholas and Fayette Counties, West Virginia. The birds occupy areas where hemlock, rhododendron, mountain laurel, and American holly are the dominant or most abundant woody species.

2. THEODORA NELSON, Hunter College of the City of New York and the University of Michigan Biological Station. *Incubation Patches as Breeding Evidence in Shore Birds*. (10 minutes).

In studying museum specimens of shore birds it was found that incubation patches are definite in birds collected during the breeding season. An extensive study of such specimens should provide sufficient evidence (1) to conclude whether both sexes incubate and brood about equally or whether one sex does the larger part, and (2) to indicate the breeding of species in which the actual length of the breeding season is unknown.

3. F. W. HAECKER and R. ALLYN MOSER, Omaha, Nebraska. *Present Day Bird Life Along the Missouri River Compared with Say's and Audubon's Findings*. (15 minutes).

Ornithological notes made during the past 14 years while traveling almost constantly up and down the Missouri River between St. Louis and Sioux City, with an occasional trip as far upstream as Montana were compared with the findings of Thomas Say made in 1819 and 1820 and with the journals of John J. Audubon made during his expedition of 1843 in this region. Say and Audubon listed 212 species seen along the Missouri River. It was thought that the probability would be against seeing 56 of these species on similar journeys at the present day. It would be impossible to see some species for they have become extinct or else their ranges have been greatly reduced. Sixty-three species not mentioned by Audubon or Say would probably be seen at the present time. In general there has been a great decrease in game birds. Other forms, principally the smaller woodland species, seem to have increased. The relative abundance of different species has changed greatly. Reasons for the changes were suggested.

4. J. VAN TYNE, University of Michigan Museum of Zoology. *Bird Distribution Among the Islands of Northeastern Lake Michigan*. (10 minutes).

An account of the distribution of birds on the Beaver Islands of Lake Michigan as ascertained during an expedition conducted jointly by the Cranbrook Institute

of Science and the University of Michigan Museum of Zoology under the direction of Dr. Robert T. Hatt.

5. C. EDWARD CARLSON, University of Minnesota and the Minnesota Division of Game and Fish. *A Record of Several Unusual Pheasant Nests from Minnesota*. Illustrated by 2" x 2" Kodachrome slides. (15 minutes).

Accounts were given of a Ring-necked Pheasant nesting in a black mulberry tree and of another nesting in a straw stack. Two cases of extreme persistence of hens incubating addled eggs were described. Examples of nest parasitism involving the pheasant were illustrated and discussed.

6. ARNOLD V. ERICKSON, Division of Economic Zoology of the University of Minnesota. *A Study of Wilson's Snipe*. (15 minutes).

Wilson's Snipe appears to have few natural enemies. It has been reported as occurring five times in Marsh Hawks' stomachs, once in a Cooper's Hawk, and once in a Dusky Horned Owl. It has persisted in numbers large enough to keep it on the list of game species probably because it has few natural enemies, is widely distributed, nests in inaccessible places, and has an erratic flight. The most plausible explanation for the production of the sound that accompanies the nuptial performance is the tail-feather theory. Fall food of 76 snipe collected in 8 localities in Minnesota was made up of 61.43 per cent animal material and 38.40 per cent vegetable material. The bulk of the animal food consisted of snails and the larvae of midges, crane flies, horse flies and dragon flies. The vegetable food consisted of fruits of *Scirpus*, *Carex*, *Juncus*, and green plant parts. About 80 per cent of the snipes examined were infected with parasites: tapeworms, *Haploparaxis*, *Diorchis*, *Paricterotaenia*; flukes, *Hypoderaeum*, *Cyclocoelum cuneatum*, *Echinostoma revolutum*; roundworms, *Cosmocephalus capellae*; protozoa, *Sarcocystis rileyi*. The average weight of 41 females was 115.28 grams and of 32 males 117.20 grams. The average bill length of 33 females was 66.34 mm. and of 32 males 65.33 mm. There seems to be no correlation between sex and weight or bill length. Of 86 snipes, 39 were males and 47 females or .83 males for each female or 45.34 per cent males. Grazing cattle improve snipe habitat.

7. HARRY H. WILCOX, JR., University of Michigan and the University of Michigan Biological Station.

An Ecological Survey of the Birds of Reese's Bog, Cheboygan County, Michigan. Illustrated by 3¼" x 4" slides. (15 minutes).

A report of a study of birds inhabiting a bog area and their relationship to the various plant associations. The study was carried on during the summers of 1939 and 1940 at the University of Michigan Biological Station.

FRIDAY AFTERNOON

8. MILES DAVID PIRNIE, W. K. Kellogg Bird Sanctuary, Battle Creek, Michigan. *Identifying Waterfowl*. Illustrated by 2" x 2" Kodachrome slides. (15 minutes).

Methods of identifying wild ducks in flight, when swimming, and in the hand. Emphasis was placed on size, shape, color, and pattern differences. Slides were used to demonstrate these methods.

9. LOUIS A. FRIED, Division of Economic Zoology of the University of Minnesota and the Minnesota Division of Game and Fish.

A Local Outbreak of Botulism in Western Minnesota. (15 minutes).

In 1939 and 1940 western duck sickness was reported at Lower Lightning Lake in Grant County, Minnesota, and in 1940 the outbreak was studied intensively. Five hundred and seventy-four birds representing 15 species were found sick or dead.

About 95 per cent of the birds were in advanced stages of the disease and consequently did not survive treatment. Food habit studies on these birds showed empty gizzards in almost every case. Nearly 98 per cent of the ducks were birds of the year, some not even fully feathered out. Frightening birds from the lake by shooting blank shells was very effective. The enormous quantities of green algae in the lake were later proved to be an excellent medium for the botulism bacillus.

SATURDAY MORNING

10. EVADENE BURRIS SWANSON, St. Paul, Minnesota.

The Minnesota Nestings of the Passenger Pigeon. (10 minutes).

All of the known Minnesota nestings of the Passenger Pigeon, including some hitherto obscurely known, were described and the best contemporary estimates of their population quoted. The attitude of local people toward the pigeons in Minnesota was quite different from that in the well known Michigan nestings. There was comparatively little commercialization of the Minnesota "pigeon roosts."

11. ALBERT F. GANIER, Nashville, Tennessee.

Notes on the Sycamore Warbler. (15 minutes).

A study of this southern warbler, including data on spring and fall departure, habitat and song. Especial reference was made to its nesting habits, based on a number of nests found, chiefly about Nashville, Tennessee. A decided preference was shown by these warblers for one species of tree, depending on the area where found. The species of trees preferred were, respectively, sycamore, pine, cypress, and oak.

12. J. MURRAY SPEIRS, University of Illinois.

Robin Movements. Illustrated by $3\frac{1}{4}$ " x 4" slides. (20 minutes).

A discussion of the movements of Robins, both daily movements and seasonal movements being considered.

13. ROBERT B. LEA, Carleton College and the University of Michigan Biological Station.

A Life History Study of the Cedar Waxwing. Illustrated by 2" x 2" Kodachrome and $3\frac{1}{4}$ " x 4" slides. (15 minutes).

Twelve nests of the Cedar Waxwing were found at the University of Michigan Biological Station and the nesting cycle was recorded from the time of choosing the nest site until young left the nesting territory. In this paper special attention was given to the development of the nestlings and the parental care which they received.

14. S. CHARLES KENDEIGH, University of Illinois.

Territorial and Mating Behavior in the House Wren. Illustrated by $3\frac{1}{4}$ " x 4" slides. (20 minutes).

A description of the establishment of territories, manner of defense, combats, how mates are acquired, recognition of sex, shifts in territory and rematings for second broods, and return and rematings in following years in the House Wren.

15. MARGARET M. NICE, Chicago, Illinois, and JOOST TER PELKWKYK, University of Chicago.

Some Experiments in Enemy Recognition in the Song Sparrow. (15 minutes).

Experiments were carried out on hand-raised birds with live animals, mounted birds, particularly owls, and cardboard models of the same. No inborn fear of snakes, cats or Cowbirds was found, but there did seem to be an inborn recognition of an owl. There was fear of large moving objects and rapidly moving objects.

16. GEORGE MIKSCH SUTTON, Laboratory of Ornithology, Cornell University.
First Impressions of the Bird Life of Southern Arizona. Illustrated with numerous field sketches by the speaker. (20 minutes).

The speaker made his first visit to Arizona in the spring of 1940, his primary purpose being to obtain topotypical material from that region for use in connection with his Mexican research. He spent some time at or near Tucson; visited the Santa Rita Mountains where such points as Mt. Wrightson, Florida Canyon, and Bog Springs were reached; and (with Messrs. Allan Phillips and Lyndon Hargrave of the Museum of Northern Arizona) undertook the first general ornithological survey of the Papago Indian Reservation.

17. DORIS HUESTIS SPEERS, Champaign, Illinois.
Facts and Fancies Concerning the Evening Grosbeak. Illustrated by $3\frac{1}{4}$ " x 4" slides. (20 minutes).

A discussion of three points concerning which there have been misconceptions: significance of the name, juvenal plumage, and the limits of the range of the Evening Grosbeak.

18. O. A. STEVENS, North Dakota Agricultural College.
Relation of Autumn Migration to Weather. Illustrated by $3\frac{1}{4}$ " x 4" slides. (15 minutes).

Migration in autumn has received less attention than in spring but its study has some advantages. Spring migration, in general, is delayed by cold weather, then moves rapidly. The fall movement is slower and not complicated by the breeding urge. A study of fall migration at Fargo, North Dakota, has been made, based upon trapping records for 15 years, chiefly of Harris' Sparrow on account of the abundance and readiness of this species to enter traps. The repeat records of banded birds are especially useful in showing the time of departure from the locality. Cold waves produce obvious movements, but quite regular movement occurs without marked weather changes, suggesting an inherent rhythm.

19. BERNARD W. BAKER, Marne, Michigan.
Michigan Birds in Color. Illustrated by 2" x 2" Kodachrome slides. (20 minutes).

A series of Kodachrome slides taken with a Leica camera, equipped with 135 mm. and 500 mm. lenses, showing 15 species of common birds during the nesting season.

NATURAL COLOR MOTION PICTURE SESSION
SATURDAY AFTERNOON

The last session of the meeting was devoted to a showing of over 3000 feet of 16 mm. Kodachrome motion pictures.

Below is given the program of motion pictures together with brief comments on their subject matter.

20. EARL G. WRIGHT, The Chicago Academy of Science.
Birds of the Arid Southwest (30 minutes).

A portrayal of the Chicago Academy of Science's 1940 Arizona expedition. There were shown eighteen species of birds, together with a few shots of reptiles, desert flowers, and scenery.

21. LAWRENCE H. WALKINSHAW, Battle Creek, Michigan.
Some 1940 Crane Observations in Mississippi and Michigan. Illustrated in part by $3\frac{1}{4}$ " x 4" slides. (30 minutes).

Studies of the nesting areas and several nests of the Sandhill Crane in Mississippi; studies of spring movements, nesting, and fall movements and concentrations of the Sandhill Crane in Michigan.

22. LAWRENCE I. GRINNELL, Laboratory of Ornithology, Cornell University.

Birds of the Hudson Bay Tundra. (30 minutes).

A motion picture record taken by the speaker and Ralph S. Palmer during a visit to Churchill, Manitoba in June and July, 1940.

23. A. TREVENNING HARRIS, Gary, Indiana.

Nesting of the Ring-billed Gull and Caspian Tern in Wisconsin and the Red-headed Woodpecker and Bluebird in Indiana. (30 minutes).

Nesting studies of the Ring-billed Gulls and Caspian Terns on Barker's Reef in Lake Michigan (Wisconsin side); nesting studies of one Red-headed Woodpecker nest and three Bluebird nests.

24. MURL DEUSING, Milwaukee Public Museum.

Nesting Studies of the Marsh Hawk. (25 minutes).

Activities of Marsh Hawks at two nests studied during the summer of 1940 at Wind Lake, Racine County, Wisconsin.

A SYMPOSIUM OF WILDLIFE MANAGEMENT

Directly following the papers session on Friday afternoon, a symposium on wildlife management was led by Aldo Leopold of the University of Wisconsin who served as Chairman.

I. *What Is Wildlife Management Like in Practice?*

What has it done for game? What has it done for (or to) songbirds? Raptors? Mammals? Food and Cover? What has it done for (or to) human attitudes toward all the above? How can the ornithologist or conservationist discriminate between good and bad management?

Discussion:

LAWRENCE E. HICKS, Ohio Wildlife Research Station.

The Farmer Cooperatives in Ohio.

ALDO LEOPOLD, University of Wisconsin.

The Farmer Cooperatives in Wisconsin.

WARREN W. CHASE, Soil Conservation Service.

The Soil Conservation Districts of the Central States.

II. *A General Discussion of the Above Questions Led by the Chairman.*

A SHOW OF NATURAL COLOR MOTION PICTURES

During Friday evening three members presented some of their latest motion pictures as follows:

Migrating Geese and Booming Prairie Chickens.

RALPH A. WOOLSEY, Minnesota Department of Conservation.

Bright Feathers of the Prairies.

OLIN SEWALL PETTINGILL, JR., Carleton College and the University of Michigan Biological Station.

With the Greatest of Ease.

CLEVELAND P. GRANT, Baker-Hunt Foundation, Covington, Kentucky.

Through the courtesy of the National Audubon Society, J. R. Pemberton's remarkable film, "The California Condor" was viewed at the conclusion of the show.

THE BIRD ART EXHIBIT

The University Gallery of the University of Minnesota cooperated with the Wilson Ornithological Club in the arrangement of an unusually impressive and representative bird art exhibit. The exhibit was held in the University Art Gallery

in Northrop Auditorium and was not only open to members and visitors during the meeting but was also open to the public from November 12 to 19.

Altogether 243 items were displayed, representing 35 named artists. All but a very few of the items were original works.

A *Special Committee for the 1940 Bird Art Exhibit* was responsible for assembling much of the material. This committee consisted of George Miksch Sutton, *Chairman*, R. T. Peterson and W. J. Breckenridge. Also a member of the committee was Mrs. Ruth Lawrence, Director of the Gallery. Upon her rested the arduous task of directing the unpacking and final arrangement of the exhibit.

Below is presented a list of the artists whose works were represented. When their works were not loaned by the artists themselves but by cooperating organizations, institutions and individuals, credit is given accordingly.

James E. Allen

Five etchings loaned by Kennedy & Company, New York City.

John James Audubon

Five prints loaned by Kennedy & Company, New York City.

Five prints loaned by Mrs. Franklin Crosby, Jr., Minneapolis.

Five plates from the *Elephant Folio* and five original sketches loaned by the Museum of Comparative Zoology, Cambridge, Massachusetts.

Richard E. Bishop

Six prints.

Courtenay Brandreth

Five water colors.

Rex Brasher

Six water colors.

Walter J. Breckenridge

Four water colors

One etching

Allan Brooks

Two oil paintings

James L. Clark

Ten small paper weights loaned by the J. L. Clark Studios, Inc., New York City

E. S. Dingle

Three water colors

Louis Agassiz Fuertes

Two large oil paintings loaned by the New York Zoological Society.

One sketch loaned by William Kilgore, Minneapolis.

John Gould

Two prints loaned by Mrs. Franklin Crosby, Jr., Minneapolis.

Owen J. Gromme

Six oil paintings

Richard P. Grossenheider

One bronzed statue, two charcoal drawings, and one water color.

Charles E. Heil

Two water colors

H. Albert Hochbaum

Three paintings

R. Bruce Horsfall

Three large oil paintings loaned by the New York Zoological Society.

One oil painting and four water colors.

F. L. Jaques

Four paintings loaned by Kennedy and Company, New York City.

H. Jones

Four original paintings for Beebe's "Monograph of the Pheasants" loaned by the New York Zoological Society.

Bruno Liljefors

One painting loaned by Mrs. George P. Jeppson, Worcester, Massachusetts.

Harriet Lord

One painting

William A. Lunk

Four paintings

Athos Menaboni

Two paintings

Robert M. Mengel

Five water colors

William Montagna

Two paintings

O. J. Murie

Four oil paintings

Arthur D. Nelles

Three water colors

Roger T. Peterson

Five paintings

Ralph S. Palmer

Three paintings

William J. Schaldach

Six prints

Peter Scott

One painting loaned by Mrs. Paul Hammond, New York City.

Joel Stolper

Three paintings loaned by the New York Zoological Society.

George Miksch Sutton

One painting loaned by the New York Zoological Society

Three oil paintings and three water colors.

Walter A. Weber

One painting

Five paintings loaned by the National Park Service, U.S. Department of the Interior.

Joseph Wolfe

Twenty-six prints from the "Birds of Paradise" collection of Daniel Giraud Elliot, loaned by the International Art Publishing Company.

Earl G. Wright

Two oil paintings and four water colors.

Miscellaneous exhibits included five bronzes loaned by Mrs. Franklin Crosby, Jr.; one book of paintings, five scroll paintings, one black and white rubbing, eight modern Japanese prints, two Chinese bird prints, seventeen Edwards and Albin prints, eight parrot prints, one toucan print, and ten hummingbird prints loaned by Mrs. Dwight E. Minnich, Minneapolis.

SOCIAL EVENTS

Members and guests of the Wilson Ornithological Club were invited to a tea given by the Local Committee in the University Gallery on Saturday afternoon. The tea was held in the rooms containing the Bird Art Exhibit.

During the preceding evening the staff of the Minnesota Museum of Natural History and members of the Minnesota Bird Club and Public Library Bird Club gave an informal reception to the Wilson Ornithological Club. The study collections of the Museum were open for inspection and there was a fine exhibit of rare bird books. The reception was followed directly by a show of motion pictures in the Auditorium.

THE ANNUAL DINNER

The Annual Dinner of the Wilson Ornithological Club took place in the new Coffman Memorial Union on Saturday evening. The menu was a particularly attractive one. When opened, the front and back covers together bore a handsome pen and ink sketch by Walter J. Breckenridge of an adult and four downy Wilson's Phalaropes. Each person attending the dinner received a Wilson Ornithological Club number of *The Flicker*, the quarterly publication of the Minnesota Ornithologist's Union.

President Lawrence E. Hicks opened the after dinner program with some humorous and philosophical remarks and then introduced Walter J. Breckenridge of the Minnesota Museum of Natural History who showed his excellent motion picture film, "Minnesota Cinemacaptures." Although birds were the predominating features of his film, the audience will not forget his intimate studies of ichneumon flies and numerous wildlife scenes along the St. Croix River.

ATTENDANCE

At the conclusion of the meeting the registration books revealed the largest attendance in the history of the Wilson Ornithological Club—together 353 persons.¹

One hundred and one of the persons in attendance were members: 11 were Councillors, 3 were Past Presidents. Several members traveled great distances to attend: among them were Ira N. Gabrielson of Washington, D.C.; Eleanor G. Cooley of Berwyn, Maryland; E. L. Nelson of New Brunswick, New Jersey; Theodora Nelson of New York City; Lawrence I. Grinnell and George Miksch Sutton of Ithaca, New York; and George B. Thorp of Pittsburgh, Pennsylvania.

The record-breaking registration was accounted for in a large measure by local attendance: 51 members and 221 visitors from Minnesota. The state with the next largest attendance was Wisconsin, with nine members and eight visitors present. Twenty states and the District of Columbia were represented.

The list of members in attendance follows:

From Illinois: 8—C. O. Decker, Alfred Lewy, Mrs. M. M. Nice, E. G. Wright, Chicago; S. C. Kendeigh, Mrs. D. H. Speirs, J. M. Speirs, Champaign; K. E. Bartel, Blue Island. *Visitors*, 3.

From Indiana: 1—A. T. Harris, Gary. *Visitor*, 1.

From Iowa: 2—David Damon, Ames; Jean Laffoon, Sioux City. *Visitors*, 3.

From Kentucky: 1—C. P. Grant, Covington. *Visitor*, 1.

From Maryland: 1—E. G. Cooley, Berwyn.

From Michigan: 7—G. A. Ammann, Shingleton; B. W. Baker, Marne; M. D. Pirnie, L. H. Walkinshaw, Battle Creek; J. L. George, J. Van Tyne, H. H. Wilcox, Jr. Ann Arbor. *Visitors*, 2.

From Minnesota: 51—Miss L. M. Aler, W. J. Breckenridge, C. E. Carlson, Mrs. F. S. Davidson, John Dobie, Miss Jean Drum, R. W. Elliott, H. R. Engstrom, J. D. Fruen, Mrs. D. B. Green, A. M. Hartwell, Mrs. G. R. Magney, L. J. McCann, G. W. McCullough, W. H. Nord, Mrs. H. W. Rice, T. S. Roberts, G. N. Rysgaard, R. C. Schenck, M. D. Thompson, Mrs. R. H. Wells, Mrs. R. B. Wilson, Minneapolis; A. M. Berthel, W. T. Cox, W. Cummings, A. B. Erickson, Gordon Fredine, L. A. Fried, B. L. Hawkins, E. T. Mitchell, Mrs. W. P. Randel, C. T. Rollings, and G. Swanson, St. Paul; R. B. Lea, Miss Dorothy Mierow, Miss Peggy Muirhead, and O. S. Pettingill, Jr., Northfield; Miss Margaret Drum, Owatonna; L. A. Parker, Faribault; K. G. Kobes, Holt; Marius Morse, Robbinsdale, U. C. Nelson, Fergus Falls; Miss Janet Buscho, Blue Earth; L. M. Butler,

¹ Other meetings with heavy total registration are as follows: 1938 Ann Arbor meeting (261), 1937 Indianapolis meeting (238), 1929 Des Moines meeting (202), 1934 Pittsburgh meeting (178), 1939 Louisville meeting (168).

White Bear; Mrs. C. E. Peterson, Madison; Mrs. E. O. Wilson, Montevideo; G. W. Friedrich, St. Cloud; R. H. Daggy, Bemidji; Miss G. M. Smith, Redwood Falls. *Visitors*, 221.

From Missouri: 1—R. P. Grossenheider, St. Louis. *Visitors*, 2.

From Montana: *Visitor*, 1.

From Nebraska: 2—F. W. Haecker, R. A. Moser, Omaha. *Visitors*, 2.

From New Hampshire: *Visitor*, 1.

From New Jersey: 1—E. L. Nelson, New Brunswick.

From New York: 3—L. I. Grinnell, G. M. Sutton, Ithaca; Miss Theodora Nelson, New York City.

From North Dakota: 6—Miss P. M. Stine, Minot; S. H. Low, Kenmare; O. A. Stevens, Fargo; H. C. Kyllingstad, Emrick; T. M. Street, Bottineau; C. J. Henry, Upham. *Visitors*, 3.

From Ohio: 4—L. E. Hicks, D. W. Jenkins, Columbus, E. L. Moseley, Bowling Green; T. W. Porter, Oak Harbor. *Visitor*, 1.

From Pennsylvania: 1—G. B. Thorp, Pittsburgh. *Visitors*, 2.

From South Dakota: *Visitor*, 1.

From Tennessee: 1—A. F. Ganier, Nashville.

From Washington, D.C.: 1—I. N. Gabrielson.

From West Virginia: 1—Maurice Brooks, Morgantown.

From Wisconsin: 9—Murl Deusing, C. S. Jung, Milwaukee; Aldo Leopold, W. E. Scott, F. R. Zimmerman, Madison; M. L. Partch, Columbia; Mrs. W. E. Rogers, Appleton; P. C. Gatterdam, La Crosse; Miss E. M. Heinke, Wausau. *Visitors*, 8.

Summary of Attendance: Total registration, 353 (Members, 101; Visitors, 252); Total from Minneapolis and St. Paul, 225 (Members, 33; Visitors, 192); Total from Minnesota, 272 (Members, 51; Visitors, 221). Total outside of Minnesota, 81 (Members, 50; Visitors, 31). Maximum number at each session: Friday morning, 140; Friday afternoon, 210; Saturday morning, 155; Saturday afternoon, 320. Approximate number at motion picture show Friday evening, 440. Number at Annual Dinner, 116. Number of persons in group photograph, 119.

REPORT OF THE LIBRARIAN FOR THE YEAR ENDING NOVEMBER, 1940

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

We have made no change in the arrangement of the library, having found it most usable in this form. We now have 107 bound volumes of books and a large number of pamphlets and reprints in the library. In addition there are over a hundred volumes of bound periodicals. We are receiving fifty-five periodicals. However, of this number, a few seem to have suspended publication because of the situation in Europe and Asia.

We have received 92 books, pamphlets, and reprints from members of the Wilson Ornithological Club, bird organizations and other interested societies. There were 28 contributors to the library this past year. A list of the donors to the library will be found in the March, June and December, 1940, issues of the Wilson Bulletin.

We hope other members will follow the example of the one who recently presented the library with a complete set of her own ornithological writings in the form of reprints and separate copies. Since this set was complete we have had it bound in buckram in one volume, which assures the greatest permanence and usefulness.

The reserve stock of the 1940 Wilson Bulletins have been received. A supply was set aside for current distribution, and the others were filed in the stock room provided by the University.

Respectfully submitted,

F. RIDLEN HARRELL, *Librarian*

November 19, 1940.

REPORT OF THE SECRETARY FOR 1940¹

Membership in the Wilson Ornithological Club now totals 1040 and is classified as follows: Honorary, 5; Life, 7; Sustaining, 35; Active, 237; Associate, 756.

Altogether 182 members were lost during the year: 136 were delinquent in dues; 34 resigned; 12 were taken by death. We thus show a net loss of 4 members compared with the all-time high of last year.

All the states are now represented in the membership roll. The state with the greatest number of members is still Ohio, with Michigan 3 members behind. Present figures are: Ohio, 91; Michigan, 88. Illinois follows third with 79 members, New York fourth with 78 and Minnesota fifth with 77. I am pleased to point out a decided increase in numbers of members from California and Missouri.

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 1940.

UNITED STATES					
Alabama	5	(2)	New Mexico	6	(1)
Arizona	5		New York	78	(13)
Arkansas	6	(1)	Ohio	91	(5)
California	56	(8)	Oklahoma	12	(2)
North Carolina	9	(2)	Oregon	6	(2)
South Carolina	5		Pennsylvania	54	(7)
Colorado	11	(1)	Rhode Island	2	
Connecticut	8	(1)	Tennessee	21	(4)
North Dakota	12	(3)	Texas	23	(1)
South Dakota	2		Utah	8	(1)
Delaware	1		Vermont	2	(1)
Florida	12	(2)	Virginia	13	
Georgia	12		West Virginia	13	(1)
Idaho	2		Washington	6	(1)
Illinois	79	(15)	Washington, D. C.	24	(1)
Indiana	28	(4)	Wisconsin	30	(8)
Iowa	29	(1)	Wyoming	8	
Kansas	6	(2)	Alaska	2	
Kentucky	21	(2)	Virgin Islands	1	
Louisiana	8	(1)			
Maine	5		CANADA		
Maryland	15	(2)	British Columbia	2	
Massachusetts	29	(5)	Manitoba	5	(1)
Michigan	88	(10)	Ontario	18	
Minnesota	77	(37)	Quebec	3	
Mississippi	6		Saskatchewan	2	
Missouri	32	(9)	FOREIGN COUNTRIES		
Montana	6	(2)	China	1	
Nebraska	9	(1)	Cuba	1	
Nevada	1		Great Britain	1	(1)
New Hampshire	5	(1)	Netherlands	1	
New Jersey	12	(2)	Northern Rhodesia	1	
			Switzerland	1	
			Venezuela	2	(1)

¹ Revised through December 31, 1940.

In general the area of heaviest membership runs from New York and Pennsylvania west to Iowa and Minnesota. Each of these states, with the exception of Indiana and Wisconsin, has shown a steady rise in membership with two exceptions: Wisconsin and Indiana.

The burden of membership solicitation has been borne by Mr. Burt L. Monroe, Chairman of the Membership Committee. I am sure you will appreciate the great amount of time and personal inconvenience this work has necessitated. For us his work is heartening indeed, but for him, I imagine, it is rather discouraging. And why? While Mr. Monroe gathers in dozens of new members, the Club proceeds to lose dozens. When the total score is reckoned, a loss is shown! What can we do to prevent this serious loss of members each year, particularly the loss of members due to failure to pay dues? Mr. Monroe would like a solution to this problem; so would I.

During the year, 4,000 more membership solicitation folders were printed. They are exactly like those printed a year ago except for a few revisions to bring them up to date.

Each new member when elected is formally notified by the Secretary and given a questionnaire to fill out. "Formal" notification actually consists of a notification blank filled out with the new member's name and membership status, and bearing a date and the Secretary's signature. This year notification blanks of a new design were printed. They differ from the older ones in size and shape, wording, and the presence of a footnote calling attention to the fact that the Wilson Club operates on a calendar year basis and that *The Wilson Bulletin* is distributed accordingly.

I wish to express my thanks to the officers, members of the Executive Council, committee chairmen, and numerous members for their kind cooperation and prompt response to my various secretarial requests.

Respectfully submitted,

November 22, 1940.

OLIN SEWALL PETTINGILL, JR., *Secretary*.

REPORT OF THE MEMBERSHIP COMMITTEE ¹

The drive for members during the year 1939 under our new system proved so successful that it was attempted again during this year. Lists were again submitted by the various state chairmen and all names were circularized.

Our results this year were not quite as good as those of the preceding year. The same amount of effort was expended in the work and the lists used were just as select. It is quite probable, however, that the unsettled condition of the country due to the war has diverted the people from outside interests, a condition which will eventually be remedied. We are gratified to be able practically to offset our annual losses due to members dropping out of the Club for various reasons.

To the time of this report, we have secured 165 new members: 3 Sustaining; 15 Active; 147 Associate. Minnesota led the list by turning in 37 members closely followed by Illinois with 15, New York with 13, Michigan with 10, Wisconsin and California with 8 each, and Pennsylvania with 7.

These results were obtained by the combined efforts of your officers, the members of the Membership Committee and individual members of the Club. Your Secretary and your Treasurer were largely responsible for the fine Minnesota showing.

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

Respectively submitted,

November 22, 1940.

BURT L. MONROE, *Chairman*

¹ Revised through December 31, 1940.

REPORT OF THE TREASURER FOR 1940

RECEIPTS FOR 1940

Balance as shown by last report, Nov. 22, 1939.....	\$ 77.92
Dues and subscriptions.....	1,963.00
Contributions	240.00
Miscellaneous receipts	31.04
Total	\$2,311.96

DISBURSEMENTS FOR 1940

Refunds on mistaken subscriptions.....	\$ 3.25
Secretary's expense: clerical work, printing, postage, stationery.....	129.44
Annual meeting expense	176.46
Editor's expense: mailing, postage.....	37.90
Membership committee expense	12.33
Treasurer's expense: clerical work, postage, mimeographing, materials....	79.85
Miscellaneous: reprints (for which author paid W.O.C.), membership in Ecological Society	8.52
Bank charges: collection fees, returned checks.....	47.75
<i>Bulletin</i> expense: printing, engravings.....	1,701.89
Total	\$2,197.39
Balance on hand in St. Anthony Park State Bank, St. Paul, on Nov. 20, 1940	\$ 114.57

Respectfully submitted,

GUSTAV SWANSON, *Treasurer.*

November 22, 1940

Approved by Auditing Committee

Albert F. Ganier

Theodora Nelson

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

Mary A. Bennett—2 reprints.

Maurice Brooks—4 reprints.

P. L. Errington—1 bulletin.

Olavi Kalela—"Über die Regionale Verteilung der Brutvogelfauna im Flussgebiet des Kokemäenjoki", 1938 (291 pp.).

Leon Kelso—Biological Leaflet No. 12.

Amelia R. Laskey—1 reprint.

Margaret M. Nice—"Measurements of Birds", Baldwin et al.; 1 reprint; 3 serials.

Edna Pennell—"Autobiography of a Bird Lover", F. M. Chapman; "Common Birds of Town and Country", H. W. Henshaw; "Audubon's Birds of America", W. Vogt; 9 reprints; 11 volumes of bird journals.

W. H. Phelps—1 reprint.

Henri Seibert—1 bulletin.

Arthur E. Staebler—1 reprint.

Richard L. Weaver—6 reprints.

THE WILSON BULLETIN PUBLICATION DATES

The actual dates of publication of the four numbers in 1940 were: March 28, June 27, September 27, December 27.

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	70c	85c	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
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
1923—Cincinnati	Dec. 31-Jan. 1, 1924	T. L. Hankinson
1924—Nashville	November 28-30	A. F. Ganier
1925—Kansas City	December 28-29	A. F. Ganier
1926—Chicago	November 26-27	A. F. Ganier
1927—Nashville	Dec. 30-Jan. 1, 1928	Lynds Jones
1928—Ann Arbor	Nov. 30-Dec. 1	Lynds Jones
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
1934—Pittsburgh	December 28-29	J. M. Shaver
1935—St. Louis	December 30-31	J. Van Tyne
1936—Chicago	November 27-28	J. Van Tyne
1937—Indianapolis	December 27-28	J. Van Tyne
1938—Ann Arbor	November 25-26	M. M. Nice
1939—Louisville	November 24-25	M. M. Nice
1940—Minneapolis	November 22-23	L. E. Hicks

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Journal of Comparative Ornithology
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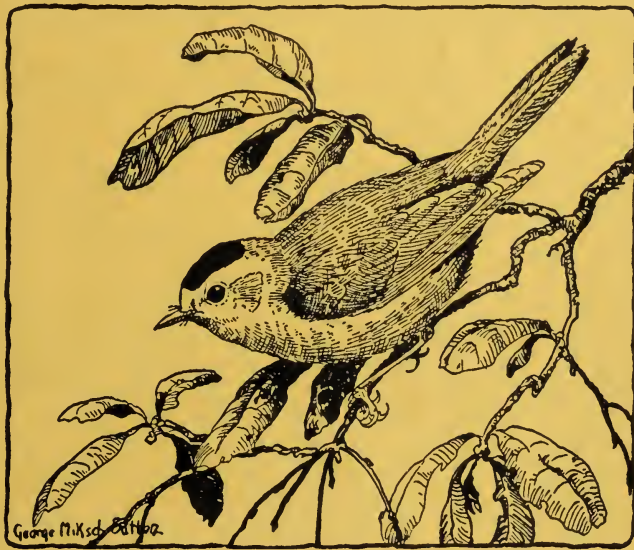
Vol. 53

JUNE, 1941

No. 2

New series of ?

The Wilson Bulletin



Published by the
Wilson Ornithological Club
Ann Arbor, Michigan

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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.

The current issue of *The Wilson Bulletin* is printed by the Ann Arbor Press, Ann Arbor, Michigan.

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 Brodtkorb.

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

Journal of Comparative Ornithology
JUN 18 1941

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

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JUNE, 1941

No. 2

REMARKS ON THE BIRDS OF ANTICOSTI ISLAND

BY HARRISON F. LEWIS

SINCE my first visit to Anticosti Island, Quebec, in June, 1922, I have returned to that island from time to time. In a published paper (Lewis, 1924) all records of the birds of Anticosti that were then available were brought together and evaluated. My subsequent observations of the birds of that island that seemed worth recording have appeared in an irregular series of brief notes (Lewis, 1925, 1926, 1927, 1938a, 1938b). This series of publications is continued in the present paper, the first part of which consists of records based on observations that I made on and near Anticosti during the week of June 5 to 11, 1940. The



Figure 1. A section of the nesting colony of Kittiwakes at Gullcliff Bay. (National Museum of Canada photograph.)

second part of this paper is concerned with another recent publication on the birds of that island (Braund and McCullagh, 1940).

I arrived at Port Menier, near the west end of Anticosti, on June 5, 1940. On June 7, through arrangements kindly made by Mr. H. E. Graham, Resident Manager of the island, I left Port Menier in a small motorboat for a cruise along the island's north shore, to East Point and return, for the purpose of observing the seabird colonies situated on that coast. This motorboat was the property of the Consolidated Paper Corporation, which owns Anticosti, and was in regular use for patrols and local transport around the island. It was operated by three of the Corporation's employes, chief of whom was the Skipper, Charles McCormick. These men had had many years of experience in navigating small boats around Anticosti and knew the coast in great detail. East Point was reached on June 9 and the return to Port Menier was completed on June 10. Early on the morning of June 12 I left Anticosti.

To the Consolidated Paper Corporation, to Mr. Graham, and to Skipper McCormick and his crew I express my sincere thanks and appreciation for their valuable co-operation and assistance.

Certain observations made during this visit to Anticosti are presented hereunder, arranged according to the species of birds to which they have reference. Three species that are here recorded from Anticosti for the first time are marked in this list with an asterisk.

Moris bassana. Gannet.—On June 9, beginning at 5:30 A.M., I visited the nesting colony of Gannets and other seabirds at Gullcliff Bay, about 3 miles northwest of East Point. The sea was smooth, so our small motorboat could approach close to shore. At my request, the boat was made to pass slowly along and close to the precipitous cliff, 116 feet high, on which the birds were nesting. Whenever I desired it, the boat was stopped and permitted to drift idly for as long a time as necessary. Such a slow passage along the full extent of this great bird colony was made four times on this occasion. In this way I was able to make a very detailed examination of the colony and to determine with much accuracy the numbers of the Gannets.

The Gannets present were counted carefully during the first passage along the colony, when they were comparatively undisturbed, and were found to number 838. These were all either in fully adult plumage or in the plumage of the fourth year, characterized by a few black feathers scattered among the white. Birds in both of these plumages commonly breed. The Gannets' nests on the cliff were counted with equal care during later passages in front of the colony and were found to number 496. Nests of this species are comparatively easy to count in this colony because they are scattered on many small ledges. It is possible that a few of them were overlooked, for the morning was cloudy and the light was not strong, but it is believed that the number stated is substantially correct. Some observations were made, a little later, from

the top of the cliff, but it was found that many of the Gannets' nests could not be seen from that position.

The number of nests counted indicates a breeding population of 992 Gannets. The 838 Gannets that were present when the cliff was first examined, between 5:30 and 6:00 A.M., therefore constitute approximately 84 per cent of the total breeding population of the colony.

Later in the summer of 1940 Mr. John Osborne, who resided at Fox Bay, Anticosti, for many years and left there in 1907, told me that during his residence at Fox Bay no Gannets nested at Gullcliff Bay, which he was accustomed to visit frequently. As Captain Oscar Mercier stated (Lewis, 1924) that the Gannet colony at Gullcliff Bay had been seen by him in 1913 and subsequent years, it appears probable that this colony was founded between 1907 and 1913.

Since P. A. Taverner reported (1929) that this colony contained "about 500 nests" when seen by him in 1928, it does not appear to have increased since that time. It seems, indeed, unlikely that the Gannet population in this colony will increase much, unless the Gannets drive away European Cormorants and occupy their ledges, for most of the ledges big enough for these large species are already occupied by one or the other of them, while extension of the colony onto the open land back of the top of the cliff is presumably prevented by Anticosti's population of foxes, black bears, and white-tailed deer.

Phalacrocorax carbo carbo. European Cormorant.—The occupied nests of this species on Anticosti (on suitable coastal cliffs on the north shore of the island from Cape Observation to East Point) were carefully counted on June 8 and 9 and found to number 605, representing a breeding population of 1,210 birds. Greater detail concerning observations of this species is being published in another connection.

Dafla acuta tzitzihoa. American Pintail.—This species was observed only in a small wooded swamp near Port Menier, between the village and the principal group of farm buildings. On June 5, I found on a small pond in this swamp four Pintails, of which at least two were adult drakes. On June 11, while I was standing in full view near the same pond, a female Pintail, quacking repeatedly, deliberately flew in and alighted on it and then, jerking nervously, swam toward me. I remained quiet and after a while she flew away.

Nettion carolinense. Green-winged Teal.—On June 6 three drake Green-winged Teal were seen on the pond near Port Menier on which the Pintails had been seen on June 5.

Nyroca (marila?). (Greater?) Scaup Duck.—A number of pairs of Scaup Ducks seen near Port Menier on June 5, 6, and 11, are believed to have been Greater Scaups. The sides of the drakes were white, greenish gloss was repeatedly observed on the head of one drake and the broad band of white displayed on the wings when the birds were flying was seen to extend well out onto the primaries. These birds were

in the same locality in which I saw Scaup Ducks on June 10 and 14, 1922 (Lewis, 1924). The Scaups seen in June, 1940, occurred as follows:

June 5—Four pairs.

June 6—One pair.

June 11—Two pairs and one group of three drakes and a duck.

Sometimes the Scaups were seen on the small lake, officially named Gamache Lake but locally known as Lake St. George, that is close behind the village of Port Menier; sometimes they were in a small shallow pond, apparently of a temporary character, in a hayfield near the lake.

Active courtship on the part of one pair was observed through a 6x binocular on June 5, for about twenty minutes, at a distance of about 300 feet. The drake would dive close to the female and immediately come up again in another position close to her. Repeatedly, with head and neck outstretched, he rushed at her across the water, and on each such occasion she rushed equally fast away from him in a similar manner, but she did not leave him or attempt to fly away. I heard no notes uttered during these performances, but one drake, when flushed with his mate, cried *squarrow, squarrow* repeatedly, in a loud, hoarse, complaining voice, as he flew away. When, a few minutes later, this pair flew back to the pond where I had first seen them, the drake again uttered his cry a number of times.

Melanitta deglandi. White-winged Scoter.—

Melanitta perspicillata. Surf Scoter.—

Oidemia americana. American Scoter.—

During my voyages along the coast of Anticosti by motorboat, the vibration of the boat was often so great as to interfere seriously with the use of a binocular for detailed observation of birds at a distance. For this reason many of the scoters, other than White-winged Scoters, that were seen were not identified specifically. Because, however, of the inadequacy of available records of scoters at Anticosti, it seems advisable to set forth here all my records of these ducks in the vicinity of that island as observed during my visit in June, 1940.

June 5—West Point to Port Menier: White-winged Scoter, 100; other scoters (sp.), 17.

June 7—Port Menier to West Point: White-winged Scoter, 17.

West Point to Cap de Rabast: scoters (sp.), 650 (a few White-winged, the rest apparently mostly American).

Cap de Rabast to Brig Harbour: White-winged Scoter, 70; Surf Scoter, 6.

Brig Harbour to MacDonald River: scoters (sp.), 7.

June 8—MacDonald River to Cape Observation: scoters (sp.), 6.

Vauréal River to Salmon River: scoters (sp.), 18.

Salmon River to Fox Bay: White-winged Scoter, 6; scoters (sp.), 400.

June 9—Fox Bay to East Point: scoters (sp.?), 70.

Bonasa umbellus. Ruffed Grouse.—This species, originally introduced near Port Menier a few years before 1926, has now, I am told, spread throughout the entire wooded area of Anticosti. It is interesting that it has been able to do this in spite of the unusual abundance of foxes on this island.

In 1940, I flushed two Ruffed Grouse on Anticosti, one on June 7 at MacDonald River, and one on June 11 near Port Menier. Both of these birds had gray tails.

Charadrius semipalmatus. Semipalmated Plover.—Ninety were observed at Port Menier on June 5. As none was seen on Anticosti during the rest of my stay, it is probable that the observation recorded marks the termination of the spring migration of this species at this place.

Lobipes lobatus. Northern Phalarope.—As this is another species that has been very inadequately recorded in the vicinity of Anticosti, my observations of it there in 1940 are set forth in full.

June 7—West Point to Cap de Rabast: a flock of 130 and a flock of 80.



Figure 2. Kittiwake nests at Gullcliff Bay. (National Museum of Canada photograph.)

June 10—East of Brig Harbour and within 5 miles of that place: a flock of 300, one of 50, one of 30.

Cap de Rabast: a flock of 5.

Rissa tridactyla tridactyla. Atlantic Kittiwake.—During my close and repeated examination of the seabird colony at Gullcliff Bay on June 9, I estimated the Kittiwake population of the cliff, section by section. The final conclusion reached is that, as well as I could judge, the total number of Kittiwakes then present was about 9,200, the total number of occupied Kittiwake nests was about 7,500, and the total number of Kittiwakes nesting in this colony was therefore about 15,000. As these estimates were made in the early morning, it appears reasonable and in accord with them that many of the Kittiwakes of the colony should be absent at that hour in search of food.

On a cliff at East Point, which was also visited on June 9, is a colony of Kittiwakes that was estimated to contain about 500 breeding birds.

Sterna (sp.). Tern.—Near the mouth of the Salmon River, on June 8, five terns, either Common Terns or Arctic Terns, but believed to be the former, were observed on small hummocks that formed little islets in a pond in a bog. The terns acted as if they were nesting there or intended to nest there. The only reason for mentioning this observation here is that two of these birds were seen perched on trees. One was perched on the slender, swaying top of a small tamarack (*Larix laricina*) that grew on one hummock; another was perched on the somewhat stiffer top of a small spruce tree (*Picea* sp.) on a neighboring hummock. I do not know of any other instance of Common or Arctic Terns perching on trees.

Uria aalge aalge. Atlantic Murre.—A few small groups of this species were seen incubating, on June 9, on some of the broader ledges of the cliff at Gullcliff Bay. I estimated the total number of Atlantic Murres in this colony to be about 220.

Tyrannus tyrannus. Eastern Kingbird.—At Fox Bay on June 8 I plainly saw a Kingbird on two occasions, about 2½ hours apart. This bird was frequenting rotting kelp on the beach, doubtless to obtain small flying insects.

On June 11, I saw two Kingbirds together near the farm at Port Menier. This suggests the possibility of their nesting there.

There are previous records of four Kingbirds on Anticosti.

Hirundo erythrogaster. Barn Swallow.—On June 11, I saw a pair of Barn Swallows resting on a wire at L'Anse aux Fraises, or Strawberry Cove, where I saw a pair of this species on July 16, 1938 (Lewis, 1938b).

Later on June 11, 1940, Mr. Ted McCormick, a resident of Port Menier, showed to me, in a large barn at that place, a clearly recognizable nest of the Barn Swallow. He said that this nest was built in

1939. There were no Barn Swallows in its vicinity at the time when I saw it.

Petrochelidon albifrons albifrons. Northern Cliff Swallow.—On June 5 and again on June 11 I saw one Cliff Swallow flying about near Port Menier.

Mr. Ted McCormick, of Port Menier, told me that several pairs of Cliff Swallows nested in 1939 under the eaves of one of the barns at that place. I did not see any actual evidence of such nesting.

Regulus satrapa satrapa. Eastern Golden-crowned Kinglet.—One singing male was observed between Port Menier and L'Anse aux Fraises on June 11.

Bombycilla cedrorum. Cedar Waxwing.—I saw three birds of this species at Port Menier on June 11.

**Sturnus vulgaris vulgaris*. Starling.—In mixed woods beside the little-used Canard Road, about 2 miles southeast of Port Menier, I obtained excellent observations of two Starlings, a short distance apart, on June 5. One of these birds remained near a dead birch stub, which was about 10 inches in diameter and was marked, between 20 and 25 feet from the ground, with four old holes apparently made by Downy Woodpeckers. This Starling scolded me angrily for some time, suggesting that it may have been nesting in one of those holes.

This is the first record of the Starling on Anticosti. I was much surprised to discover it in little-frequented woodland, rather than in the village of Port Menier.

**Vireo philadelphicus*. Philadelphia Vireo.—On the morning of June 8, in poplar woods on a low ridge near the mouth of the Vauréal River, I found a Philadelphia Vireo, singing steadily. It was clearly seen at close range through a 6x binocular, its characteristic markings were noted with care, and its identity was established with certainty. I timed the rate of its singing and found that it was uttering 33 song-phrases per minute. On the morning of June 10 a Philadelphia Vireo, presumably the same individual, was heard singing on the same ridge. This species has not previously been recorded from Anticosti.

Vermivora ruficapilla ruficapilla. Nashville Warbler.—A singing male was observed at Fox Bay on June 8 and two singing males were observed near Port Menier on June 11. Previously this species had been recorded on Anticosti only on June 13, 1922, at Port Menier (Lewis, 1924).

**Dendroica tigrina*. Cape May Warbler.—On the morning of June 10, in mixed woods near the mouth of MacDonald River, a male of this species was singing repeatedly. Recognizing its song, I followed it about for some time and eventually succeeded in seeing it in the clear morning sunshine and identified it by sight as well as by sound. This is the first record of this warbler on Anticosti.

Melospiza lincolni lincolni. Lincoln's Sparrow.—Two individuals were heard singing at Port Menier on June 5.

* * * *

I now turn with reluctance to the task of offering some critical comment on certain aspects of a recent paper on the birds of Anticosti (Braund and McCullagh, 1940).

Included in this paper are some quotations, attributed to previous publications, that are related to the matter in hand very distantly or not at all. Even though we grant that in a list of the birds of Anticosti there may be some possible reason for quoting from the "Catalogue of Canadian Birds" (Macoun and Macoun, 1909) a statement that the Razor-billed Auk "breeds, but not in large numbers, on the Great Bird rock, Bryon island, and Entry island, Magdalen islands, Gulf of St. Lawrence," there does not seem to be any occasion for including in such a list the following remarks about the American Eider:

"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'."

These quotations do not refer to Anticosti and add nothing to our knowledge of the status of the Eider there. Incidentally, the statement cited from a paper by the present writer, though presented as a direct quotation, is not to be found at the place referred to, where the remarks made are: "This species prospered along the south shore of the Labrador Peninsula in 1929. The hatch of young Eiders was a large one . . ."

Perhaps the most remarkably inapposite of the quotations published in the Anticosti bird list under discussion is the following, which is included in the paragraph about the Eastern Goldfinch:

"Henry Mousley (1932) found this species common on August 23, near St. Lambert, Quebec, and states that many nest."

St. Lambert is a suburb of Montreal, in the Transition Zone, more than 500 miles from Anticosti, which is partly in the Canadian Zone and partly in the Hudsonian Zone. What the status of the Goldfinch at St. Lambert has to do with its status on Anticosti is a mystery. Mr. Mousley, in numerous papers, has published a great deal of detailed information about the birds of southern Quebec. Why his passing comment, at the place cited, that "On this day (August 23, 1931) I was out with my friend Mr. Terrill near St. Lambert when we saw many nests of the eastern Goldfinch (*Spinus tristis*) . . ." should be chosen for reference in a list of the birds of Anticosti, while all his other published records of the birds of southern Quebec, in this paper and others, are very properly omitted from that list, is a mystery even deeper than the first.

Such references in this paper cannot fail to make the reader wonder how the search of the literature incident to its preparation was carried on.

Under the name "*Hylocichla ustulata almae* Oberholser. Alma's

Thrush" these authors state, in part, "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. . . . 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."

Under the name "*Melospiza georgiana ericrypta* Oberholser. Western Swamp Sparrow" they state, in part, "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."

Hylocichla ustulata almae and *Melospiza georgiana ericrypta* are names not to be found in any edition of the A.O.U. Check-List. The latter name, having been proposed in 1938, was not available when the Check-List was published, but the former, which was proposed in 1898, was presumably considered and rejected by the Committees that prepared the Third (1910) and Fourth (1931) Editions of the Check-List. As far as the mere question of use, in a faunal list, of names in such categories is concerned, some will consider it undesirable, yet it may be justified as an exercise of that liberty in science properly pertaining to the publishers of carefully-formed opinions.

To assume and state, without further evidence, that the representatives of *Hylocichla ustulata* and *Melospiza georgiana* that inhabit Anticosti Island, in the Gulf of St. Lawrence, belong, respectively, to races of those species whose known range had previously been restricted to distant regions is, however, a very different matter. It brings into question the fundamental concept of the subspecies.

Before the general acceptance of an evolutionary view of living creatures, it was customary to classify them, for practical convenience, like artifacts, on a basis of physical similarity. The resulting "systems" differed so basically in their aim and form from those accepted at present that they have become mere historical curiosities.

Modern classification is arranged to serve the primary purpose of expressing *genetic relationship*, as far as that has been ascertained or rationally inferred. Morphological features are still utilized in arranging our classifications, but are properly so utilized only as indications, albeit often the principal ones available, of what the genetic relationships actually are.

A subspecies, then, is not essentially a group of conspecific individuals that possess in common certain morphological distinctions, but

is a group of conspecific individuals that possess among themselves a *common genetic relationship* that:

(1) relates them to one another more closely than to individuals in any other group within their species;

(2) is indicated by the presence, in most of the individuals concerned, of the heritable morphological distinctions that accompany it;

(3) is made to appear more probable by auxiliary evidence, such as appropriate spatial or geographical occurrence.

It follows that, to determine the subspecific position of an individual specimen or of a number of specimens, it is not sufficient to set up, as it were, a series of sieves calculated to sort out morphological characteristics, and to pass our specimen or specimens through them and conclude that any specimen corresponding to sieve "A" is, by that very fact, subspecies "a"; any specimen corresponding to sieve "B" is subspecies "b," and so on. It is also necessary to present at least a reasonable likelihood that the morphologically similar specimens do possess among themselves a genetic relationship closer than that existing between them and any other similarly differentiated group. This likelihood is commonly indicated in practice by the fact that the specimens possessing the morphological distinctions in question have been obtained from an ascertainable unbroken range.

When specimens with identical or closely similar morphological characteristics of subspecific value are found in different ranges, not known to be connected, and known to be separated, in the region directly intervening, by a different subspecies of the same species, this fact renders it doubtful if they possess that close genetic interrelationship that alone would constitute them members of one subspecies. Subsequent investigations may reveal that, by some indirect route, what originally appeared as two distinct ranges are actually joined as portions of one unbroken range, but, until that has been shown, it is the part of proper scientific caution to refrain from stating that such morphologically similar but geographically separated populations are of one and the same subspecies.

The fact that the Swamp Sparrows of Anticosti Island may be found to be morphologically indistinguishable from those of Manitoba, more than 1,300 miles away, does not constitute them all one subspecies if the intervening breeding-grounds of this species are occupied by individuals that form a different subspecies. Such a situation indicates that it is quite probable that the Anticosti Swamp Sparrows and the Western Swamp Sparrows evolved independently from a common stock to subspecific status and have not since interbred. If that be actually the case, they are not one subspecies, but two, even though they be morphologically identical.

Practical convenience has no standing as a pleader on this question. It would doubtless make matters much simpler for the systematist to

deal only with the present measurable morphological features of living creatures, but the day for such simple science has passed. Now that the main object of our classification is not the convenience of the scientist but is the expression of genetic relationships developed in the course of the evolution of living things, we are not justified in omitting consideration of any available evidence that, in the light of present knowledge, assists in indicating those relationships. This evidence seldom is restricted to the morphological and usually includes the geographical.

These views are not new, but the statements quoted from the paper under discussion indicate that there is need to emphasize them again. An able commentary on the subject by the late Dr. Joseph Grinnell is cited below (Grinnell, 1918).

SUMMARY

Notes of special interest concerning the occurrence on Anticosti Island, Quebec, of 24 of the bird species observed there by the author during the period June 5 to 12, 1940, are presented.

Sturnus vulgaris vulgaris, *Vireo philadelphicus*, and *Dendroica tigrina* are recorded from Anticosti for the first time.

Certain features of a recent paper on the birds of Anticosti Island (Braund and McCullagh, 1940) are discussed. Objection is taken to the unsupported assumption of the subspecific identity of conspecific populations possessing close morphological similarity but occurring on ranges widely separated by the range of a different subspecies.

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DEPARTMENT OF MINES AND RESOURCES, OTTAWA, CANADA

AN EIGHT-WINTER STUDY OF CENTRAL IOWA BOB-WHITES¹

BY PAUL L. ERRINGTON²

THE winter behavior and survival of central Iowa Bob-whites (*Colinus virginianus*), 1932-35, has been discussed at some length in earlier publications (Errington, 1936b; Errington and Hamerstrom, 1935; 1936). Data for five years more, 1935-40, in combination with those previously acquired, delineate a population curve that not only begins and ends with abundance peaks but also depicts seasons of scarcity. What this curve may have in common with the periodic fluctuations of grouse (Tetraonidae) and hares (Leporidae) of Canada and northern United States may be difficult to judge, but its amplitude, at least, should make it of interest from the standpoints both of conservation and biological science.

Tables 1 to 3 summarize Bob-white census figures obtained from four central Iowa areas. Techniques of investigation used were largely those of direct enumeration and "reading of sign" that have proved suitable for regular studies in this region (Errington and Hamerstrom, 1936: 310-333). Helpful information was contributed by farmers and other persons living in the vicinity of Ames; and notes taken by employees of the Des Moines Waterworks Supply Grounds (mainly by Messrs. Ben Baltzley, Lee Simmons, and Martin Haines, and made available through the courtesy of Mr. A. F. den Boer) are of supplementary value.

The Bob-white, being as a species sedentary and gregarious within limits (Stoddard, 1931; Errington and Hamerstrom, 1936), may be rather easily counted under winter conditions prevailing in north-central United States, but the validity of population figures may be affected by lack of tracking snows, by imperfectly ascertained movements of birds across the boundaries of observational areas, by interruptions of local censuses necessitated by more urgent demands of work elsewhere, and by undetected losses as from poaching. Hence, when for any reason the tabulated data are believed to be of less than standard quality, appropriate notations are added for the guidance of the reader.

Of the observational areas, the one at Des Moines (Table 1) was characterized by relatively constant environmental conditions. Non-agricultural land, it had growing on it few of the crop and weed plants of cultivation upon which the Bob-white are so largely dependent for winter food (Errington, 1936a), but this deficiency was offset by the proximity of food-bearing private fields and gardens and by feeding

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² Iowa State College in co-operation with the U. S. Biological Survey, the American Wildlife Institute, and the Iowa State Conservation Commission.

TABLE 1
BOB-WHITE WINTERING DENSITIES, CITY WATERWORKS
SUPPLY GROUNDS, DES MOINES, IOWA, 1932-40

Winter	Date or time of season to which census figures most closely apply	Sample area of 300 acres under regular observation		Entire Waterworks area of 1506 acres plus about 80 acres of adjacent farm land Figures from miscellaneous sources
		Only territory having known boundaries completely within sample area	Entire sample, including parts of borderline, hence imperfectly defined territories	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	
1932-33	Mid-Nov. 16 Dec. 26 Jan. 26 Feb. 8 Mar. 21	62 fair data 59 57 fair data 55 55	92 fair data 109 fair data no data 98 55	176 fair data 177 fair data no data 139 questionable data no data
1933-34	Dec. 8 Jan. 20 Feb. 27	59 63 49	109 126 109	261 fair data 241 questionable data 215 fair data
1934-35	Nov. 23 Early Dec. Mid-Jan. Feb. 9 Mar. 1	60 40 31 20 21	82 62 31 32 33	no data 171 fair data 134 fair data 59 fair data 85 fair data
1935-36	Early Nov. Early Jan. Early Feb. Mid-Feb. Late Feb.	68 fair data 71 fair data 63 fair data 31 fair data 27 fair data	81 fair data 115 fair data 75 fair data 31 fair data 27 fair data	155 fair data 204 fair data 157 fair data no data 69 fair data
1936-37	Late Nov. Mid-Dec. Late Jan. Feb. 5 Feb. 16	40 53 23 11 9	48 101 23 37 9	no data
1937-38	Nov. 19 Dec. 21 Jan. 20 Feb. 23	31 48 39 49	74 84 78 66	no data
1938-39	Mid-Nov. Dec. 5 Dec. 31 Jan. 18 Early Feb.	50 fair data 51 44 50 53 fair data	62 fair data 51 53 74 101 fair data	150 fair data 141 fair data 154 fair data 186 fair data 242 fair data
1939-40	Early Jan. Feb. 5 Mar. 11	54 fair data 56 26 poor data	74 fair data 72 34 poor data	156 fair data 119 questionable data no data

stations maintained by the waterworks staff. Brushy refuge cover was generally excellent in places intended for native wildlife, and the latter was given police protection from human interference. In contrast, the areas near Ames and Story City (Tables 2 and 3) were typical farm lands for which habitability for Bob-white—as concerned food and cover, at any rate—varied much from year to year and according to crop rotation as well as to differences in practices such as tree cutting, debrushing of fence rows and roadsides, plowing, and pasturing.

POPULATION STABILITY

Stoddard (1931: 167-182) found that a favored area of ground in the southeastern states may be occupied by similar numbers of Bob-whites year after year, even when the composition of coveys may greatly change; and this is in keeping with the results of studies in the north-central states from 1929 to 1935 (Errington and Hamerstrom, 1936).

The latter authors listed 119 instances in which trends toward uniformity of local population levels were apparent. In 69 of these, the trends had become manifest at the beginning of the winter; in 43, through winter reduction of "surplus" birds; and, in 7, through the filling of habitat vacancies in the course of the winter. Of the central Iowa data, only those from a few well defined Bob-white range units under regular observation for many winters are strictly eligible for consideration in this connection.

It may be seen that the single territory lying within the 300-acre sample area at Des Moines (Table 1) usually accommodated between 50 and 60 birds from December to February. The decline of 1934-35 was due to experimental manipulation; that of 1935-36, to one of the most severe winter crises on record; and that of 1936-37, to egress and establishment of quarters just off the territory, which in turn was probably induced by low Bob-white densities existing on the area as a whole.

In Table 2, the principal territory west of Skunk River wintered in the neighborhood of 20 birds three of the four winters that it had initial populations up to or over that number; in the fourth winter, 1934-35, the decline seemed non-lethal and associated with population phenomena later to be discussed. The territory east of Skunk River shows little that looks like uniformity, perhaps in part because of pronounced annual variations in the winter-available food supply.

The one territory along Squaw Creek (Table 3) wintered close to 40 birds during three of the four winters it was well filled at the start; the 1934-35 decline was a clear case of eviction as a consequence of practically the entire food supply being plowed under in the fall. The limited data from the Story City area have a bearing upon the possible competitive status of the Ring-necked Pheasant (*Phasianus colchicus torquatus*) and will again be referred to.

TABLE 2
BOB-WHITE WINTERING DENSITIES OF THE SKUNK RIVER
BOTTOMLANDS SOUTHEAST OF AMES, IOWA, 1932-40

Winter	Date or time of season to which census figures most closely apply	Territories usually occupied if Bob-whites winter in their vicinity		Entire area of about 1000 acres under observation
		Principal territory west of Skunk River	Principal territory east of Skunk River	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard
1932-33	Early Dec.	43	61	129
	Jan. 30	43	61	129
	Feb. 27	23	61 fair data	109 fair data
	Mar. 20	22	59	105
1933-34	Jan. 13	38 fair data	30 fair data	133 fair data
	Feb. 27	21 questionable data	0 fair data	58 questionable data
1934-35	Mid-Nov.	42	13	72
	Mid-Dec.	25	16 fair data	58
	Jan. 23	14	13	27
	Feb. 1	13 fair data	12 fair data	25 fair data
	Mar. 1	7	2	9
1935-36	Mid-Jan.	6 fair data	14	44 fair data
	Feb. 6	0 fair data	8 questionable data	43 fair data
	Feb. 11	0	9 fair data	41 questionable data
	Feb. 19	0 fair data	0 poor data	40 poor data
1936-37	All winter	10 poor data	0 poor data	10 poor data
1937-38	Dec. 10	0	0	12
	Dec. 23	9	0	9
	Middle and late winter	9 fair data	0	9 fair data
1938-39	All winter	12 poor data	30 to 40 poor data	40 to 50 poor data
1939-40	Dec. 28	28 fair data	44 questionable data	115 fair data
	Jan. 26	32	37 fair data	124 fair data
	Feb. 28	17 fair data	7	92 fair data

Population maxima on the above central Iowa wintering territories were largely delimited in "good quail years" by what has been called the "carrying capacity" of the land or "the level beyond which simple predation upon adult birds, their own territorial intolerances, and their tendencies to depart from coverts over-crowded with their own or some other species do not permit continued maintenance of population"

(Errington and Hamerstrom, 1936: 309). Numerical values for carrying capacity usually differed with the locality but typically remained about the same from one winter to the next on specific areas unless significant changes in environmental equations took place—*sometimes despite profound modifications in food and cover relationships*.

Food is linked with carrying capacity in the sense that enough high grade food must be available to attract, hold, and sustain the birds. The 1934-35 data for the Des Moines and Ames territories of Tables 1 and 3 reflect the abandonment of otherwise suitable habitat that may be expected when this minimal requirement is not met; but, on Midwest agricultural lands, the amounts of Bob-white foods are commonly in excess of needs except in the event of emergencies unrelated to carrying capacity as the latter has been defined. Carrying capacity may likewise be conditioned by quality and distribution of brushy cover, but individual coveys may vary astonishingly in their preference for, or dependence upon, different cover types. Certain coveys may find untenable brushy cover that may look adequate or superior to human eyes, whereas others may find habitable many patches of sparse brush or corn fields having no more cover than that provided by stalks and weeds. The declines shown by the Skunk River (Table 2) and Squaw Creek (Table 3) census figures for 1934-35 and 1939-40 were partially attributed to coveys moving to food-rich but generally cover-poor uplands situated away from the streams and outside of the observational areas.

Predation borne by wintering northern Bob-whites tends to be of incidental nature and of intensity governed by the degree of vulnerability of the birds, themselves, rather than by kinds and numbers of predators (Errington and Hamerstrom, 1936; Errington, 1937)³. Although populations above the carrying capacity of the land are preyed upon with conspicuous severity, carrying capacity functions as a threshold of security below which the numbers of wintering birds can rarely be forced very far through attacks of wild predators alone. Winter losses from predation on the Des Moines 300-acre sample (Table 1) have been consistently negligible. In the vicinity of Ames, the territory west of Skunk River (Table 2) lost birds from predation chiefly in 1932-33; the Squaw Creek territory (Table 3), in 1932-33 and 1939-40. On other parts of the 4200-acre Squaw Creek area, two covey groups in 1934-35 and two in 1939-40 lost considerably from predation, but the data on carrying capacities of their habitats are insufficient to permit further evaluation in this writing.

Weakness, as from injuries or hunger, may of course predispose birds to capture by enemies even when no state of overpopulation exists,

³ In southeastern states, Bob-white and predator relationships may differ materially from those described for the north-central region and reveal less flexibility (Errington and Stoddard, 1938).

TABLE 3
BOB-WHITE WINTERING DENSITIES OF FARM LANDS BORDERING SMALL
STREAMS NEAR AMES AND STORY CITY, IOWA, 1932-40

Winter	Date or time of season to which census figures most closely apply	Area of about 4200 acres situated mainly within one mile of Squaw Creek, north and northwest of Ames		Square mile of land south of Story City having suitable habitat only in one corner
		Only well-defined territory under regular observation for full period	Entire Area	
		Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard	Number of birds and appraisal of data if below accuracy standard
1932-33	Dec. 17 Jan. 29 Mar. 4 Mar. 19	48 44 42 42	no data	no data
1933-34	Dec. 13 Early Jan. Feb. 27	42 43 38 fair data	no data	no data
1934-35	Early Dec. Early Jan. Late Jan. Feb. 20 Mar. 8	53 7 fair data 0 0 0	156 no data 127 88 57	no data 23 38 fair data no data 31
1935-36	Nov. 28 Dec. 16 Jan. 15 Jan. 30 Feb. 20	19 21 18 8 4	no data	no data no data 20 poor data no data no data
1936-37	Early Dec. Jan. 7 Feb. 14	8 6 6	19 questionable data no data 15 questionable data	0 fair data 0 fair data 0 fair data
1937-38	All winter	0	12 questionable data	15 poor data
1938-39	Early Dec. Mid-Jan. Mar. 2	18 26 10	45 fair data 39 questionable data 39 questionable data	12 to 15 all winter —poor data
1939-40	Late Dec. Jan. 20 Early Feb. Late Feb.	47 31 36 40	231 180 157 170	18 fair data 15 fair data 15 fair data 15

and man may still be able to exploit populations that less-equipped predators had long found essentially unavailable.

The influence of species psychology on population levels of the Bob-white is a subject so beset by unknowns and variables that we find it hard to say how much the 1935-40 data may have to add to what has already been published (Stoddard, 1931: 167-182; Errington and Hamerstrom, 1936: 366-405; Errington, 1937). The manifestations and consequences of overcrowding may be spectacular, and there is no question that birds harassed by their fellows or forced into inferior habitats may be confronted by lethal disadvantages; to explain why limits of toleration should be definite for a given area for many winters in succession yet different on different areas is another matter, however, particularly when about the only uniformity to be seen in a local situation may relate to maxima of birds annually tolerated.

Intraspecific behavior was best studied at Des Moines, where an exceptionally stable habitat was kept filled with Bob-whites close to its evident capacity for the greater part of six or eight winters, or the whole 1932-40 period except 1934-35 and 1936-37. In all years, preliminary adjustments indicative of toleration limits on the main territory had occurred by late November or December (Table 1). Four to six coveys occupied this common territory—which was something of an ecological island of between 140 and 160 acres—during “saturation” winters, but continuous splitting and recombining of coveys and fluidity of movements seldom left coveys with any particular identity for more than a few days at a stretch, though in many ways the total population reacted as a group. Coveys from outside entered the filled-up territory on occasion, but either they did not remain or an equivalent number of birds soon departed.

Autumnal fighting between coveys has been noted alike for the Valley Quail (*Lophortyx californica vallicola*) in California (Emlen, 1939: 129) and for the Bob-white, and both species may violently exclude strangers from covey groups. Avoidance of fully populated coverts by excess birds may occur without manifestations of animosity and sometimes after close associations terminated by birds segregating into their original coveys and going their respective ways. Bob-whites of the north-central states may also, and seemingly without direct compulsion, avoid concentrations of Ring-necked Pheasants and other conspicuous animal life. Bob-whites of underpopulated areas, such as the one at Des Moines in 1936-37 (Table 1) and the two near Ames from 1934-35 to 1938-39 (Tables 2 and 3), were generally more mobile than residents that were unable to go so far without trespassing in occupied territories.

What appear to be changes in habitability of Bob-white environment may be due chiefly to increased experience of the birds as the winter progresses. Few coveys were found more than a mile from central Iowa streams at the beginning of the winter, except those fairly well situated about farm groves or the occasional grapevine tangles

along fence rows, and similar places; in late winter, 1934-35 and 1939-40, it was not unusual to encounter coveys—including large ones of 30 birds or more—in previously unoccupied farmyards and open fields one and one-half to two miles away from the streams. Among these coveys were some that were almost certainly wanderers, but the losses associated with winter-wandering of a few coveys in spacious central Iowa cornfields seem proportionally much less than those of birds drifting from one filled territory to another in areas having less food and more cover (Errington and Hamerstrom, 1936).

Since the Bob-white may nest in grassy prairie fence rows and roadsides miles from wintering quarters and as the preliminary splitting of paired birds from coveys may be observed as early as the middle of February, some of the movements into open habitat in late winter may conceivably be initiated by the approach of the breeding season. The evidence suggests, however, that the majority of the peripheral coveys gradually accustom themselves to living with less brushy cover than they require in late fall and early winter—a period of readjustment and more or less mortality from enemies.

In summer, the more general distribution of the birds, the poor visibility resulting from a profusion of ground cover, and the ephemeral persistence of carcasses are serious hindrances to the analysis of mortality in detail, and we have few reliable data on recovery of central Iowa Bob-white populations during the breeding season. Eleven years of data from an area of five square miles near Prairie du Sac, Wisconsin, indicate that the net increase of birds by late autumn and early winter is commonly in inverse ratio to the density of the spring population (Errington and Hamerstrom, 1936: 422; 1937: 17; Leopold and Errington, MS). In other words, environment that is well filled with adult birds is not likely to rear many young, with lower recovery rates under such circumstances being attributable as much as anything to accelerated juvenile mortality. Differences in kinds and numbers of enemies apparently have much more influence on seasonal recovery rates of Bob-white populations in southeastern than in north-central states (Stoddard, 1931; Komarek, 1937; Errington and Stoddard, 1938).

IRREGULAR FLUCTUATIONS

Sudden losses from starvation may take place even during rather mild weather if the food of the birds is cut off by heavy snow or ice. Much of the 1934-35 early winter decline for the 4200-acre Squaw Creek area (Table 3) was thus accounted for, and a food crisis also followed experimental discontinuation of artificial feeding at Des Moines (Table 1) (Errington, 1936b: 560-562).

As a rule, but not invariably, northern Bob-whites can withstand cold as long as they are in good flesh (Errington, 1939: 23-7), and this

is illustrated by the Ames data for 1939-40. The extended "Indian summer" had permitted clean harvesting and pasturing by livestock of the corn field feeding grounds of a number of the Squaw Creek coveys; what little food remained was covered by snow from about the first of the year to midwinter, but few birds died of hunger before the middle of January; then, temperatures that dropped to 25° below zero (F.) eliminated in the space of less than 24 hours on January 17 and 18 almost all Bob-whites on the area not living near farm yards, feeding stations, or fields of soy beans. Our census figures show a decline of 51 birds between late December and January 20; the carcasses of 40 were found during, or just after, the cold snap. Of these carcasses, 14 collected before scavengers had eaten on them averaged 121.3 grams or from 60 per cent to 65 per cent of their "normal" winter weights, hence were in somewhat better flesh than the usual starvation victims dying at higher temperatures (Errington, 1939: 23-7). The decline of seven birds between December 28 and January 26 on the territory east of Skunk River (Table 2) mainly represents starvation losses suffered by a covey before it moved into a farm yard. Subsequent to the January, 1940, crisis, the Ames coveys wintered with slight detected mortality.

The exceedingly severe winter of 1935-36 was one of drastic losses in Iowa and southern Wisconsin (Green and Beed, 1936; Leopold, 1937; Leopold and Errington, MS), a great deal of which was due to hunger; but at least some of the lethal effect of this winter may be charged to exposure. Scott (1937) describes a covey of otherwise normal central Iowa birds reduced to helplessness by partial encasement of their heads in ice and snow. Of 14 southern Wisconsin Bob-whites found dead by Wade (1938) after the covey had been scattered just before, or during, a blizzard, five "weighed over 200 grams thawed, none less than 160 grams thawed" (Leopold, 1937: 411). The birds resident in 1935-36 on the Skunk River area (Table 2) were unusually well situated when observations were begun in the middle of January; whether these represent remnants of an earlier population is not known, but the population of the Squaw Creek territory (Table 3) really did not start dying before this time, and that of the Des Moines territory (Table 1) maintained its approximate numbers until the blizzard of February 8.

In 1939-40, a covey living about a half mile off the Squaw Creek observational area suffered another type of mortality. While on a field trip January 27, a graduate student, Mr. Leo Brown, dug five Bob-white carcasses out of a very hard snowdrift beside the snow fence of a railroad. Going out two days later, I found four more carcasses and "sign" corresponding to about four living birds. Seven intact carcasses were in good flesh, averaging 184.3 grams with no food in their stomachs. The birds had died in two loose groups (not in "huddle" forma-

tion) some days before and apparently from asphyxiation following individual imprisonment by drifting snow.

Winter losses from miscellaneous causes may vary. Shooting or trapping, which may have a pronounced effect on Bob-white population levels in some communities, is not thought to have been of consequence on the central Iowa areas during the years of the investigations. Young hatched in September or October may be at a hopeless disadvantage if cold, stormy weather comes early; some full-sized birds appear hypersensitive to low temperatures and are eliminated by the first sub-zero cold. Injuries and diseases claim individuals from time to time. Security from predation is rarely absolute, and even well situated populations may lose a few birds to enemies in the course of the winter—especially in the early part.

During the warmer months much happens concerning which we can expect to gain only fragments of information. We know broadly that the reproductive success of local Bob-white populations may be affected by climatic vicissitudes or by agricultural practices such as burning, mowing, and pasturing, and that losses of mating and incubating adults, of nests and young, may be heavy or light, but, for all of that, intercompensatory trends in breeding and loss rates may counteract many of the influences that would seem conducive to irregularities in population maintenance (see Errington and Hamerstrom, 1937, for related data and discussion).

THE QUESTION OF PERIODICITY

Through intensive field work, we have been able to trace the preponderance of the central Iowa winter losses that we had any reason to believe due to actual death of the birds, and these losses fell with some consistency into well known and characteristically irregular types. It would therefore seem that, if any truly "cyclic" decline of central Iowa Bob-whites took place between 1932 and 1940, the causative factors must have been dominantly operative at another time of year. Kendeigh's (1933) compilation of the *Bird Lore* Christmas bird censuses for Ohio, 1908-31, show the effects of certain killing winters, but not all of the declines may be so correlated.

Failure of breeding stock to repopulate specific areas at expected rates may, for one thing, be associated with drought. In 1934, there seemed to be a rough agreement between autumn Bob-white scarcity over much of southern Iowa and the length and intensity of the spring and summer dry period in different localities (Errington, 1935); a less pronounced decrease was indicated by data from the central Iowa areas; at Prairie du Sac, Wisconsin, the recovery was "normal" for the breeding population. In view of the fact that the "cyclic" decline of grouse and rabbits in Minnesota and Wisconsin was contemporaneously in progress, the possibility of the Bob-white likewise showing general and "cyclic", rather than local and irregular, fluctua-

tions was considered but without any conviction that the Iowa declines could not be attributed mainly to the unfavorable season.

That a rainy summer may adversely affect Bob-whites is known (Stoddard, 1931: 200-202), and the unusually wet summer of 1935 was at least accompanied by rates of recovery from central Iowa breeding stock that were below expectations. Nevertheless, it is unproved that, in this case, the relationships of recovery rates to the weather were more than incidental. Recovery was "normal" for the spring density of birds at Prairie du Sac.

Winter-killing in 1935-36 had reduced breeding populations throughout the region (Green and Beed, 1936; Leopold, 1937), but neither this nor the 1936 drought, nor the two in combination, may be advanced as full explanation for the near-disappearance of Bob-whites in the vicinity of Ames. The Prairie du Sac recovery was only about half "normal" for the season's adult population—which, considering the regularity that percentages of increase on the area rose and fell inversely with the breeding densities during other years, droughts and winter emergencies notwithstanding, may suggest a depressive mechanism somewhat different from any we have hitherto succeeded in analyzing. The very poor 1936 recoveries of many species of upland small game living in the north-central region, including "cyclic" grouse and rabbits, may or may not have a significant correlation; but the data available do not refute the concept that irregular fluctuations of the Bob-white may perhaps be superimposed upon a basically, if not conspicuously, "cyclic" pattern. The similarity in the low points of the Ohio Bob-white curve (Kendeigh, 1933) and those of the hardy but violently "cyclic" Ruffed Grouse (*Bonasa umbellus*) of Wisconsin (Leopold, 1931: 142), for example, may not be due to chance.

From 1937 to 1939, Bob-white population recoveries in central Iowa and southern Wisconsin showed increasingly predictable trends, irrespective of further droughts and winter mortality, and little appeared to happen that could not be accounted for in terms of past experience.

THE COMPETITIVE STATUS OF THE RING-NECKED PHEASANT

The Ring-necked Pheasant is not the least formidable of the exotic game birds the introduction of which has been a source of apprehension to many conservationists, and its combative prowess may even be manifested by vicious encounters with poultry cocks in farm yards or by beating off attacking enemies such as dogs or hawks. It is not strange that the occasionally authentic reports of Pheasants destroying eggs or young of ground-nesting birds should lead to conjecture as to whether some of our native wild species may thereby be driven out.

So far as the Bob-white is concerned, the aggressive traits of the Pheasant appear to be of slight direct importance. Regardless of interspecific friction that may now and then take place, Pheasants and Bob-

whites may frequently be seen using the same feeding stations and otherwise consorting without evidence of animosity. On the other hand, some types of competition between Pheasants and Bob-whites may have an adverse influence upon population levels of the latter.

The superior foraging ability of the Pheasants give them a distinct advantage over Bob-whites in such food competition as may exist between the two species (Errington, 1939). Lethal aspects of food competition during crises, however, have been observed less often than benefits to the Bob-white resulting from Pheasants—along with Crows (*Corvus brachyrhynchos*), rabbits, and fox squirrels (*Sciurus niger rufiventer*)—exposing ice-glazed or snow-buried corn and otherwise rather inaccessible foods. Dependence of Bob-whites upon “competitors” for food was especially noted on the Squaw Creek area (Table 3) during 1934-35 (Errington, 1936b: 559) and 1935-36 (Errington, 1939:34).

Competition for wintering environment on semi-wooded farm lands of southern Iowa and southern Wisconsin may favor Bob-whites rather than Pheasants insofar as the former may be better adjusted to particular habitats. From central Iowa north and west to southern Minnesota and eastern South Dakota, the prairie farm lands not only have fewer brushy coverts suitable for Bob-whites but fewer still that are not also attractive to the far more abundant Pheasants. It has been noted that, while Bob-whites may tolerate low or moderate densities of Pheasants, they tend to avoid coverts where Pheasants concentrate, essentially as they do those overpopulated with their own species. The Pheasants themselves may be tolerant of massing within much greater limits, as in fall and winter it is sometimes possible to flush hundreds at once from certain parts of tree claims, marshes, and corn fields.

The difficulties of getting reliable census figures on birds that may range as widely and irregularly as Pheasants have restricted our opportunities for even reasonably exact studies. It is neither easy to say what constitutes a sufficient number of Pheasants to cause Bob-whites to leave their coverts, nor to what degree such abandonment may have lethal consequences.

A 200-acre experimental area of the University of Wisconsin had a mixed wintering population of 47 Bob-whites and about 30 Pheasants in 1930-31 and a population of 26 Bob-whites and about 50 Pheasants in 1931-32, or a total close to 77 and 76 gallinaceous birds for two successive and comparable winters (Errington and Hamerstrom, 1936: 335, 368-369, 429-431). The carrying capacity of the tract for Bob-whites apparently declined as the Pheasant population rose; in 1931-32, a concentration of about 40 Pheasants in a 5-acre woodlot was followed by a definite withdrawal of the Bob-whites. The Bob-whites of a game management area near Ida Grove, Iowa, 1932-33, avoided the most attractive covert after about 35 Pheasants established themselves there;

and similar observations were made on neighboring land. The Story City data presented in Table 4 show a survival of 31 Bob-whites and a wintering population of about 8 Pheasants for 1934-35; 15 Bob-whites and about 27 Pheasants for 1939-40; or mixed wintering populations of about 39 and 42 birds for the two winters that are eligible for comparison.

Pheasants were present but very scarce on the Des Moines area, three being the largest number recorded for the 300-acre sample on any visit between 1932-33 and 1939-40. On the Ames areas, after several years of not doing much more than maintaining themselves at low densities, the Pheasants practically doubled their wintering populations between 1938-39 and 1939-40 (Table 4); as usual, the Bob-whites sooner or later departed from coverts frequented by more than about a dozen Pheasants, but the heaviest Bob-white survival in years does not indicate that the 1939-40 Pheasant population was seriously competitive.

TABLE 4

COMPARATIVE WINTERING DENSITIES OF BOB-WHITES AND RING-NECKED PHEASANTS NEAR AMES AND STORY CITY, IOWA, 1932-40

Area	Winter	Bob-white populations		Figures arrived at for mid-winter populations of Pheasants—see text for comments
		Early winter	Late winter	
1000 acres southeast of Ames	1932-33	129	105	8 to 12
	1933-34	133	58	
	1934-35	58	9	probably close to 25
	1935-36	44	40	
	1936-37	about 10 all winter		
	1937-38	12	9	perhaps 20
	1938-39	40 to 50 all winter		
	1939-40	115	92	
4200 acres north and northwest of Ames	1934-35	156	57	12 to 15
	1935-36	data incomplete		about 25 to 30, with possibly a gradual in- crease from 1935-36
	1936-37	19	15	
	1937-38	about 12 all winter		to 1938-39
	1938-39	45	39	
	1939-40	231	170	
640 acres Story City	1934-35	23	31	8
	1935-39	data incomplete or of poor quality		27
	1939-40	18	15	

How abundant the Ames Pheasants would need to become to depress winter Bob-white populations and how likely the Pheasants are to increase up to this point are questions for which we as yet have no answers. Old notes indicate that, by the fall of 1921, Pheasants were just becoming established on my family's 300-acre farm west of Bruce, South Dakota, and that they reached peak numbers of about 350 by

the fall of 1927—a rise from an estimated 5 to 10 birds, or several thousand per cent in six years. This South Dakota farm presumably furnished better environment for Pheasants than exists on the Ames Bob-white areas, but Conservation Officers and other observers have also reported pronounced recent increases of Pheasants in many central and southern Iowa counties that were formerly sparsely occupied despite continued stocking. In the event that the present ascendencies of Pheasants terminate in populations averaging a bird per 2 to 10 acres over wide areas—which appear to be densities about as high as we may expect to find in midwestern “pheasant country”—a material lowering of the capacity for accommodation of Bob-white habitats may be entirely conceivable.

But even when Pheasants have all of the advantage of numbers, adaptations, and habitats, and their dominance adversely affects Bob-white population levels, it does not necessarily follow that the Bob-white will as a species be evicted from a given locality. It is still possible to find Bob-whites nearly every year in some of the strongest Pheasant range of glaciated north-central United States; data from the vicinity of Ruthven and Emmetsburg, Iowa, Hutchinson, Minnesota, and Lake Norden, South Dakota, refer to aggregates of two or three coveys of Bob-whites living along the edges of dry marshes frequented by hundreds if not thousands of Pheasants.

In the above instances, there were two apparent major reasons why competitive interactions between a thriving and another greatly handicapped species did not lead to complete replacement of one by the other, after the manner shown by the experiments of Gause *et al* with simple microcosms (Gause, 1935; Gause and Witt, 1935). The Pheasants seldom occupied with any uniformity the whole of the environment suited to Bob-whites but tended to mass along certain sides of a marsh, for example, thus leaving at nearly any time a few more or less vacant places to which Bob-whites could withdraw in comparative privacy. Then, again, the latter birds were not strictly confined to brushy habitats but were able to live more in weed patches, marshy growths, and corn fields, much as were those of the Ames coveys that displayed unusual mobility and latitude in choice of coverts.

DISCUSSION

The statement by Stoddard (1931: 170) that Bob-white coveys tend to keep their organization of normal size through repeated combinations is emphasized by data on the possible role of “tradition” in determining toleration limits in wintering territories.

On the whole, the coverts that are occupied the most continuously seem to show the greatest year to year constancy of carrying capacity, for example, those of the main territory at Des Moines (Table 1).

The population figures for the Skunk River territories, as they are presented in Table 2, look highly variable in many respects, but the one part of the west territory that was frequented nearly every winter usually accommodated between 8 and 10 birds; the east territory, either abandoned or not occupied for five successive winters, revealed little uniformity in population levels at times when it did have birds. Three of the seven habitable Prairie du Sac, Wisconsin, territories or groups of territories that showed such definiteness of carrying capacity, 1929-35 (see Errington and Hamerstrom, 1936: 368-369, 394-395), still seem able to accommodate about the same number of birds, and these are the only ones that have not been grossly underpopulated for more than one winter in succession since 1935-36; in the course of 11 years of study, two apparent changes in carrying capacity—from one rather definite value to another—were noted, both changes following two-winter vacancies (unpublished).

The sole evidence that appears against this concept is that furnished by the Squaw Creek territory, which after four winters of underpopulation (not including 1934-35, when the territory was well filled by early December) accommodated in 1939-40 a population that compares with what were judged to be carrying capacity figures in 1932-33 and 1933-34. Six other possible territorial blocks of the 4200-acre Squaw Creek area had quite dissimilar populations in 1934-35 and 1939-40; these two seasons, with at least three low-population winters intervening, are the only ones for which our data indicate full or nearly full coverts. The existence away from the streams and gullies of large acreages of prospective or semi-habitable environment—highly attractive from the standpoint of food—is itself a partial explanation for much of the territorial laxity observed in central Iowa, but some of the differences might simply be due to failure of local habits to be carried over.

The likeliest mechanism behind these toleration phenomena seems to be dominance by veteran individuals that have their own ideas as to what constitutes desirable or safe numbers of birds in specific habitats. As long as the habitats are fairly well filled each winter, there should be a greater chance of "traditions" being retained, either through continued presence of dominant old birds or through successors having had previous local experience. It may be postulated that "traditions" die along with populations during periods of great mortality or fail to be maintained during a series of low-density years when extensive areas are left unoccupied. Interchange of Bob-whites between neighboring coveys and reorientation of old and young in different local covey groups has been demonstrated by banding (Stoddard, 1931: 169-182; Errington, 1933) as well as indicated by field observations; and it is probable that coverts well occupied for a succession of winters generally have a number of birds the responses of which to crowding in

particular places may be conditioned by former "apprenticeship" there. Emlen (1939: 125; 1940: 94-95) carried on a very detailed banding and feather-marking study of California Valley Quail populations and found that older birds had a distinct advantage in competition with the immature and the yearlings; however, he writes (letter, July 14, 1940) that there is "very little evidence of policing activity or of peck order in . . . coveys until February when, it is true, older birds generally rank highest (except when these are recent immigrants or transplants from other coveys) . . ." It is therefore conceivable that "traditions" may not represent the reactions only of veterans and that "apprenticeship" may be of shorter duration.

The possible applications of the work by Lorenz (1935; 1937) on the critical effects of early experiences of various young birds are worth considering. In the above correspondence, Emlen raises the question whether "imprinting" ("Prägung" of Lorenz) resulting from association of Valley Quail chicks with different sizes of broods or combined broods may not have a bearing upon their later flocking habits. To explain constancy of carrying capacity or of toleration limits for the Bob-white, I would think that such "imprinting" would have to be operative fairly late in life, for constancy not only seems to be maintained despite variations in size of broods and fluctuations in juvenile mortality accompanying low or heavy densities of adults but also despite the fall reorientation of the birds and occasional great changes in year-to-year food and cover relationships.

The influence of quality and distribution of food and cover on habitability of wintering environment need not be minimized in our efforts to understand Bob-white populations. We should recognize, nevertheless, that carrying capacity of given land units may be to a considerable extent a matter of what the birds themselves make it.

SUMMARY

An eight year (1932-40) field study of central Iowa Bob-white populations not only began and ended with abundance peaks but also covered an interval of pronounced scarcity. Practically all of the traceable mortality associated with the decline took place during the winters of 1934-35 and 1935-36 and most of this proved to be of the familiar starvation-emergency types that may be expected on a greater or less scale nearly any winter; an inexplicably low rate of recovery of Bob-whites among other wild species during the breeding season of 1936, however, may suggest the operation of unknown factors, perhaps of periodic nature. Occupancy of given tracts of environment is evidently determined by the sociality of the birds as well as by food and cover conditions; and this is illustrated by Bob-white responses to crowding either on the part of their own or some other species as the Ring-

necked Pheasant, by their occasional late-winter adaptiveness in establishing themselves in food-rich fields away from the bushy fence rows, woodlots, gullies, and water courses usually frequented, and by their apparent maintenance—despite annual changes in habitats and in covey composition—of toleration “traditions” peculiar to the most regularly used winter territories.

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THE CROW AND THE RAVEN IN EARLY WISCONSIN

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THE early writers on Wisconsin birds state that the Crow† was a comparatively rare bird while the Raven‡ was common. Settlement of the state produced a complete reversal, the Crow becoming very abundant and the Raven disappearing from the southern portion. While it is true that the Crow is seldom mentioned in the early accounts, this statement applies with almost equal force to the Raven. Both species have received only casual mention and the earliest records are easily overlooked.

Errors occur in the translations of the *Jesuit Relations* and other early French writings where *corbeau* appears indiscriminately as either Raven or Crow. In every case examined the French is *corbeau*. This criticism applies also to place names, such as Crow Wing River (*Aile de Corbeau*). The only instance noted where Crow (*corneille*) was properly applied is mentioned by Schoolcraft¹ who was in Minnesota in 1820. A small stream called *Corneille* by the French flows into the Mississippi between Saint Anthony Falls and Crow Wing River.

The Crow was long known to the northern Indians. Schoolcraft mentions that the Chippewa name is *andaig*. W. W. Cooke², who spent three years among the Chippewas at White Earth, Minnesota, states that the Raven is called *ka-gog-i'* and the Crow *an-deg'*, meaning those that migrate, in contradistinction to the Raven which is a permanent resident. Schoolcraft³, in spite of his vigilance, is inconsistent. He makes the interesting observation that the Magpie occurs at Lac du Flambeau, Wisconsin, and translates the Chippewa name, *wabish kagagee*, as White Crow.

Perhaps the first mention of the Raven in Wisconsin is made by Perrot⁴. He visited the Mascoutin Indians at the site of modern Berlin, Wisconsin, in 1666, and relates that at a feast some Indians had the skins of Ravens with their feathers (*peaux de Corbeaux avec leur plumage*) attached to their girdles. Hennepin⁵, while coasting along the Wisconsin shore of Lake Michigan in October 1679, found a deer upon which Ravens and eagles were feeding. In keeping with tradition, the Raven is mentioned in connection with disaster. Marin⁶ in a letter dated May 11, 1730, describes his attack on the Fox Indians in their fort on Lake Winnebago. After the fifth day of battle, Ravens were seen to alight in the fort from which it was concluded that the enemy had departed. Rev. Cutting Marsh⁷ recorded in his journal on September 18, 1834, that one of the Stockbridge Indians had found at South Kaukauna a dead body marred beyond recognition by Ravens.

† *Corvus brachyrhynchos*.

‡ *Corvus corax*.

The Crow is not mentioned until well into the nineteenth century. The evidence for its presence and abundance is conflicting over a period of many years. This may be due to erratic distribution or to faulty observation. As late as 1905 Sayre⁸ wrote: "Forty years ago one never saw a crow in Wisconsin, and yet within but a year the supervisors of Rock County passed an ordinance to pay ten cents for each crow killed." Nevertheless, the Crow did occur throughout Wisconsin before the agriculture of the whites.

The Crow, according to Richardson and Swainson⁹, ranged to the fifty-fifth parallel of latitude as early as 1831. Schoolcraft¹⁰ found both the "Crow (*Corvus corone L.*)" and "Raven (*Corvus corax L.*)" in Minnesota in 1820. McKenney¹⁴ was on Madeline Island, Wisconsin, in late July, 1826, and wrote: "Tame crows appear common in this part of the world. I notice four here that fly after the family as if they were part of it and had never been wild." Crows were not confused with Ravens, for he mentions having seen the latter at the mouth of the Montreal River.

In 1823, Keating's²¹ party* travelled overland from Chicago to Prairie du Chien. "The Crow (*C. corone*)" was not encountered until the Wisconsin River was reached. This was the first heavily wooded area encountered, the significance of which will appear later. Mrs. Roseline Peck¹³, the first white woman to settle at Madison, mentions that in July 1837, some of her guests "shot my two little pet crows." This act is to be commended highly, as it is improbable otherwise that these Crows would have become historic. McLeod¹⁴ travelled through southern Wisconsin in the '40s and among the birds of the region mentions both the Crow and the Raven.

The contribution of Moses Barrett¹⁵ is particularly interesting, with respect to distribution. In the fall of 1850 he settled on the "Indian Lands" at Wautoma, then on the edge of the wilderness. Flocks of eight to ten Ravens were seen in winter and the species remained for two or three succeeding seasons. During this period numerous settlements were made and the Raven disappeared. A year or so later the first Crow arrived, soon followed by others. Barrett was of the opinion that the Fox River formed the boundary between the two species and that they would not intermingle. J. A. Allen¹⁶ immediately replied with the statement that in Dakota and Montana he found Crows and Ravens intermingling freely and even breeding in the same forests. On Madeline Island where Crows congregate by hundreds in autumn I have failed to observe any antagonism between the two species.

References become more numerous and scientific after 1850. Barry¹⁷, in his list of the birds of Wisconsin, states that the Raven is rare while

* This is known as Long's Second Expedition to which Thomas Say was attached as naturalist. Say was the first trained zoologist to travel in Wisconsin. He left but little information on the birds of the state due in part to the loss of many of his specimens in transit. I have been unable to trace any of his notebooks for this period.

only a few Crows have ever been seen in the state. Hoy¹⁸ considered the Crow one of the rarest birds at Racine and records that "it never takes up its quarters within fifteen or twenty miles of Lake Michigan." The Raven was more numerous, and resident. In a later paper Hoy¹⁹ states that the Crow was first seen by him at Racine in 1858 and that they began to nest in that section "about twenty years since," which would be about 1865. The Raven became scarce about 1850. R. M. Strong²⁰, writing in 1895, stated that thirty years earlier the Crow was considered by the old settlers to be a comparatively rare bird.

The curious conflict of opinion continues. Kennicott²¹ reported the Crow and Raven as common throughout the state of Illinois and stated that both species have been known to nest in Cook County. About twenty years later (1876) E. W. Nelson²² wrote that the Crow "is far from an abundant species in Northern Illinois, at any season or locality."

The report of King²³ on Wisconsin birds was based on field work done from 1873-7. He states that the Crow is common throughout the southern portion of the state and winters in considerable numbers. At that time the Crow was known to occur in the Mississippi valley as far north as New Richmond, Saint Croix County, but he had not observed it in the eastern portion of the state north of Stevens Point. However, at about this time Willard²⁴ reported the Crow as breeding near Green Bay while at the same time (1881-83) Grundtvig²⁵ found it common in migration, with a few nesting, in Outagamie County.

Reports on the wintering of Crows in the northern half of the state do not appear until about 1870. The statement of Kumlien and Hollister²⁶, made in 1903, that Crows do not winter in north and north-central Wisconsin requires modification. In the winter of 1872-3 they remained in unusual numbers at Prescott²⁷, as well as at New Richmond²⁸ in the winters of 1872-3 and 1875-6. In the winter of 1883-4 they remained in Fond du Lac County.²⁹

The small population of Crows in southern Wisconsin in the early days was due in large part to the presence of great areas of prairie. Elliott Coues³⁰ mentions that the Raven ranged more over the plains, while the Crow was "partial to the wooded river-bottoms, and the immediate vicinity of the water-courses." There is general agreement that the Crow, in both Wisconsin and Illinois, was a comparatively rare bird in the prairie regions until the latter were brought under cultivation. Agriculture not only provided more food but permitted the growth of forests previously prohibited by prairie fires.

It may be stated in general that the Crow was distributed sparsely in the state prior to 1855, became common in the southern portion by 1875, and abundant by 1890. The Raven began to disappear from the southern half of the state about 1850 and became a scarce winter visitor about 1865. Its rarity in extreme southern Wisconsin may be

judged by the fact that the last record known to Kumlien and Hollister²⁶ was the one shot at Lake Koshkonong in November 1891. In October, 1934, one was shot by duck hunters at Crystal Lake, Dane County, and subsequently recovered by Leonard Wing.³¹ At the present time the species is confined largely to the northern third of the state.

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168 NORTH PROSPECT AVENUE, MADISON, WISCONSIN

INCUBATION STUDIES OF THE YELLOW-HEADED BLACKBIRD ¹

BY REED W. FAUTIN

ALTHOUGH the Yellow-headed Blackbird, *Xanthocephalus xanthocephalus* (Bonaparte), is a fairly common bird within its breeding range, the details of its incubating activities have been given but little attention, even though its nesting habits afford several advantages for making a study of this kind. This species nests in colonies of considerable size, thereby making it easy for the investigator to keep a large number of nests under observation within a comparatively small area, to obtain incubation data on a large number of eggs, and to make observations on the incubating activities of many individual birds.

During the spring and summer of 1937 two colonies of "Yellow-heads" were kept under observation from April until September. The larger of the two colonies, occupying an area 5 acres in extent, was situated at the mouth of the Provo River on the east shore of Utah Lake and will be referred to as the "Provo River colony." The height and density of the vegetation, *Tamarix gallica* and *Salix* sp., made the determination of the exact number of males present very difficult, their maximum number being estimated to be 35 at the height of the nesting season. Eighty-three females nested in this colony, thus making a maximum population of 118 birds.

The smaller colony, consisting of 40 females and 12 males, was located northeast of the Provo River colony about two miles east of Utah Lake and will be referred to as the "Lakeview colony." This colony was confined to a small bulrush marsh, 0.37 acre in size, situated in a low depression surrounded by higher ground and open pastures. The entire area occupied by this colony could be observed from any one position around its border, thus making it convenient to observe the behavior of individual birds and to check on the exact number of birds in the colony. Observations on the behavior of the incubating females were restricted to birds of the Lakeview colony because of the location as described above.

Most of the nests were located during the time of their construction and the progress of each nest was followed until the young birds had left. Each nest was given a number when it was first located, a parchment tag with the number being attached to the vegetation near the nest. The location of each nest in the Lakeview colony was marked by sticking a tall willow into the mud within a few feet of the nest. The presence of these tall willows, in contrast to the shorter bulrushes, made

¹ Contribution from the Zoological Laboratory of the University of Illinois, No. 581; and No. 85 from the Department of Entomology and Zoology, Brigham Young University, Provo, Utah.

it very easy to locate and identify the various nests in the colony at a distance.

During the early part of the season, the nests were visited daily but as more nests were located and more time was consumed in visiting nests, weighing young, and observing individual birds, it became necessary to visit each of the colonies on alternate days. The eggs were marked with India ink to facilitate identification at the time of hatching.

EGG-LAYING

The laying of eggs began within one to 7 days after the nests were completed. Sixty-one and eight-tenths per cent of the females laid their first egg the first day after their nests were completed; 23.7 per cent the second day; 10.5 per cent the third day; and 4 per cent the fourth day.

The deposition of eggs began about the same time in both colonies, the first egg being recorded May 7 in the Provo River colony and the first one May 8 in the Lakeview colony. The period between the first and last eggs laid was approximately 7 weeks, the last egg recorded in the Provo River colony being laid June 10 and the last one in the Lakeview colony June 22.

The number of eggs present varied from 2 to 5, with 4 the most common number (Table 1). One egg was laid each day until the clutch was completed. Most of the eggs laid during the fore part of the season were 4-egg sets, but as the season progressed there was a tendency for more sets of 3 to be laid. The 2-egg sets were the result of second attempts at nesting by females whose first clutch had previously been destroyed.

TABLE 1
NESTING STATISTICS

	Provo River colony		Lakeview colony	
	No.	Per Cent	No.	Per Cent
Nests recorded.....	84	100.0	44	100.0
Nests completed.....	82	97.7	42	93.2
Incomplete sets of eggs.....	3	3.7	3	7.1
Total completed sets of eggs.....	79	96.3	39	92.9
a. Two-egg sets.....	1	1.3	3	7.7
b. Three-egg sets.....	16	20.2	10	25.6
c. Four-egg sets.....	59	74.7	24	61.5
d. Five-egg sets.....	3	3.8	2	5.2
Average number of eggs per set.....	3.8		3.6	
Total number of eggs laid.....	301		142	
Number of young hatched.....	228	75.7	86	60.6
Eggs failing to hatch.....	73	24.3	56	39.4
a. Infertile or addled.....	29	9.7	10	7.0
b. Destroyed before hatching.....	44	14.6	46	32.4

BEGINNING AND DURATION OF THE INCUBATION PERIOD

The beginning of incubation varied from the time the first until the third egg was laid, but in most cases began with the deposition of the second egg (Table 2).

In some clutches each of the eggs hatched consecutively on the thirteenth day after they were laid, indicating that incubation had begun at the time the first egg was deposited and that the length of the incubation period in such instances was 12 days. The eggs of other clutches hatched consecutively in the order in which they were laid on the fourteenth day after being deposited, indicating that incubation



Figure 1. Nesting area of the Lakeview colony.

was begun in such clutches at the time the first egg was laid and that their incubation period was 13 days in length.

In those clutches where 2 eggs hatched the first day and each of the remaining ones on consecutive days, incubation was considered to have begun at the time the second egg was laid. When incubation began at the time the third egg was laid the first three eggs deposited all hatched the same day.

Although there was a definite tendency for all the eggs of the same clutch to require the same length of time for incubation, yet there were a few exceptions in which the eggs did not hatch with such regularity. In one particular set the first 2 eggs laid hatched after 12 days of incubation in the order in which they had been laid, but the third egg did not hatch until 2 days after the second, making its incubation

period 13 days in length. This delay may have been due to a sudden drop in the temperature of the air caused by a cold rain accompanied by wind during the twelfth day of incubation of this particular egg. This storm was not responsible, however, for another type of variation in which 2 eggs would hatch the second day after hatching began instead of the first. If incubation began at the time the first egg was deposited, in such cases, then, two of the eggs would have an incubation period of 13 days duration and the other two 12 days. If, on the other hand, incubation began at the time the second egg was laid, 3 of the eggs would have an incubation period of 12 days and the other one 13 days. Such irregularities occurred in only a very few nests and may have been due to differences in the degree of attentiveness of different females or of the same female at critical times during the incubation period, or possibly to the eggs not receiving identical incubation conditions in the nest.

From Table 2 it can be seen that incubation began before any of the clutches were completed and that there was a tendency for it to begin sooner, with respect to the time the eggs were laid, the smaller the clutches were, being delayed until the third egg was laid in only the 4- and 5-egg sets. Incubation began at the time the first eggs were deposited in all 2-egg sets.

In Table 3 are given detailed data concerning the length of the incubation periods for the different sized sets of eggs in each colony. These data include only sets in which all the eggs in the same set had the same incubation periods and indicate that there is no correlation between the size of the sets and the length of the incubation periods. In both colonies the majority of the sets had a 12-day incubation period, but the 2-egg sets were the only ones in which the incubation period was restricted to 12 days. When the data for all sets are combined it is found that 74.6 per cent of the eggs had a 12-day incubation period and 25.4 per cent of them a 13-day period.

There was a tendency for fewer of the eggs which hatched later in the season (June) to have a 12-day incubation period than those which hatched earlier (May). In the Provo River colony 86 per cent of the eggs which hatched in May had an incubation period of 12 days, whereas only 58.5 per cent of those which hatched in June hatched in 12 days. This phenomenon also occurred in the Lakeview colony in which 89.9 per cent of the eggs that hatched in May required only 12 days for incubation while only 51.4 per cent of those in June hatched in 12 days. The difference in the mean monthly temperatures for May and June would apparently be of little significance since it amounted to only 2.6° F. As has been shown by some investigations (the Oven-bird, Hann, 1937; Song Sparrow, Nice, 1937), there seems to be no correlation between the length of the incubation period, within the normal range for the species, and the time of year that incubation occurs.

TABLE 2
TIME OF BEGINNING INCUBATION

Size of set	3 Eggs						4 Eggs						5 Eggs											
	1st Egg		2nd Egg		3rd Egg		1st Egg		2nd Egg		3rd Egg		2nd Egg		3rd Egg									
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%								
	No.		Per Cent		No.		Per Cent		No.		Per Cent		No.		Per Cent									
Beginning of incubation	4		66.7		2		33.3		15		33.3		25		55.6		5		11.1		0		0	
Provo River.....	1		50.0		1		50.0		4		23.5		12		70.6		1		5.9		1		50.0	
Lakeview.....	5		62.5		3		37.5		19		30.6		37		59.7		6		9.7		1		25.0	
Total.....	24		32.3		43		58.1		7		9.6													
Beginning of incubation in all sets	First Egg						Second Egg						Third Egg											
	No.		Per Cent		No.		Per Cent		No.		Per Cent		No.		Per Cent									
	24		32.3		43		58.1		7		9.6													

TABLE 3
LENGTH OF INCUBATION PERIODS

Size of sets	2-egg				3-egg				4-egg				5-egg															
	12 day		13 day		12 day		13 day		12 day		13 day		12 day		13 day													
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%												
	No.		Per Cent		No.		Per Cent		No.		Per Cent		No.		Per Cent													
Provo River colony	1		100		4		66.7		2		33.3		30		76.9		9		23.1		2		66.7		1		33.3	
Sets of eggs.....	1		100		1		50.0		1		50.0		13		72.2		5		27.8		1		100		0		0	
Lakeview colony	2		100		5		62.5		3		37.5		43		75.4		14		24.6		3		75.0		1		25.0	
Sets of eggs.....	2		100		5		62.5		3		37.5		43		75.4		14		24.6		3		75.0		1		25.0	
Both colonies.....	2		100		5		62.5		3		37.5		43		75.4		14		24.6		3		75.0		1		25.0	

However with the European Wren (*Troglodytes t. troglodytes*) Kluijver et. al. (1940) found that the average incubation period in April lasted 17.5 days, in May 16.3 days, in June 15.3 and July 14.5. Although there is no obvious reason why a higher percentage of the eggs hatched in May should have a 12-day incubation period than those which hatched in June, it is possible that this is the result of the incubation rhythm and attentiveness of the females being more constant and regular during the earlier part of the nesting season.

ATTENTIVENESS AND INATTENTIVENESS

The females were found to do all the incubating of the eggs, not assisted by the males in any way. This seems to be characteristic of many members of the Icteridae, occurring in the Red-wings (Allen, 1914); the Tri-colored Blackbird (Lack and Emlen, 1939); the Boat-tailed Grackle (McIlhenny, 1937); and the Eastern Meadowlark, (Saunders, in letter), Bobolinks, and orioles.

In many of the Icteridae sexual dimorphism in regard to size is very marked, especially in such birds as the Boat-tailed Grackle and the Yellow-headed Blackbird. This larger size of the males may be an important factor in preventing them from occupying nests constructed by the smaller females and consequently only large enough to accommodate themselves. Polygamy may also play a part in discouraging the males from attempting to aid their several female mates with incubating activities.

During the incubation period the females divided their time between alternating attentive periods (on) and inattentive periods (off) the nest. The length of these periods was determined by observing individual females from a blind, timing them as they left and came back to the nest. These periods were found to vary in length with different females and with the same female during different parts of the day and during different parts of the incubation period. Unfortunately hourly temperatures were not recorded during the periods of observation and consequently no information can be presented relative to the possible effects of temperature changes on the length of the attentive and inattentive period. Daily mean temperatures were recorded but there seems to be no correlation between them and the nesting rhythm of the birds concerned. With Song Sparrows (Nice, 1937) and Oven-birds (Hann, 1937) it was found that the cooler the weather, the shorter the inattentive periods.

The periods of inattentiveness were more uniform in length than were the periods of attentiveness, having a range of one to 18 minutes, whereas the periods of attentiveness ranged from one to 41 minutes in length. The average length of the attentive periods for all females observed was 9.1 minutes, whereas the average length of the inattentive

periods was 5.4 minutes. During more than 80 hours of observation the females spent an average 63.9 per cent of their time on their nests and 36.1 per cent off (Table 4).

TABLE 4
INATTENTIVENESS

Nest No.	Stage of incubation	Time of observation	Mean temp.	Periods per hour	Aver. length (minutes)	Range (minutes)	Per cent of time off nest
39	4th day	6:30 a.m.-6:36 p.m.	57.8	3.3	6.4	2-18	34.5
43	4th day	10:09 a.m.-7:00 p.m.	58.0	3.6	5.8	2-9	31.5
43	8th day	4:42 a.m.-8:00 p.m.	68.0	3.3	6.0	2-12	32.4
35	8th day	9:23 a.m.-6:22 p.m.	55.5	3.8	5.8	2-11	39.9
41	10th day	2:52 p.m.-8:00 p.m.	60.5	4.3	6.5	1-13	46.9
42	11th day	3:09 p.m.-8:00 p.m.	60.0	5.0	5.3	2-15	39.8
42	12th day	5:47 a.m.-8:00 p.m.	71.5	5.2	3.8	1-9	31.0
41	12th day	5:45 a.m.-7:52 p.m.	70.0	5.5	3.5	1-16	33.0
Grand Average				4.3	5.4		36.1

The amount of time spent on the nest varies in different passerine species as well as in the same species during different times of the day. When the percentage of time spent on the nest by the Yellow-headed Blackbird is compared with recent studies of several other species (Table 5), it is found that it is rather low, the Song Thrush being the only bird with a lower percentage of attentiveness.

TABLE 5
PER CENT OF TIME SPENT ON NEST BY VARIOUS PASSERINE SPECIES

Species	Reference	Period of observation	Average per cent of time on nest
Song Thrush..... (<i>Turdus philomelus</i>)	Bussman (1933)	7 hours, 40 min.	58.7
Yellow-headed Blackbird..... (<i>Xanthocephalus xanthocephalus</i>)	Fautin	83 hours, 23 min.	63.9
Hedge Sparrow..... (<i>Prunella m. modularis</i>)	Steinfatt (1938)	2 all day periods	66.4
European Nuthatch..... (<i>Sitta europea homeyeri</i>)	Steinfatt (1938)	11 hours, 17 min.	73.0
Song Sparrow..... (<i>Melospiza melodia</i>)	Nice (1937)	92 hours	76.5
Chiffchaff..... (<i>Phylloscopus collybita</i>)	Steinfatt (1938)	33 hours	77.5
Oven-bird..... (<i>Seiurus aurocapillus</i>)	Hann (1939)	4 all day periods	82.5
Marsh Tit..... (<i>Parus p. palustris</i>)	Steinfatt (1938)	12 hours	84.0

At the time the eggs began to hatch the females become more nervous and there was a tendency for the range in both the attentive and inattentive periods to become greater (Figure 2). Because of this difference in the behavior of the females before and at the time hatching began, the data concerning the length of the periods of attentiveness and inattentiveness during these two stages of the incubation period are considered separately. The average length of the periods of attentiveness was greatest at the beginning of the day followed by a gradual decrease during the morning hours, which seems to be correlated with the feeding activities, until about 11:00 A.M., when the length of the periods begin to increase again until about 2:00 P.M., after which time they again decrease in duration reaching a second low point about 5:00 P.M. when the females were again doing most of their feeding (Figure 2). Although the females did some feeding throughout the day, feeding

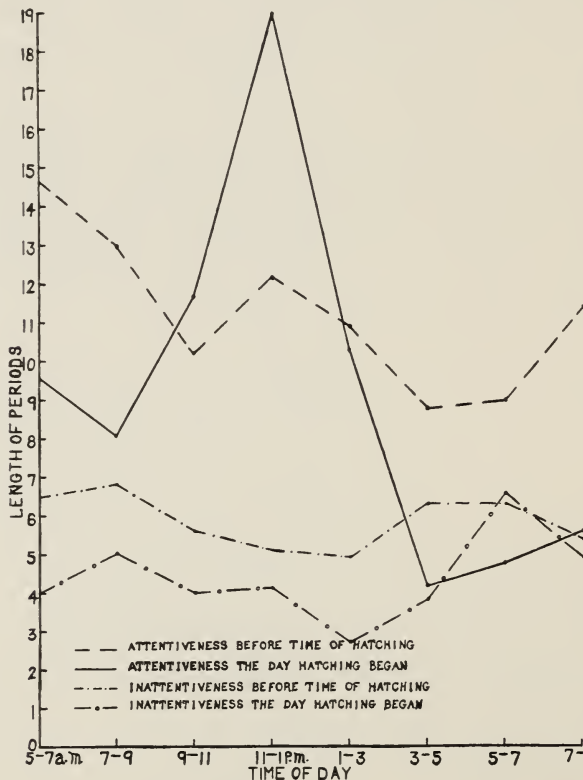


FIGURE 2. Average length in minutes of the periods of attentiveness and inattentiveness at two-hour intervals throughout the day prior to hatching and the days that hatching began.

was most in evidence during the morning and evening hours. After 7:00 P.M. there was a marked increase in the length of the periods of attentiveness with the beginning of nightfall and a drop in the temperature of the air.

The day that hatching began, the general trend of the attentive periods was similar to what it had been prior to that time, but the variations in range tended to increase, the average length of the periods varying from 4.2 minutes in the evening to 19 minutes for the 11:00 to 1:00 interval, and amounted to 26 minutes in the case of one female. This increase during the middle of the day seems to be a response on the part of the female to protect her eggs from the direct rays of the sun during that part of the day. The nest of the Yellow-headed Blackbird is of the open type and is attached to the upright stalks of vegetation which afford very little protection to the contents of the nest especially during the middle of the day when the sun is directly overhead. At the time of hatching the need of protecting the newly-hatched young from the heat of the sun may be even greater than in the case of the eggs as shown by the response of the female in increasing the length of the periods spent at the nest during that time (Figure 2).

The periods of inattentiveness were much shorter than the periods of attentiveness and their range of variation throughout the day was less. The average length of these periods was considerably reduced at the time hatching began, but prior to the time of hatching and at the time hatching began there was the same general trend in the length of these periods, which was somewhat the reciprocal of the periods of attentiveness, being longest in the morning and evening, when the birds were doing most of their feeding, and shortest during the middle of the day when the eggs and young were being protected from the heat of the sun.

The average duration of both periods was reduced 2.4 minutes after the eggs began to hatch (Table 5), but the greatest percentage of reduction occurred in the periods of attentiveness. Prior to the time of hatching the average length of the inattentive periods was 60 per cent as long as the average for the attentive periods, whereas after hatching

TABLE 6
ATTENTIVENESS AND INATTENTIVENESS IN RELATION TO THE TIME OF HATCHING

	Hours of observa- tion	Ave. length of periods in minutes	Ave. No. periods per hour	Total No. of periods	Per cent of total time
Before hatching began					
a. Attentiveness. . . .	55.2	10.0	3.8	205	62.5
b. Inattentiveness. . .		6.0		205	37.5
First day of hatching					
a. Attentiveness. . . .	28.5	7.6	5.3	142	68.0
b. Inattentiveness. . .		3.6		141	32.0

began it amounted to only 47.4 per cent. The amount of time spent on the nest was thus increased from 62.5 per cent prior to the time of hatching to 68.0 per cent at the time that hatching began.

BEHAVIOR OF FEMALES

The females seldom flew directly to their nests but would alight in the vegetation about 5 or 6 feet away and then make their way through the vegetation to the nest, each female approaching her nest from some one particular direction.

Just before leaving their nests the females would always emit a series of chirps and while off their nests they spent most of their time feeding. During the middle of the day this feeding was primarily confined to the vegetation of the nesting area and around the margin of the marsh, but during the morning and evening feeding periods they sometimes fed outside the nesting area, going to the adjacent fields and pastures.

The incubating females were very easily disturbed and were seldom found on their nests unless they were observed from a blind. When their nests were being visited they would usually leave very silently before the investigator was near enough to witness their departure. However, they exhibited considerable individuality and two particular females strongly resented the presence of the writer each time their nests were approached. None of them would hesitate to drive an intruding bird, of their own species or a different species, away if their nests were approached too closely. The females exercised dominion over a small area immediately around their nests, but failed to recognize the boundaries of the male's territory in which they nested (Fautin, 1940). The emitting of an alarm call by one of the members of the colony would also cause them to leave their nests and fly to the assistance of the one that had sounded the alarm. Such cooperative behavior was witnessed on several occasions. On one occasion, when an American Bittern (*Botaurus lentiginosus*) visited the marsh, it was so severely attacked that it could not escape by flight and crawled down among the dead bulrush stems to avoid the onslaught until the confusion subsided and part of the Yellow-heads had retired from the scene of the conflict.

BEHAVIOR OF THE MALES

Although the males did not assist in the incubation of the eggs, they were usually stationed in their respective territories and on guard to prevent the intrusion of any trespassers. They were very cooperative whenever an intruder visited the colony and entered into the conflicts described above jointly with the females. After such conflicts had subsided they would retire to their respective territories and reassert their territorial intolerance for each other (Fautin, 1940). Whenever the nests were being investigated, the males were very hesitant about leaving and would often sit near the nest and chirp. Such behavior was

frequently used to a good advantage in locating new nests during the early part of the nesting season.

The males were never observed to call the females from their nests. There was no evidence that they assisted the females in any way during the incubation period except to prevent the intrusion of trespassers.

No yearling males remained in the areas within which the nesting colonies were situated, although they were present during migration and in the adjacent vicinity. A flock of 28 females and 59 first-year males were located May 7 in the tamarix about one-half mile south of the Provo River colony. This flock remained in that area until the nesting season was practically over and by May 16 had increased to 225 or 250 members of which more than half were yearling males. The habitat occupied by this non-breeding flock was very similar to that of the Provo River colony, and nesting conditions were apparently just as favorable, yet none of these birds nested. Since no yearling males occurred in either of the breeding colonies and were not found breeding elsewhere, it is very probable that they do not breed until the second year as in the case of the Boat-tailed Grackle (McIlhenny, 1937:277). Although the yearling males were more numerous in the non-breeding flock, the females outnumbered the males in the breeding colonies about 3 or 4 to 1, which would make it appear as if the yearling females may breed even though the yearling males do not.

INTERRUPTIONS IN INCUBATING ACTIVITIES

Twenty-nine or 24.6 per cent of the completed sets of eggs were destroyed or disappeared from the nests before the time of hatching. The causes of these interruptions were extremely varied and some of them were never determined. Windstorms accompanied by rain were responsible for the destruction of most of the destroyed nests. The action of the wind caused the nests to be torn from their moorings or so loosened them that eventually one side would give way causing the nest to tip over and the contents to roll out. The bottom of one nest was apparently not strong enough to support the weight of the female and broke through, allowing the contents to drop into the water. Another became infested with small black ants which the female attempted to eradicate and in so doing she tore out the bottom of the nest. Two females were recorded as deserting their nests but they may have been killed, for they disappeared from the colony. One female was taken from her nest by a predator of some sort, the nest and supporting vegetation being showered with her feathers. Mashed egg shells were found in the bottoms of 2 nests in the Lakeview colony although the nests remained intact. The eggs from 11 other nests suddenly disappeared, leaving no evidence of their fate. The cause of these last types of interruptions was never determined, although it was evidently the work of an animal of some kind. Similar interruptions have been reported by T. S. Roberts (1909) and Linsdale (1938).

SUCCESS AND FAILURE IN HATCHING

One hundred and twenty-nine eggs, or 29.1 per cent of all the eggs laid, failed to hatch, with the result that 314 young were hatched from a total of 443 eggs (Table 1). Of this number, 90 or 20.3 per cent were destroyed or disappeared from the nests before the time of hatching. The other 8.8 per cent failed to hatch because of being infertile or addled. The percentages given for infertile and addled eggs in Table 1 are based on the total number of eggs laid, but since some eggs were destroyed before the time of hatching these percentages do not represent the true rate of occurrence of addling and infertility. If only those eggs are considered which occurred in undisturbed sets the percentages for addling and infertility become 11.7 and 10.4 per cent in the Provo River and Lakeview colonies respectively.

The number of eggs failing to hatch in undisturbed nests in May was much lower than the ones which were laid later and which were due to hatch in June. During the month of May no more than one egg failed to hatch in any one set in either colony, whereas in June two eggs failed to hatch in one three-egg set, one four-egg set, and one five-egg set; and 3 eggs failed to hatch in one four-egg set. Only 2 eggs failed to hatch in one set of 3 eggs during the month of June in the Lakeview colony, while in all other sets no more than one egg failed to hatch in any one set.

When the hatching success attained by these colonies (Table 1) is compared with that of other species, given in the following table, it

TABLE 7
HATCHING SUCCESS

Species	Reference	Number of eggs	Young hatched	
			No.	Per cent
Red-winged Blackbird.....	Williams, 1940	214	156	73.0
Yellow-headed Blackbird.....	Fautin	443	314	70.9
Oven-bird.....	Hann, 1937	161	102	63.4
Song Sparrow.....	Nice, 1937	854	510	59.7
Yellow-headed Blackbird.....	Roberts, 1909	123	55	45.8

will be seen that the success attained in the Provo colony (75.7 per cent) is greater than that of any of these other studies, approximating that of the Red-winged Blackbird (Williams, 1940). The success attained in the Lakeview colony (60.6 per cent) is about the same as that of the Song Sparrow (Nice, 1937) and a little lower than that of the Oven-bird (Hann, 1937). However, it is much higher than that of the colony of "Yellow-heads" studied by T. S. Roberts (1909) in Minnesota. Predation was evidently abnormally high in the colony studied by

Roberts since all of the progeny of the colony were eventually destroyed. Nice (1937:143) has compiled the data from six studies of passerine birds that nest in the open in which 1,225 young were hatched from 1,994 eggs, thus giving a nesting success of 61.4 per cent.

The Provo River colony, being situated on the edge of Utah Lake, was subjected to much more wind than the Lakeview colony and the tamarix and willows being tall and slender were often vigorously whipped back and forth with the result that nests were sometimes completely destroyed or torn loose from their moorings and the contents tipped out into the water. The nests of the Lakeview colony were not subjected to this sort of damage because the vegetation was more dense, the nests were placed nearer the water, and the wind movement was not so great. During one storm 4 nests were completely destroyed and 7 others torn loose and tipped over in the Provo River colony, whereas only one nest was damaged in the Lakeview colony. In spite of the fact that the nests of the Lakeview colony were better protected from the hazards of wind and storm, the hatching success in this colony was 15 per cent less than in the Provo River colony. The per cent of addled and infertile eggs was much the same in both colonies but the per cent of eggs destroyed, principally by predation, in the Lakeview colony was more than double that of the Provo River colony (Table 1).

The size of the colony has been found by Darling (1938) to affect the nesting success of the colonial-nesting Lesser Black-backed and Herring Gulls. He advances the idea that the social interactions and relation of the members of the colony has a cumulative stimulating effect on the reproductive functions of the members which speeds up the breeding cycle and thus shortens the nesting period in the larger colonies. The interval of time during which predation of eggs and nestlings can occur is thus reduced and the chances for a higher degree of nesting success being attained are increased. The occurrence of a greater number of available predatees, in the case of the larger colonies, would also tend to reduce the total percentage taken by predators during that time and thus contribute to a higher degree of nesting success.

The nesting period of the smaller Lakeview colony was about two weeks longer than that of the Provo River colony and consequently afforded a longer period for predation to occur, which may have contributed to the smaller degree of nesting success. Whether or not the longer nesting period of the Lakeview colony, in comparison with that of the Provo River colony, was due to a lesser degree of functional reproductive stimulation in keeping with "Darling's Principle" or whether it was merely coincidence, is a controversial matter and is in need of further study. Social stimulation during the breeding cycle probably varies in its importance in different species because Brian Roberts (1940) has found in his study of the breeding habits of penguins that there was no evidence of a minimum threshold number of

birds necessary to enable them to complete the reproductive cycle; that egg-laying began no earlier in the larger colonies than the smaller ones; and that ovulation was not restricted to a shorter period of time in the larger colonies.

DISCUSSION

The period from the day that the last egg is laid until the first egg hatches is often the interval of time used in determining the length of the incubation period for a particular species of bird. This interval of time is used on the assumption that incubation is not begun until the last egg is laid and is not valid unless such has been shown to be the case. Such an assumption is not always true because many birds begin incubating their eggs before the clutch is completed. Consequently the time that each egg is laid and the time that it hatches must be known before the length of the incubation period can be accurately determined, otherwise it will appear to be considerably shorter than it really is.

T. S. Roberts first (1909) gave the incubation period of the Yellow-headed Blackbird as 10 days, stating that from the time the last eggs were deposited until the first ones hatched varied from 9 to 11 days, being 12 days in one case. He points out that the eggs hatched very irregularly, in some cases 2 eggs hatching the first day and then one each consecutive day, while in other sets only one egg hatched each day. An analysis of Roberts' nesting records, taking into consideration the sequence in which the eggs of each set hatched, indicates that the incubation period of these birds is 12 to 13 days in length and that incubation was usually begun at the time the first or second egg was deposited, being delayed until the third egg in only one set. Roberts later evidently recognized this error because in his "Birds of Minnesota" (1932, vol. 2:297) he gives the incubation period as 12 to 14 days.

The length of the incubation period of most members of the family Icteridae ranges from 11 to 14 days, being 11 or 12 days in the Red-winged Blackbird (Allen, 1914); 11 to 14 days in the Cowbird (Nice, 1937; and Hann, 1937); 14 days in the Boat-tailed Grackle (McIlhenny, 1937) and the Eastern Meadowlark (Saunders, in letter) and about 11 days in the Tri-colored Blackbird (Lack and Emlen, 1939). It is to be expected therefore that the incubation period of the Yellow-headed Blackbird would fall within this range.

SUMMARY

The nesting activities of two colonies of Yellow-headed Blackbirds, located in the vicinity of Utah Lake west of Provo, Utah, were studied from April to mid-September. Eighty-three females nested in the Provo River colony and 40 in the Lakeview colony.

Egg-laying began May 7 and 61.8 per cent of the females laid their first egg within one day after the completion of the nest. The number

of eggs per set varied from 2 to 5, with 4 the most common number (68.1 per cent).

The females were not assisted by the males in any way in the incubation of the eggs, 56.6 per cent of them beginning incubation at the time the second egg was laid, with a tendency for the beginning of incubation to be delayed longer the larger the clutch. The length of the incubation period varied from 12 to 13 days, 74.6 per cent of the eggs hatching in 12 days.

The attentive periods during incubation ranged in length from one to 41 minutes, with an average of 9.1 minutes. These periods were longest during mid-day when the females were seemingly protecting their eggs from the sun. During 83 hours of observation the females spent an average of 63.9 per cent of their time on the nest, with a range from 53.1 to 69 per cent.

The inattentive periods ranged in length from one to 18 minutes, with an average of 5.4 minutes. These periods tended to be longest during the morning and evening hours when feeding was most intensive.

The hatching success of the larger Provo River colony amounted to 75.7 per cent, while that of the smaller Lakeview colony was only 60.6 per cent, giving an average of 70.9 per cent for the two. Wind and predation were responsible for the destruction of 90 (20.3 per cent) of the eggs before the time of hatching, and 39 (8.8 per cent) failed to hatch because of being addled or infertile. The lesser degree of nesting success of the Lakeview colony was due to a greater amount of predation which in turn may have been the result of a more prolonged nesting season.

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GENERAL NOTES

Great Blue Heron Spearing Fish.—On March 14, 1939, our party which included Maurice Brooks and Robert Patterson, had stopped to observe a group of water-fowl feeding in a small pond along the Huron River in Wayne County, Michigan. On the opposite shore we saw a Great Blue Heron (*Ardea herodias herodias*) strike into the water to catch a 9 to 10 inch fish. The heron carried the wriggling fish, which appeared to be a bullhead, between its mandibles while walking to the bank. Here the bird laid the fish down on the ground, poised motionless for a few seconds and then, using his closed beak as a spear, drove it through the fish. The bird shook the fish off and again poised erectly above it. A second swift thrust and the fish was speared again.

In all the bird speared the fish four times and at the end of the fourth time adeptly transferred the fish between its mandibles and swallowed it. The bird seemed to have difficulty swallowing so large a fish. He immersed his bill in the water and seemed to regurgitate something only to swallow it again. For the next five minutes the bird took little sips of water about every 15 seconds, and meanwhile visible contractions of the throat indicated he was trying to swallow. At the end of this time the bird assumed the familiar erect feeding position. He did not however do any more feeding but flew away out of sight.—JOHN L. GEORGE, *Department of Zoology, University of Michigan, Ann Arbor, Michigan.*

Prairie Falcon at Oberlin, Ohio.—On September 20, 1940, Lloyd Hugo Heidgard, an Oberlin College student, captured a Prairie Falcon (*Falco mexicanus*) that had become entangled in a wire chicken fence in Oberlin. He kept it on leash for some days, and succeeded in teaching it to be unafraid of him, but was not able to get it to eat enough to keep it in good condition, so he sent it to Bear Mountain (New York) Trailside Museum. It escaped from there and has not been heard from since, although Director Kenneth H. Carr offered a reward for its return.—LYNDS JONES, *352 West College Street, Oberlin, Ohio.*

Note on the Courtship of the Black-necked Stilt.—The nonmusical, monotone cry of the Black-necked Stilt (*Himantopus mexicanus*) has an insistent quality which compels attention when the call is often repeated. Late one afternoon in early April the reiterated *kwa, kwa, kwa* of more than one Stilt led me along the Gulf beach of Sanibel Island, through a tangle of saw grass to a hidden pool of brackish water some two hundred feet inland. Although my approach was not especially careful, the two pairs of Stilts which had appropriated this pond seemed unaware of my presence as I sat upon a tussock of grass at the edge of the pool. The four birds were close together and the members of each pair were attentive to one another as they stood face to face in the shallow water about two feet apart, bowing, fluttering wings and frequently half leaping—half flying a few feet upward into the air. After a few moments of this charming play, one bird—probably the male, though sex is indistinguishable at a distance—executed a flying leap over the back of his partner and with incredible swiftness kicked up a shower of spray, using the feet alternately. The shower bath seemed to give pleasure to the courted bird and immediately the two faced about and commenced a repetition of the bowing, wing-fluttering, leaping, and sprinkling.

Presently, quite suddenly and synchronously, all four birds flew steeply upward to a considerable height where they remained for some time flying together in wide circles, giving utterance to their loud, sharp call. Gradually their arc of flight narrowed and quite abruptly the four birds spiralled downward to alight in the shallow water and begin anew the same ritual of bow, flutter, leap, spray.

This sequence was repeated again and again during the hour and a half I sat upon the grassy tussock. The Stilts took no note of my presence nor departure and until late in the night their continued cries told that the courtship was prolonged by the light of the moon.—LOUISE M. PERRY, *Sanibel, Florida*.

Where is the Marbled Murrelet in Early Summer?—During field work in 1940 at Sitka, Alaska, which involved almost daily trips on salt water, several observations were made on the little-known Marbled Murrelet (*Brachyramphus marmoratus*).

This species was seen occasionally from February 28 on throughout the spring. By April 26 they were invariably seen in pairs; by May 2 they were common in the upper parts of Sitka Sound; from then on a few birds were seen daily until May 22. From May 22 until June 21 no Marbled Murrelets were seen. After June 21 they were noted commonly until September 10, when I left town. On July 19, 24, and 25 adults were seen carrying fish, presumably for their young, over salt water towards the mainland of Baranof Island.

During July, while working as a nightwatchman, I saw and heard murrelets flying inland just after sundown and out to sea about dawn each morning. The first juvenile noted was collected, on Sitka Bay, August 24.—J. DAN WEBSTER, 2381 Thornton Avenue, Newark, California.

Winter Association of Pairs of Ground Doves in Florida.—During a series of quail trapping and banding studies conducted on the University of Florida Conservation Reserve at Welaka, Florida, a number of trapping records were obtained of the Eastern Ground Dove (*Columbigallina passerina passerina*). Among these records are several that seem to indicate that Ground Doves may remain mated through the winter. In addition I observed during the winter many instances of the apparent attachment of one member of a pair to the other. This, as well as the very common winter field observation of two of these doves together, supports the evidence obtained by trapping.

The captures of the two pairs of birds that best illustrate this association of apparently mated doves are discussed below. Unless otherwise stated, all of the birds were caught in the Stoddard "standard" quail trap, and no other doves were taken with these pairs in any of the instances cited.

On August 21, 1939, a pair of Ground Doves were captured after they had entered a large wire enclosure. On January 20, 1940, these birds were again taken together, this time in a trap 350 yards from the scene of their first capture. The most conclusive records are those of a pair that were trapped together three times: October 25, 1939; December 8, 1939; and January 11, 1940. Between the October and December trappings the pair had moved a mile—the greatest movement that was shown in the numerous recaptures of banded Ground Doves throughout the winter.

The breeding season of the Ground Dove extends from February to October (A. H. Howell, "Florida Bird Life," 1932:282), although Oscar E. Baynard (*Oologist*, 26, 1909:5) reports finding eggs in every month of the year.—O. EARLE FRYE, JR., *Department of Biology, University of Florida, Gainesville, Florida*.

Utah Bird Records.—A number of bird specimens which provide new state records, verifications, or changes in previously published records have accumulated at Dixie Junior College. With the exception of the Ring-necked Duck, all specimens discussed in this note were identified by Dr. Clarence Cottam and Dr. H. C. Oberholser of the Fish and Wildlife Service, Washington, D.C.

A Pacific Loon (*Gavia arctica pacifica*) was found dead beside U. S. Highway 91 about one mile south of Beaver, Beaver County, Utah on October 18, 1940, by Mr. Lee Kay of the Utah State Fish and Game Department. He gave it to Mr. A. A. Paxman of the Woodward High School of Saint George who very kindly presented it to Dixie College for preservation. This seems to be a new state record.

The Yellow Warbler (*Dendroica aestiva*) of this region was listed by Vasco M. Tanner (*Condor*, 29, 1927:199) and by me (Ross Hardy and Harold G. Higgins, *Proc. Utah Acad. Sci., Arts, and Letters*, 17, 1940:95-111) as the race *sonorana*. Seven specimens from Washington and Juab counties, including both transients and breeding birds, have been identified as *morcomi* by Dr. Oberholser.

Two specimens of vireo reported (Hardy and Higgins, *loc. cit.*) as *Vireo belli pusillus* should probably be listed as *V. b. arizonae*. The oriole listed as *Icterus cucullatus sennetti* is *I. c. nelsoni*. Neither of these two forms has been previously reported from Utah.

Two races of Audubon Warbler migrate through Saint George. Specimens of *Dendroica auduboni auduboni* were taken April 12, 1936; March 8, 1940; and March 25, 1940 at Saint George. Specimens of *Dendroica auduboni memorabilis* were taken at Saint George, March 8, 1940 from the same flock as *D. a. auduboni*. Additional specimens of *memorabilis* were obtained at Saint George, March 27, 1940 and at Cabin Valley in the Pine Valley Mountains, Washington County, June 3, 1939 and June 15, 1940. The species evidently nests in the latter area. Another specimen was taken near Navajo Lake in Kane County August 19, 1939, while yet another was obtained at Sunnyside, Carbon County, October 12, 1935. The race *memorabilis* was previously reported by S. B. Benson (*Univ. Calif. Publ. Zool.*, 40, 1935:445) for Navajo Mountain in San Juan County.

A male Gray Vireo (*Vireo vicinior*) taken June 29, 1940, in the Beaverdam Mountains of Washington County is not typical but may represent a case of symmetrical albinism as its two outer tail feathers are white.

Specimens of the following races of Washington County birds were also examined:

Anthony Green Heron (*Butorides virescens anthonyi*).—Saint George, Washington County, September 17, 1936.

Western Least Bittern (*Ixobrychus exilis hesperis*).—Saint George, May 20, 1938.

Texas Nighthawk (*Chordeiles acutipennis texensis*).—Three specimens from Washington County in May, 1940.

Mountain Chickadee (*Penthestes gambeli gambeli*).—Five specimens from Carbon, Kane and Washington counties.

Lead-colored Bush-tit (*Psaltriparus minimus plumbeus*).—Sunnyside, Carbon County, December 17, 1935; and Beaverdam Mountains, Washington County, March 9, 1940.

Rocky Mountain Nuthatch (*Sitta carolinensis nelsoni*).—Sunnyside, Carbon County, November 22, 1935; and Pine Valley Mountains, Washington County, June 13, 1940.

Western Yellow-throat (*Geothlypis trichas occidentalis*).—Ten specimens from Juab and Washington counties.

Dwarf Cowbird (*Molothrus ater obscurus*).—Four specimens were taken at Saint George: April 26, 1940; May 7, 1939; May 15, 1940 and May 16, 1940.

Nevada Cowbird (*Molothrus ater artemisiae*).—A male was taken at Saint George, May 14, 1940.

A Ring-necked Duck (*Nyroca collaris*) was taken at Ivins Reservoir in Washington County by Harold Higgins on April 20, 1940. Numerous observations of this species in the spring of 1941, as well as in 1940, seem to indicate that it is somewhat more common in Utah than has been previously supposed.—ROSS HARDY, *Dixie Junior College, Saint George, Utah.*

Number of Contour Feathers in the English Sparrow.—In 1936 Alexander Wetmore published an account (*Auk*, 53: 159-69) of a study made on the number of contour feathers on certain birds. The work interested me greatly and I intended to accept the suggestion he gave to follow some common species throughout the year. Various circumstances have prevented the completion of the problem but it seems desirable to place on record what observations were made.

The English Sparrow (*Passer domesticus*) was selected. The results are tabulated below. Wetmore's single specimen of the English Sparrow is also included. The methods employed were much the same as Wetmore's. All the specimens were collected in the vicinity of Ann Arbor. Before plucking the feathers, notes were made on the condition of the plumage and measurements taken of the wing and tail. The sex of the bird was determined by dissection after completion of the feather counting. The feathers were counted in lots of fifty. Only the contour feathers were counted, the downs and filoplumes were not included.

The disparity between Wetmore's results and mine became evident at the completion of the first specimen. Unable to explain this difference, I felt that perhaps I had been counting many down feathers. On specimen No. 3 special care was given to every feather that was downy in nature. All doubtful feathers were examined under a microscope to determine accurately their nature. I found that there were very few down feathers on the bird. When I removed only those feathers that actually formed a part of the external covering of the bird, an underlying layer of fluffy feathers was left. These downy feathers were structurally contour feathers. The number of these feathers was far too small to account for the difference between Dr. Wetmore's results and mine. On specimen No. 3 these underlying feathers numbered 211 out of the total of 3615.

In a letter commenting on the differences in our results, Dr. Wetmore stated: "I remember the single male English sparrow that I plucked very well indeed. It was an adult in very worn dress taken here during hot weather. The small number of feathers impressed me at the time, and I have gone back again to the original record for this specimen to verify the total as indicated in the *Auk*. I hesitated to include the record with the others but finally put it in."

Despite the fact that his specimen was unusual in the small number of feathers, it is quite evident that the difference between our results is due to some other cause. It would be interesting to know if others have done work of this kind.

There was not much individual variation in the specimens that were counted at the same time of the year. The three mid-winter birds, Nos. 3, 4, and 5, had totals of 3546, 3615, and 3557 respectively, and the variation between the two extremes was 69. It is interesting to note the differences between the two birds collected in July (Nos. 7 and 8). The adult male had 20 pin feathers but exten-

DATA OF INDIVIDUALS COUNTED

No.	Sex	Date	Total number of feathers
1	♂ im.	16 Nov. 1936	3352
2	♂ im.	28 Nov. 1936	3514
3	♀ ad.	10 Jan. 1937	3546
4	♂ ad.	10 Jan. 1937	3615
5	♂ ad.	20 Feb. 1937	3557
6	♀ ad.	12 Mar. 1937	3515
7	♂ ad.	5 July 1937	3138
8	? im.	5 July 1937	3179
*	♂	2 July 1933	1359

* Wetmore's specimen.

sive molting had not started. The immature bird had no pin feathers. The totals for the two birds are surprisingly similar. The adult male had 3138 feathers and

the immature bird had 3179 feathers. Comparing the two summer birds with the three mid-winter birds, it is noted that a loss of 11.5 per cent has taken place. A gradual seasonal change is indicated by the November and March specimens.—ARTHUR E. STAEBLER, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

Does the Southern Hairy Woodpecker Occur in Oklahoma?—The Hairy Woodpecker, *Dryobates villosus*, occurs throughout Oklahoma save in the treeless "Dust Bowl" section. In the extreme northwestern Panhandle (the Black Mesa country) it is represented by a western race, probably *D. v. monticola* Anthony. (Two specimens taken near Kenton, Cimarron County appear to be intermediate between *monticola* and *leucothorectis*. See G. M. Sutton, *Annals Carnegie Museum*, 24, 1934:23). Here it inhabits the juniper- and pinyon-sprinkled mountainsides, rarely, if ever, descending to the cottonwoods of the bottomlands.

So effective a barrier is the treeless Panhandle plain that the species has nowhere invaded the Black Mesa country from the east, hence there is no zone of intergradation between *monticola* and any eastern subspecies. But throughout the main body of the state, to the very edge of the Dust Bowl, the Hairy Woodpecker is to be found. The senior author has encountered it repeatedly in Greer, Beckham, Roger Mills, Ellis, and Harper counties, and he is convinced that it ranges westward and southward wherever there is good tree-growth to and across the Texas state line.

Now to what race the Hairy Woodpeckers of the main body of the state belong? Mrs. Nice, in her useful "Birds of Oklahoma" (*Publ. Univ. Okla. Biol. Surv.*, 3, No. 1, 1931) lists two subspecies, *D. v. villosus*, "the breeding form of central Oklahoma"; and *D. v. audubonii*, a "resident in eastern Oklahoma."

During the course of the senior author's investigation of Oklahoma birdlife in 1936 and 1937 five Hairy Woodpeckers (four adult males and one juvenile male) were collected in the main body of the state. All these prove to be *villosus*. Not one of them tends to be small or dark. The most significant individual of the series, an adult from Broken Bow, McCurtain County, in the extreme southeastern corner of the State, is large even for *villosus*, the wing measuring 121 mm. (Ridgway's average for twenty-five male *villosus* is 120.4), and the bill 32.5 (the extreme in Ridgway's series is 33). Among eighteen adult male *villosus* in the Cornell University collection (from New York, New Jersey, and western Virginia) only one is as long-billed as this McCurtain County bird.

Determined to ascertain whether *audubonii* has actually ever been taken in Oklahoma, the authors borrowed from the University of Oklahoma Museum of Zoology their entire series of *Dryobates villosus*, six specimens, four of them adults, and all but one with data. The only bird in the lot marked *audubonii*, a young male taken July 1, 1923, in McCurtain County, is subspecifically unidentifiable. It is blunter-billed than the adult male from the same region, of course—that is to be expected in so young a bird. The only other specimen in the series that might conceivably be called *audubonii* is a smallish, short-billed female wholly without data. Among the comparative material at hand are four fresh topotypical *D. v. audubonii*, collected by Mr. Herbert L. Stoddard in the Thomasville region of Georgia.

As a result of finding (a) that the only breeding McCurtain County specimens available is *villosus* and (b) that the McCurtain County *audubonii* specimen listed by Mrs. Nice is a racially unidentifiable young bird, the authors are forced

to conclude that *Dryobates villosus audubonii* has not yet actually been taken in Oklahoma and that it therefore has no right on that state's list of birds at present.

Measurements, in millimeters, of Oklahoma

Dryobates villosus:

MALES						
Number	Age	County	Culmen	Wing	Tail	
C. U. 6436	Adult	Ellis	32	122	69	
C. U. 6437	Juv.	Ellis	28	114	70	
C. U. 6438	Adult	Noble	33	118	60	(worn)
C. U. 6440	Adult	Murray	32	118	67	
C. U. 6439	Adult	McCurtain	32.5	121	72	
U. O. M. Z. 5704	Juv.	McCurtain	30	118	66	
U. O. M. Z. 3279	Juv.	Pottawatomie	26.5	115	65	
U. O. M. Z. 5502	Adult	Cleveland	34	116	72	
FEMALES						
U. O. M. Z. 5500	Adult	Cleveland	30	119	73	
U. O. M. Z. 5507	Juv. (?)	Cleveland	29	116	69	

—GEORGE MIKSCH SUTTON and ERNEST P. EDWARDS, *Department of Zoology, Cornell University, Ithaca, New York.*

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

- Ralph Beebe—2 books, 6 pamphlets, 11 mimeographed publications.
- P. L. Errington—4 reprints.
- Horace Groskin—1 reprint.
- Lynds Jones—13 reprints, 23 magazines.
- Amelia R. Laskey—1 reprint.
- Fred J. Pierce—3 pamphlets.
- Evelyn J. Schneider—1 mimeographed volume.
- Thomas G. Scott—4 reprints, 3 mimeographed reports.
- L. L. Snyder—1 pamphlet.
- Dayton Stoner—1 reprint, 1 bulletin.

EDITORIAL

There still seems to be some misapprehension among Wilson Club members in regard to the significance of the several classes of membership. To make the matter quite clear we may say that only in the case of Honorary Members does the Club make any attempt to recognize achievement in ornithology or service to the organization. The other classes of membership simply give the bird student who appreciates particularly the work of our Club a chance to give it stronger backing to the extent that he is able. A number of our members have already generously increased their membership this year, thus strengthening our organization and enlarging the scope of its work. We hope that other members planning help in this way will write to our Treasurer in time for him to make the necessary correction in the complete membership list which is to be published in the September *Bulletin*.

We have had such an enthusiastic response to our suggestion in the March *Bulletin* that we propose to begin in an early issue publishing information on current research projects in ornithology. In the beginning at least, we should like to emphasize the more extended studies of single species. We now solicit such information. Please include all studies not yet published but do not report projects which are merely planned or barely begun. For the information of the Editor only, please indicate when the work was begun.

OBITUARY

CLAUD B. TICEHURST, noted British ornithologist and editor of *The Ibis*, died on February 17, 1941. His early work was mainly concerned with British birds but showed a remarkable breadth and originality. Following his service in India during the World War, he published extensively on European and African birds and became a leading authority on the birds of British India.

ELMER T. JUDD of Cando, North Dakota, died on February 27, 1941. Mr. Judd worked in the field on North Dakota birds with Louis B. Bishop, William Hoyt, Arthur C. Bent, Norman A. Wood, and others and was himself an authority on the birds of the state.

ORNITHOLOGICAL NEWS

The Wildlife Society has made its annual award for the outstanding paper of the year 1940 to Dr. Paul L. Errington, Mrs. Frances Hamerstrom and F. N. Hamerstrom, Jr., for their research bulletin on "The Great Horned Owl and Its Prey in North Central United States." The award is in the nature of an engrossed scroll and a citation in *The Journal of Wildlife Management*. (*Science*, 93, April 11, 1941: 346).

C. Gordon Fredine, formerly game and fish consultant with the Minnesota Department of Conservation, has been appointed Assistant Professor of Wildlife Management at Purdue University where he will be engaged in research upon wildlife problems.

Maurice Brooks will teach this summer at the University of Minnesota Biological Station at Itasca Park.

S. Morris Pell has been appointed manager of the Huron Mountain Club, west of Marquette, Michigan.

The Boston Society of Natural History announces that original, unpublished essays on any subject in the field of ornithology are eligible for the Walker Prize competition for 1942. For details apply to the Secretary, 234 Berkeley Street, Boston, Massachusetts, after August 15, 1941. Manuscripts are due on May 1, 1942.

WILDLIFE CONSERVATION

Recent Federal Reports on Wildlife Conservation

Two reports of major importance on the progress of wildlife conservation in the United States have been published recently. These reports are (1) "The Status of Wildlife in the United States, Report of the Special Committee on the Conservation of Wildlife Resources," Senate Report No. 1203, 76th Congress, 3rd Session (Gov. Printing Office, Wash., 1940: 457 pp., 74 pls.) and (2) "Conservation of Wildlife, Hearings Before the Select Committee on Conservation of Wildlife Resources," House of Representatives, 76th Congress, 3rd Session (Gov. Printing Office, Wash., 1940: 429 pp., map). These reports present a comprehensive picture of what is being done and what needs to be done for wildlife in the United States.

The outstanding element in both publications is the emphasis placed on the importance of obtaining wildlife conservation on farm land. The Senate Report includes a list and discussion of subjects investigated by the Senate Wildlife Committee, the legislation enacted since the organization of the Committee, and the text of federal laws relating to the protection of wildlife. Reports on the wildlife programs of the eleven federal agencies make up the bulk of the publication.

Under the heading "Future Needs of the Conservation Program," in the report of the Biological Survey, it is stated:

"The most pressing need in the national movement to restore the Nation's wildlife resources is an effective means of reaching the owners and users of land to advise them of the many relatively simple and inexpensive practices which will restore environment conducive to increased wildlife populations."

"Wildlife is an organic resource, a product of the soil, inseparable from the land. It must depend on the land for its nourishment, its protection, and its very existence. On the other hand, the earth must have its protective cover of trees, shrubs, and grasses to check erosion and to return organic substances to the soil."

"Fortunately, practices designed to encourage wildlife production invariably conserve soil and water resources and build back some of the fertility wasted through unwise agricultural practices." . . .

E. G. Holt of the Soil Conservation Service pointed out a similar approach in his report, as follows:

"Eighty-five percent of the land of the United States is used for agricultural purposes, including grazing. Eighty-five percent of all hunting takes place on agricultural land, and on it 70 percent of the wild fur crop is caught by farm boys. Obviously, the pattern of use developed on agricultural land is of paramount importance to wildlife, and it is clear that unless plans for wildlife are developed as part of the plans for agriculture, most wildlife produced in the country will be largely accidental."

What has been emphasized for game conservation in these reports is true largely for all forms of wildlife. To facilitate the carrying out of conservation activities on farm land, an extension program for wildlife is advocated by the Biological Survey in their report.

The report to the House of Representatives includes the testimony of the various government agencies dealing with wildlife, relative to what they are doing and what needs to be done. In addition, testimony of State Game and Fish Commissioners from twenty-two states was presented.

Included in the hearings was a report of fundamental importance in wildlife conservation upon which any sound plan for future programs dealing with private land must be based. This report is the result of a joint study made by the Bureau of Biological Survey and the Bureau of Agricultural Economics, entitled "An Economic Study of Wildlife as a Supplementary Farm Enterprise." It is no doubt the most thorough analysis of the wildlife conservation problem as it

relates to private land that has ever been presented. A few highlights from the report follow:

"Under present conditions of agricultural utilization of land and of wildlife production and utilization, there is little or no opportunity for farmers on good land to make wildlife a profitable supplementary farm enterprise, because farmers on such land are finding that producing wildlife on a sustained yield basis and allowing outsiders to harvest it costs them more than hunters and trappers are willing to pay for hunting and trapping privileges. However, when esthetic and recreational aspects are considered, properly controlled wildlife production and utilization can be made worth while on most farm land as it assists in making the farm and community a better place to live and it can often make use of otherwise waste land." . . .

"Although wildlife continually acts as a check on insect and rodent pests and is known to have helped in repelling pest outbreaks locally, it seldom acts as a complete control of a pest on farm land." . . .

"All of this would indicate that *the chief values of wildlife* to the community, state, or federal government* are its contributions as a foundation for various industries, its stimulus to business, and its contribution in providing esthetic, recreational, and social outlets for the people and *not its direct monetary return to the individuals or to the state*. Its chief value to the individual, whether farmer, hunter, or businessman, is the stimulus it gives his business by attracting people to his community and the esthetic, recreational, and social enjoyment he gets out of it." . . .

"The retirement of submarginal farm land by public purchase will not greatly increase wildlife or the opportunities for its enjoyment for the nation as a whole, because the use made of submarginal land in farms is generally much better than average for wildlife production and utilization, while the grazing, recreational, and residential uses to which much of the retired submarginal farm land is expected to be put in certain areas are adverse to wildlife and its utilization." . . .

". . . The wildlife user must become willing to pay an increased amount for his use of wildlife and the farmer must be willing to accept a large part of his remuneration for his efforts on behalf of wildlife in the form of such intangibles as recreational, aesthetic, and social enjoyment."

"The study indicates the need for a scientific, coordinated conservation program that will integrate wildlife production and utilization into all land-use and soil-conservation programs; and for recognizing the rights of the individual landowner as well as the rights of the wildlife user in all wildlife conservation programs."—Charles A. Dambach.

Pole-traps

The Oregon Cooperative Wildlife Research Unit has publicly advocated pole-trapping of "The great horned owl and hawks" in the interest of game management, with the further comment that "*If* padded jaws are used and the traps are tended regularly, beneficial birds can be released unhurt*" (see p. 11 of "Suggestions on Management of Small Game in Oregon," Arthur S. Einerson, *Ore. Exper. Sta. Circ.*, 140. Jan., 1941).

The latter quotation permits the clear inference that any concern for "beneficial birds" is secondary, an inexcusable slip. The whole treatment of raptor control shows a complete disregard of any interest in wildlife other than the hunters', and of the trends of modern studies of predation. One may disagree with the interpretations of the results of these studies, but no serious treatment of predation can afford to ignore them. It is unfortunate that this circular, published primarily for people with little knowledge of the complexities of predation, should so thoroughly do so; it is a reflection on its sponsors that a blanket recommendation of pole-trapping is given instead.—F. N. H.

WILDLIFE CONSERVATION COMMITTEE,
Frederick N. Hamerstrom, Jr., Chairman

* Italics by the reviewer.

ORNITHOLOGICAL LITERATURE

COURTSHIP AND DISPLAY AMONG BIRDS. By C. R. Stonor. Country Life, Ltd., London. 1940: $5\frac{1}{2} \times 8\frac{3}{4}$ in., xvi + 144 pp., 57 pls. 8s. 6d.

In this handsome volume the author, writing from an intimate acquaintance with birds in the Zoological Gardens at Whipsnade and with a background of work in the British Museum of Natural History, besides a wide field experience, gives us minute descriptions of many spectacular and typical displays used by birds in courtship and in combat, with discussion of the principles involved. Mr. Stonor takes the view that most display, though it may be used in fighting, had its origin in its value for courtship purposes. He brings out clearly the three main types of display—that of male before female (or in certain families the reverse state of things of the female wearing and displaying the ornaments); that of mutual display of the two sexes, sometimes with the male playing the leading part and sometimes with absolute parity between male and female; and, thirdly, communal display, such as prevails with the Ruff and the Prairie Chicken. In mutual display the sexes are dressed alike or nearly so, while in the other two types one sex, usually the male, wears the ornaments. The use of special display grounds is also discussed at some length, with detailed descriptions of the courts of the Manakins, the mounds of the Lyre Bird, and the bowers of the various species of Bower Bird.

The descriptions of the displays, reinforced by a set of remarkable photographs largely taken at close range in the Zoological Gardens, show a surprising variety of methods, even in members of the same family. The displays of the Birds of Paradise, for instance, are almost incredibly varied, and each is correlated with the structure of the bird and the disposition and characters of its ornamentation. Where, as usual in this family, the body plumes are the most gorgeous, it is they that are most displayed, and the stiffer plumes of the Great Bird of Paradise are erected over the back, while the long and delicate plumes of the Lesser are arched back to form a drooping cascade of "indescribable grace" and the cobweb-like plumes of the Emperor of Germany's Bird spread a mist about their wearer as he hangs by his feet from the twig of a tree. These are a few of the many displays used by this remarkable family, and the well-known displays of many of the grouse are not less wonderful.

Though the author does not go quite so far as to insist that every peculiarity of plumage, color, and form is adaptive, he leaves the reader with the impression that in his opinion the vast majority have been preserved because of their value to the race; and, indeed, it is hard to disagree with him in view of the evidence he presents. The sexual selection argued in this book is sexual selection up to date—not the mistaken idea that the female is supposed to choose deliberately a male from among many that present themselves, not even the Darwinian theory pure and simple that the most attractive male inevitably attracted the most females, but the theory that, to follow the author in quoting F.H.A. Marshall, "It is the pair which have the highest capacity for mutual stimulation which are, so to speak, selected by Nature for the perpetuation of the race." After discussing hormones, endocrine glands, and the effect of visual images upon the pituitary, the author very pertinently adds, "This is far from shutting out altogether any aesthetic point of view; I for one find it impossible to believe that the harmony of colouring, the brilliance, and the beauty of ornament that so many birds show in their courtship can have been evolved merely because they happen to serve the right purpose, and without their owner or their recipient in the display being in the least conscious or appreciative of them."

Mr. Stonor cites some cases of display that appear to him to be purely for aggressive purposes. Among them he includes the head-shaking of the Ruffed Grouse in which the ruff is expanded. In this, of course, he follows Dr. A. A.

Allen, whose observation of captive birds led him to the conclusion that this display was a threat. Cleveland Grant, however, has shown us in a recent film a wild grouse using this display before a wild female that has approached his drumming-log, and it would seem that only a complete acceptance of the theory that all courtship is actually a matter of intimidation would admit the belief that that female would linger about there for the express purpose of being intimidated.

In treating of communal displays the author mentions the great variety of color and pattern in the ornamental plumes of the Ruff and shows that the females actually appear to select their mates from among the many that are gathered together. He also cites the suggestion that these striking ornaments and the habit of exhibiting them in assemblies may have been evolved for their effect as a mass of color like that of a flower-bed visible from a distance.

The probability that the use of display changes and develops from generation to generation needs emphasis. Everyone knows how such changes as the adoption of trees for roosting by the Rock Dove have come about within a comparatively few years; and Mr. Stonor mentions the belief on the part of some ornithologists that the Lyre Bird's display and care of its display mounds have outgrown their function as a part of the nesting cycle and have become largely recreational in character.

The author stresses the importance of concealing coloration as a factor to be considered when studying the development of display plumage. He even goes so far as to say, "Probably the greatest thing a bird is up against, the most vital and ever-pressing need of its whole existence, is that it must at all costs blend and tone in with its surroundings." Is it possible that the views of Abbott Thayer are at last coming into their own? The reviewer, who, though no blind follower of that extremist, long ago took occasion to ask for a respectful hearing for Mr. Thayer as an expert on color as it appears in nature, is glad to meet with this statement, exaggerated though it may be, and equally glad to see another statement with which Thayer might not have agreed—"But when it comes to courtship, it [the bird] is concerned with the very opposite—with the need for making itself as conspicuous as it possibly can to attract and stimulate a mate, and (probably with a separate ceremony) to drive off potential rivals." And again, still following Thayer, we have, "It seems beyond reasonable doubt that the greens of the Parrots, the bizarre colours of the Fruit Pigeons, the brilliance of the Kingfishers, are not there for use in courtship, and would appear to have concealment from enemies or (with the Kingfishers) prey as their most important object."

There is some discussion of the decisive factors in the development of display. Considering especially the Birds of Paradise, in which the most obvious ornaments throughout the family are the flank plumes, the author thinks that here form preceded function, though he finds the general opinion of ornithologists favoring the view that "it is the display which decides the evolution and development of its mechanism." It might be reasonable to suppose that the two developed concurrently and that neither one actually preceded the other.

This book was written for "the non-specialist interested in natural history and for ornithologists who have not had the time to go deeply into this branch of their subject." Ornithological readers will regret the absence of adequate bibliographical notes and will wish the author had made a point of naming his authority in all cases where he referred to a particular writer. It may be of *some* value to know that the behavior of certain manakins was described to him by a "traveller in Brazil" and that though it "sounds like a real 'traveller's tale,'" it is "confirmed by the independent account of a German naturalist," but the names might have added to the reader's confidence in the story. A minor criticism might be made of the use of the ambiguous word "pairing" when actual coition is really meant.

The book seems to deserve very well the hearty commendation given it by that distinguished ornithologist Mr. Percy R. Lowe in his Foreword.—Francis H. Allen.

ISLAND YEARS. By F. Fraser Darling. Illustrated from photographs by the author. Oxford Press, Toronto, 1940: 6 x 9 in., xii + 306 pp., 37 photos, 5 maps. \$3.00.

INAGUA. By Gilbert C. Klingel. Illustrated from photographs taken by the author. Dodd, Mead & Company, New York, 1940: 6 x 9 in., xii + 385 pp., 34 photos. \$3.00.

Life on an island holds a special appeal to the field worker, for not only is it an isolated unit in world biology, conveniently delimited and tangible, but its study has an adventuresome flavor that freshens the imagination. These truths, perennially acceptable, are in themselves good reason for the appearance of "Island Years" and "Inagua."

Ornithologists who recall Dr. Darling's splendid books, "Bird Flocks and the Breeding Cycle," "A Naturalist on Rona," and "Wild Country," will find his latest volume, "Island Years," particularly welcome. Here is the human story behind the obtainment of the subject matter of those books, the personal experiences of Dr. Darling, his wife and son, on the uninhabited Scottish islands: Eilean a'Chleirich, Lunga, and inaccessible North Rona. The purposes of the lengthy sojourns on these remote areas are explained briefly for the sake of the story value; the results achieved receive no special attention. And rightly so! Important among these pages are the ways in which the family confronted alone the restless elements, finding moments of great exhilaration and excitement alternating with times of disappointment and despair; numerous episodes such as the serio-comic lot of "Doormat" who, though "the lowliest member of a pack of scriddy hens" brought to Eilean a'Chleirich, performed many a "deed of valour" by being the only member of the flock with sufficient courage to ward off a Raven intruding upon the flock's food supply.

Great Inagua is the southeasternmost island of the Bahamas. Like the Scottish islands it is desolate and forbidding even though inhabited by a small group of dark-skinned natives. On a well-planned, personal, scientific expedition to the West Indies in a ship especially designed for the occasion, Gilbert Klingel unexpectedly landed on this island when his ship became hopelessly wrecked on its shores. Undaunted by this hair-raising and disastrous accident, he turned immediately to the study of the island's web of life and returned on a second expedition to continue it. "Inagua" is a popular account of the investigations conducted from the barren interior to the surrounding depths, sometimes by night, sometimes under glaring sun and against wearisome wind. Although the author's chief interests centered on the races and distribution of numerous lizards of the island, his story brooks no such limitations. Careful detailed descriptions abound; they are elegant, thoughtful, but never sentimental. Ornithologists will find their special interests gratified in many sections of the book, especially in the vivid account of a visit to a colony of Flamingoes numbering three thousand birds and the quest of the Roseate Spoonbills when vast multitudes of mosquitoes brought unendurable torture to the author.

Both of these books are to be strongly commended. Having read one, there is all the more reason for reading the other. Well written, decidedly personalized, entirely authoritative, beautifully illustrated by many thrilling photographs, comparisons between the rich biology of these two dissimilar environments and the differences in the authors' reflections and adjustments are very enjoyable and instructive. Dr. Darling and Gilbert Klingel are ecologically minded to a high degree reached by few popular authors to date.—O. S. Pettingill, Jr.

ORNITHOLOGY LABORATORY NOTEBOOK. By Arthur A. Allen. Comstock Publishing Co., Ithaca, N.Y., 1941: Fourth ed., $8\frac{1}{2}$ x 12 in., [viii] + 204 + 64 unnumbered pp., illus. \$3.00.

Most teachers of ornithology in the United States are doubtless familiar with previous editions of this laboratory notebook, and it is certain that the author himself is well known to students of birds. The present fourth edition is based in part upon the experience of thirty-five years of teaching ornithology at Cornell University. Its chief advance over the third edition lies in the inclusion of material on birds of other parts of the country than the eastern United States, thus making the book more widely applicable.

The notebook is well printed, with few typographical errors, on good quality, moderately heavy paper, and the covers are of heavy, tan-colored paper with cloth reinforcement on the back. Its size, $8\frac{1}{2}$ x 12 inches, is convenient for use in a standard looseleaf notebook if one wishes; indeed, some of the sheets are punched for such use. About four-fifths of the book is made up of pages on which the student fills in data obtained from field and laboratory observation of birds and from available literature. Five sets of outline drawings are to be labeled by the student, and so provide a basis for becoming acquainted with the topography of a bird, natural groups of feathers, parts of a feather, and the more important skeletal features. The two blank pages following furnish an opportunity to use this knowledge in sketching and discussing types of feathers and in writing a formal description of some particular bird.

Three good, though largely artificial, keys to all orders and families of birds occurring in the United States and to the nests of common species breeding in the eastern states are a feature of the notebook. All are well illustrated, by line drawings for the keys to the groups, and by excellent photographs of most of the types of nests for that key. Many of the nest photographs show eggs as well, and nearly all include some of the natural surroundings of the nest. For use with the keys to orders and families are several pages for recording the ordinal and familial names of birds identified in the keys. There is a list of the orders and families of North American birds, with blank lines for listing three diagnostic characteristics of each. Two pages provide captioned columns for recording the Latin and vernacular names of the birds previously identified to order and family.

A section is devoted to condensed statements of the winter and summer ranges of birds that have been found in the vicinity of Ithaca, New York. The addition of local dates and regularity of occurrence increases the value of this section for students in central New York. The reviewer feels that the title of the section, "Summer and Winter Ranges of North American Birds, including migration data for central New York" is somewhat misleading in its implied scope. This title, combined with the use of subspecific names and the non-detailed character of the statements of range, would lead most beginning students to think that other races and species do not occur in the eastern part of the country. For example, three races of Horned Lark are given because all have been found at Ithaca, but only one race each of Savannah Sparrow and Song Sparrow. An excellent feature of this section is the presence of accent marks on Latin names. This should prove of much help to students, who usually have difficulty with the pronunciation of these names.

The largest section in the notebook is a series of 100 "life history and identification charts." On each chart is captioned space for data on many features of species identified in the field. Included are places for notes on migration, habitat, habits, sounds, food, economic status, nest, recognition marks, plumages, and eggs. Each page bears a map of the larger land masses of the western hemisphere, which should be a great aid to the student in visualizing and learning distribution and migration routes after they have been indicated on the maps in color. Unfortu-

nately, the maps are Mercator projections, which makes difficult the comparison of size of ranges at different latitudes because of the exaggerated size of northern regions. Twenty-four checklists of species of eastern North America are intended for abbreviated records of information obtained on field trips. Extra spaces are provided at the bottom of each page for additional species.

Another large section comprises 188 fine outline drawings of 200 species of birds, mostly by Louis Agassiz Fuertes and William Montagna, for coloring by the student. Most of the figures are of eastern species, but kinds found in other parts of the country are included, and other figures are so generalized that they can be used for any one of several closely similar species in different regions. Several hawks are shown from the under side, thus bringing out clearly markings of value in field identification. In this connection, the reviewer feels that most beginning students would be saved considerable time by some indication of the kinds of characters most useful in field identification. The egg shapes shown at the end of the section would be more descriptively named, we think, if called ovoid, ellipsoidal, and pyriform, rather than "normal," "oval," and "pointed," respectively.

The notebook has been made more useful to bird students in the west and south by expanding the keys to include all North American families and orders, and by adding generalized drawings and drawings of additional species. Even so, numerous common species are omitted. Of western birds, for example, there are no drawings of Williamson and Red-breasted Sapsuckers, Townsend Warbler, Linnet, Cactus Wren, Evening Grosbeak, Green-backed and Lawrence Goldfinches, and others.

The main purposes of the notebook, as indicated in the preface, are to aid students in identifying birds and to introduce them to other phases of ornithology. For the first of these objectives, the notebook is, in general, well adapted. It seems to the reviewer, however, that certain phases of the latter might well be further emphasized by including exercises on such things as physiology, migration, social habits, habitat relations, song, and geographic variation. Some of these topics are included on the life history charts, but in such a way that there is collected a great mass of detailed information, from which only the exceptional student learns general principles and fundamental information. Specific exercises would provide a firm foundation on which detailed observations of individual species could be built. A few sentences might well be included to explain the concept of life zones, especially as a full-page, colored map of life zones in North and Central America forms the frontispiece, and life zones are used in most of the definitions of ranges. References to a few important books and papers on birds should prove helpful to a beginner.

For learning to identify birds and as a repository for detailed information on species seen in the field, the Ornithology Laboratory Notebook should be of value to many students and teachers in all parts of the country.—Frederick H. Test.

MODERN WILDERNESS. By William Arthur Babson. Illustrated with two paintings by Clifford R. Babson and photographs taken by Carl H. Lester, Jr., and others. Doubleday, Doran & Co., Inc., New York, 1940: 6 x 9 in., xix + 261 pp., 2 col. pl., 24 photos. \$3.00.

This book purports to be the story of a wildlife sanctuary—a strip of swamp and woodland in New Jersey bounded by civilization—where the author has made observations of the locality's many forms. But the book has unfortunately missed its mark, for it is no story at all. It is instead a hodgepodge of unrelated chapters showing wildlife—mainly birds—at the perpetual mercy of human interferences: young owls and crows being removed from nests, photographed and reared in captivity; Wood Duck eggs being transferred from natural nests to nests of

domestic hens; surplus jays and squirrels being "popped off" with a .410; innumerable visits to nests resulting in the terrified reactions of the birds in possession. In a few instances there are accounts of observations made after watchful hours but the interpretations of events seen are weak and of little significance. The author shows a knowledge of different species of birds but his references to other living things are couched in such vague terms as "small brown spider," and a "bee of some species smaller than a honey bee." The style of the writing is uneven and rambling; the humor is stilted and unnecessary.

The book is illustrated by two puerile paintings and numerous photographs. The majority of the photographs are either slightly out of focus, over enlarged, retouched, or too contrasty.

Altogether this book gives an impression which is not only unfavorable, but also distasteful.—O. S. Pettingill, Jr.

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Correction—We were very sorry to find that after we saw the last proof of the March *Bulletin* the printer inserted an erroneous line on page 54 of Ludlow Griscom's able book review. The line is the fourth line from the end of the first paragraph. Instead of, "their habitats . . ." it should read: "habitats, the Red-wing occurs in C only. The Lincoln's Sparrow is assigned to D"

REPORT OF THE AFFILIATIONS COMMITTEE, AS ADOPTED BY THE WILSON
ORNITHOLOGICAL CLUB AT THE 1940 ANNUAL MEETING

The Wilson Ornithological Club, at its meeting in Louisville, Kentucky, in November, 1939, appointed a committee to examine into the desirability of closer affiliations between the various ornithological organizations. After some consideration, this committee offers the following statement of policy:

1. The proper type of affiliation between the Wilson Club and other ornithological societies seems highly desirable, in that it is capable of offering certain advantages to each of the organizations involved.

2. Since the Wilson Club has become national and international in its membership, there seems to be no good reason why affiliation should be limited to societies in any particular region. Should any society of the proper scope and membership wish to affiliate with the Wilson Club, your committee favors placing the matter before the Council for action.

3. Affiliated societies should in general be at least state or province-wide in membership, and should be active in ornithological work. It is suggested that the four strong and active state societies already affiliated with the Wilson Club, namely the Tennessee Ornithological Society, the Nebraska Ornithologists' Union, the Kentucky Ornithological Society, and the Iowa Ornithologists' Union, be taken as examples of the type of organization with which affiliation would be desirable.

4. Affiliation should be carried out only when there is practical unanimity among the members of the affected organizations as to the desirability of such a step.

5. It is not the intention or desire of the Wilson Club to infringe upon any other ornithological group. Therefore, although affiliation will not be refused any organization of the proper scope and membership, groups affiliated with other national or international ornithological societies will not be urged to affiliate with the Wilson Club.

6. No financial consideration on the part of either organization should be involved in affiliation.

7. *The Wilson Bulletin* will be glad to exchange with the publications of affiliated societies. In addition, *The Wilson Bulletin* will publish as a service to affiliated organizations brief notices of their meetings, programs, field trips, and other activities. It is hoped that the journals of affiliated societies will perform a like service for the Wilson Club.

8. *The Wilson Bulletin* will serve as a possible organ for publication of the results of studies going forward within the affiliated societies, where the scope of these studies is too great for publication in the journals of local organizations.

9. Where it may be desirable, the Wilson Club will welcome the meetings of affiliated societies in connection with its own annual meetings. Separate sessions may be held as desired, but joint programs of great interest will be possible through such an arrangement.

10. Your committee believes that affiliations along the lines outlined above will result in much good to each of the organizations involved, will strengthen each of the organizations without any loss of individual entity, and will help to present a more nearly united front of those persons in the United States and Canada who are vitally interested in ornithology in particular, and in the broad problems of conservation as well.

Respectfully submitted,

A. F. GANIER

S. C. KENDEIGH

MYRON H. SWENK

MAURICE BROOKS, *Chairman.*

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.

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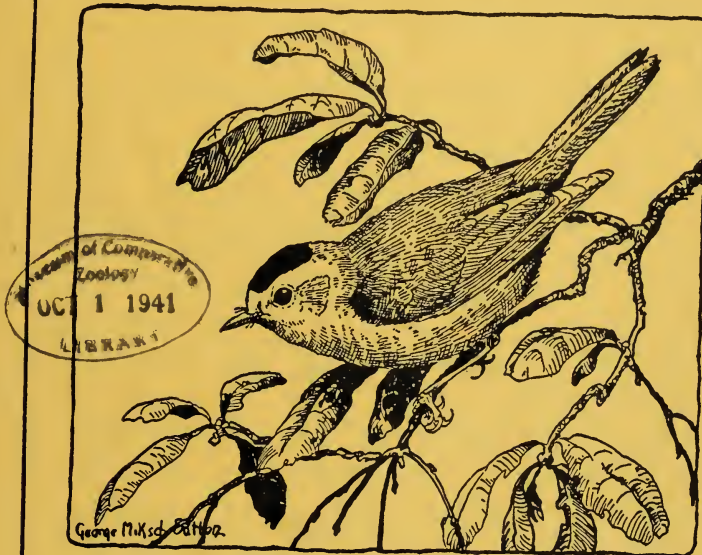
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THE WILSON ORNITHOLOGICAL CLUB

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

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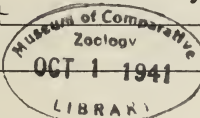
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THE BREEDING OF THE BLACK OYSTER-CATCHER

BY J. DAN WEBSTER

THE four thousand mile coast line along which the Black Oyster-catcher (*Haematopus bachmani*) ranges includes many very different types of country but the littoral marine invertebrate fauna of the exposed shores of this area is remarkably uniform (Webster, 1941). The Sitka region, where the present study was made, is one of high precipitation and mild, even temperature. High mountains (2,500 to 4,000 feet) front the Pacific Ocean, buttressed at their feet by rocky islands and capes. From sea level to 2,500 feet luxuriant coniferous forests clothe all in green.

Five pairs of Black Oyster-catchers nested on Kayak Island in 1940, and here a large part of the observations were made. Kayak Island (Figures 1 and 2) is actually a group of islands, of which all but the most southerly, "S E Rock," are united at low tide. The location is two miles southwest of the town of Sitka, in the eastern part of



Figure 1. Kayak Island from the east.

Sitka Sound. Although the dry-land size, according to the chart, is 160 by 460 yards, these dimensions must each be increased about 60 yards to express the size in calm weather at mean low water. On all sides the shores are precipitous and rocky. The invertebrate fauna of the wide seaward shore is chiefly the "association" of *Mitella polymerus*, *Pisaster ochraceus*, and *Mytilus californianus*. On the landward, eastern shore the vegetation grows down nearly to the high tide line. Here the littoral fauna is of the semi-exposed type—chiefly *Acmea scutum*, *Balanus glandula*, *Strongylocentrotus franciscanus*, and *Cribina xanthogrammica*. The vegetation of the island is a dense growth of shrubbery and conifers; around the borders, and all over barren S E Rock, hardy clusters of rock buttercups (*Potentilla villosa*) and a few grasses withstand occasional salt spray, in crannies of the basalt. The pinnacle of S E Rock is only twenty-five feet above mean low water; on this barren rock three pairs of Oyster-catchers and two pairs of Pigeon Guillemots (*Cepphus columba*) had their nests. The Guillemots and Oyster-catchers, however, completely ignored each other.

The Black Oyster-catcher's nest is usually (Dawson, 1923) of one of five types:

- (1) A platform or bowl of rock flakes in a cranny of the bare rock.
- (2) A hollow scraped from a soil pocket in an irregularity of the rock and lined with bits of shell and rock flakes. Later in the summer grass grows up around the nest (Figure 4). This type is particularly common as a play nest, built several days before egg laying.
- (3) A hollow scraped from weedy turf on a ledge several feet above spray line, and lined partially with rock flakes. One nest of this kind was found which had been dug through the shallow soil two inches to the ledge beneath, which formed a solid rock bottom on which the eggs lay.
- (4) A bowl of grass or dried moss, similar to a gull's nest.
- (5) A hollow scooped from unmodified beach gravel. Not found near Sitka.

The nest is built high enough to escape the flying spray of summer gales. This meant from 5 to 21 feet above mean high water—which was 7.7 feet above mean low water at Sitka—varying with the surf exposure of the site. The preferred site is the top of an isolated rock with no trees—only sparse vegetation. There is usually shelter from the prevailing winds.

The earliest and latest egg dates I recorded—a full clutch of four eggs on Kayak Island, May 9, 1940, and an egg hatching on Kayak Island on August 6 or 7, 1940—are beyond any recorded in literature, although Willett (1909) records a set taken May 14, "About half incubated." The eggs are deposited at intervals of from one to three days; incubation commences about one day after the deposition of the last egg. Of thirteen first sets examined, five consisted of two eggs

each, seven of three eggs each, and one of four eggs, an average of 2.69 eggs per clutch. Of three second sets, one consisted of one egg and two of two eggs each, an average of 1.67 eggs per clutch. Removal of eggs by Ravens (*Corvus corax*) did not stimulate the laying of additional eggs unless the entire clutch was stolen. Zerlang and Fraser (1940) report the finding of a five-egg clutch laid by a single hen. On S. E. Rock, the writer found that the territories (See figure 2) of two pairs

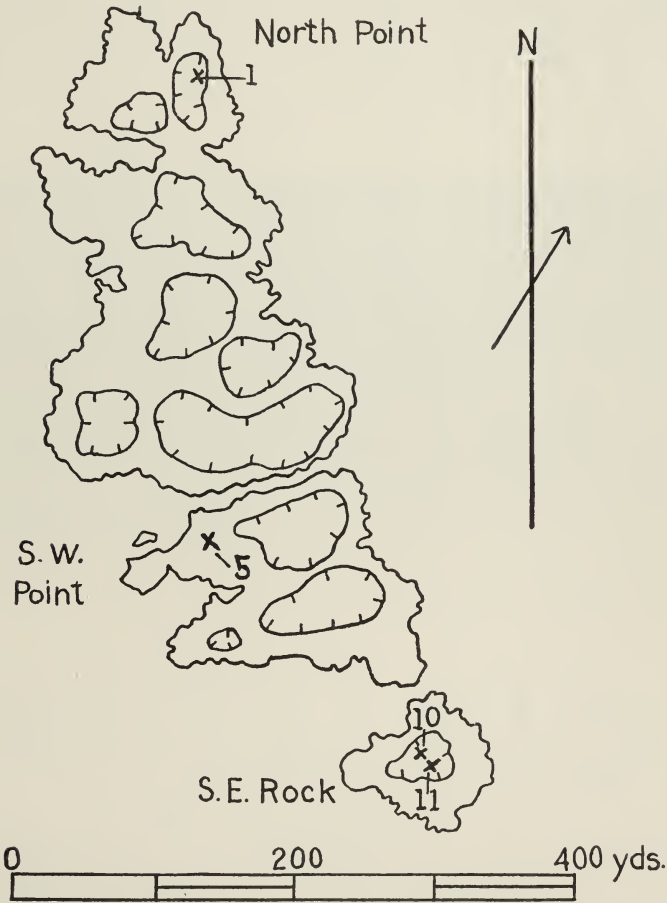


Figure 2. Kayak Island. The inner contour lines represent winter high tide line. Black Oyster-catcher nests are indicated by crosses.

of Oyster-catchers overlapped. The two hens laid in the same nest (Figure 4); one hen four eggs before May 9 and the other, evidently, two before May 17. Three of these occupying birds were shot by

poachers before observations could be made on incubation. The remaining bird (sex not known), belonging to the later-laying pair, incubated the eggs until they were destroyed on June 16.

The incubation period was observed to be 27 days in one case. Other determinations were: Not over 26 days; 26 or 27 days; 27 to 30 days. Dirksen (1932) found that the incubation period of the European Oyster-catcher (*Haematopus ostralegus*) varied from 25 to 34 days, averaging 27 days.

In winter Black Oyster-catchers are found in flocks of from two to more than fifty individuals. (The latter large flock—"over fifty birds"—was seen by George Willett at Sea Otter Harbor, Dall Island, South-eastern Alaska, in 1920. Personal communication). The Sitka Bay flock observed during 1940 ranged chiefly around the Indian River flats mussel beds and a group of rocky islets including The Twins and a headquarters rock nicknamed "Cormorant Rock." They bred over an area three miles square.

In early March there were twelve birds in the flock and several wandering pairs; definite territorial behavior was first noted in five pairs of Oyster-catchers on Kayak Island on March 22. From March 28 to April 26 there was a marked correlation between the height of the tide and the number of birds in the flocking territory. At low tide there were never more than four present; at high tide, no matter what the time of day, the number present was from six to ten. This shows a tendency in the present species like that noted in April in Holland by Huxley and Montague (1925). There the pairs of inland-breeding European Oyster-catchers gathered on the flocking grounds during the late afternoon, slept there, then went on the breeding territories during most of the day. But in the case of the Black Oyster-catcher, a marine species, the flocking period was at high tide.

By May this flock had been reduced, by the desertion of breeding birds, to two birds which were seen several times on or near Cormorant Rock throughout the summer; they usually fed on the Indian River mussel beds. They never showed territorial behavior as exhibited by nesting birds and I regarded them as non-breeding yearlings, although on May 7 they did perform a switch-back chase.

In mid June two other Oyster-catchers, evidently the pair which had deserted territory on the MacClelland Island, a mile away, joined the two on Cormorant Rock, and thus formed the carry-over from the previous winter's flock and the nucleus of the 1940-41 winter flock. These MacClelland Island birds may have been immatures—that is, Oyster-catchers in their second spring—because they established territory, built nests, but never laid eggs and abandoned their nesting place very early. Dirksen (1932) gives good proof that Oyster-catchers do not ordinarily breed until their third spring.

On July 25 the flock had increased to eight by the addition of more

unsuccessful nesters. At this time, however, many more birds, having lost their chicks, were wandering around in pairs and small flocks, sometimes reverting to their nesting territories, sometimes joining the main flock. By August 19 the flock consisted of all of the Oyster-catchers from the area, save for one very late nesting pair with their chick. This flock, consisting of twenty-two adults and two juveniles, was observed until September 5.

Piping was never observed in the flock during July or August, but it was noted during March and April. The flock's general schedule consisted of a period of resting and sleeping during high tide, crowded together on Cormorant Rock, then feeding, scattered out over a half-mile or so, on the rocks or flats on the latter part of the ebb and the



Figure 3. Flock of Black Oyster-catchers on Cormorant Rock at high tide. Note the two juveniles at the far right.

early part of the flood tide. When the Oyster-catchers had eaten their fill, they returned to Cormorant Rock to preen and sleep. An alarm when the flock was scattered soon brought them crowding together, in flight or on a single rock or point.

The actual territory claimed by each pair of Oyster-catchers varies considerably; as Buxton (1939) notes, tidally exposed rocks, which are particularly valuable for feeding, are included in the territory.

The bird not incubating sometimes flies to the distant feeding ground. In this case Indian River flats was a feeding ground for all birds within two and a half miles. However, as soon as the chicks are hatched this practice is discontinued and the bird not brooding or feeding the chicks remains within call. When the bird not incubating is not foraging, it stands on the lookout on some eminence of rock, at a distance of from five to twenty-five yards from the nest. This lookout

post is not invariably the same, but one place is used more often than any other by each pair of birds. Often this lookout post is the same spot used as a refuge when their nesting place is invaded. But the lookout position, it is noticeable, is never at a greater elevation than the nest, although such places are often available.

Behavior of Oyster-catchers when their nesting territory is invaded by man varies somewhat. Before the eggs hatch, a loud, shrill call is given continuously—*kee, kee, kee, kee*—while the birds stand on their refuge, or fly from the opposite side of the observer to the refuge and back. Often the birds attempt to lead the intruder away, running along in a semi-crouching position with the nape feathers raised and ruffled and the tail lowered (Shortt, 1939). Frequently an Oyster-catcher watches an observer from behind a rock, so that only part of the bird's head can be seen peeping over the rock. After the chicks are hatched the behavior of the parents differs in that a new call—*keek-a-keek, keek-a-keek*, or, *keek, keek, kee-akee-ooo*—is introduced, most often being given as the parents fly near the crouching chicks. In one case, however, —on the Eckholms,—a certain bird used this other call each time it was visited, even shortly after the eggs were laid. When the human invader has left and can be seen still going away at a distance of about 150 yards from the nest, the Oyster-catchers give an "All clear" piping ceremony—sometimes in unison, sometimes one alone. In the latter case the other bird, which is already approaching the nest or chicks, does not answer verbally, merely pecking the ground or bowing once. Occasionally this piping is reduced to a single note—an all clear call—which is the same as the opening note of a piping ceremony. This note, reiterated, is sometimes used by a lookout bird as it flies from one perch to another, apparently to tell its mate its location. It is lower in tone and less shrill in quality than the alarm call.

The Black Oyster-catcher is very bold in defense of its nest, intruding birds being attacked and struck until driven away. According to my observation a Raven steals eggs by watching from a nearby tree until both Oyster-catchers are away from the nest in a piping ceremony or chasing away a second Raven. The Raven then swoops suddenly down to the nest, spears an egg, and flies off with the booty. Bald Eagles are blamed for the loss of many chicks; Raven for the loss of nearly all eggs laid in certain areas. The following birds were noted being chased away from the nesting territory: Bald Eagle, Glaucous-winged Gull, Hudsonian Curlew, American Raven, and Northwestern Crow. Crows and gulls were tolerated on the feeding areas of the territory, but were driven off when they approached closer than twenty-five yards from the nest. Sparrows, guillemots, and small shore birds were ignored.

Other Oyster-catchers are sometimes driven off but more often are "bowed off" in a piping ceremony which is nearly always given on land.

In various circumstances, two or more Oyster-catchers standing near

each other point their bills vertically downward, opening them slightly, extend their necks, hunch their shoulders forward, and erect their nape feathers. A series of loud, high-pitched, sharp notes is given, *Kewik, kewik, kewik, kwik, kwik, kwik, kwirrr*, gradually becoming closer-spaced, then running into a trill which slowly dies out in intensity. During this time, the hunched-forward attitude is retained and the entire body is bobbed up and down.

Early in the spring piping ceremonies are frequent at the boundaries of territories, with four birds taking part. The most common piping ceremony observed was of three birds, when one extraneous bird entered the territory of a pair. Often this occurred while the observer was rowing away, and the previously alarmed pair, which had called a third bird over to join in hurling maledictions at the human intruder, edged the foreign Oyster-catcher away in a more or less extended bowing trio that replaced the usual "All clear" duet or solo. Soon the third bird flew off to his own territory. Following are the field notes of a case of this kind observed on Kayak Island on June 10, from a blind ten feet from nest 1 (See map):

E and F were the birds holding the nest near the blind. If Buxton [1939] was right in believing that only the hen clucks, then E was the cock, F the hen. A was the non-incubating bird from nest 5, 300 yards away.

3:10 P.M.—David* left the blind. At least two of the three eggs were pipped and the chicks were peeping. F was fifteen yards northwest of the nest with A; E was twenty-five yards southeast of the nest.

3:17—E flew to join A and F when David disappeared 250 yards to the south. F began piping, facing A, as E landed parallel to her and a few inches away. E immediately joined F in piping, the two bowing alternately, and walking, slowly, stiffly west, away from the nest. A postured and bowed, did not pipe, walked out of sight behind a boulder.

3:22—A flew off west. E and F flew to the lookout, twenty-five yards southeast of the nest.

3:24—F flew to a point below the nest, and fifteen yards east.

3:26—F rapidly flew and walked to the nest, crouched; fluffed feathers and wiggled for quite a while; the peeping of the chicks ceased.

3:35—E moved up to a point fifteen yards east of the nest, stared at the blind.

4:00—E left to join other oyster-catchers which could be heard giving the alarm call on the other end of the island.

4:07—E returned, landed ten yards north of the nest.

4:15—I made a loud noise in the blind, frightening F from the nest. As F landed beside him, E began bowing and the two gave a piping ceremony ten yards north of the nest.

Sometimes piping is given in flight by a group of four or more birds; in such case the bill is pointed straight downward, but the shoulder-hunching and bowing are absent. "When the piping is given in flight a peculiar form of flight is used; the flapping is swift but the forward progress is slow" (Buxton, 1939). According to Dirksen

* My brother David acted as assistant, helping me in many ways. Thanks are also extended to Dr. Arthur A. Allen and to countless other friends and councilors at Sitka and at Ithaca.

(1932), these piping flights do not begin until ten days before the eggs are laid, and disappear by the time the first eggs hatch. I observed this "flight piping" ("Flugbalz" of Dircksen, 1932) several times on Kayak Island. The piping birds circled the island, the lookout bird of each pair joining the group as it passed and flying with it. Usually the incubating bird pecked the ground, a sign of excitement; sometimes it left, to pipe with the others. Probably this performance is an expression of social excitement. One particularly noteworthy fact is that the larger the piping group, the longer the excitement lasts and the more intense the excitement appears (See Huxley and Montague, 1925).

Performances in which only two birds take part are common. Usually the ceremony begins when one bird, which has been at a distance, flies to its mate and lands beside it. The stationary bird begins piping as it watches its mate land, then both bow and pipe together. The ceremony is self-exhausting and afterward the birds resume their normal activities (i.e., preening, sleeping, feeding, or incubating).

Huxley and Montague (1925) observed a type of flight which they called "Butterfly flight"; Dircksen (1932) also observed this in May. It consisted of a lazy floating flight, with slow wingbeats of large amplitude. Never was this behavior seen at Sitka, nor was the "Flutter flight" of Dircksen observed. This latter involved wing movement of very small amplitude.

During May especially, Black Oyster-catchers frequently indulge in the "Switchback chase" described first by Huxley and Montague (1925). Two birds fly low over the water, one in close pursuit of the other. Now and again the pursued bird, followed by the other, rises into the air, skidding on to one side; then they side-slip diagonally down and continue their pursuit. Sometimes a mated pair indulges in this flight, although this is not common. On one occasion, July 12 on Mahknati Island, the female (proved by subsequent collection) of the invaded territory pursued an invader of an unknown sex (whose mate was also invading the territory) for a long time in a switchback chase. Finally, after a circular and figure-eight course of at least two miles had been traversed, the pursued bird landed on a rock one quarter mile distant. The pursuer landed with him, but very soon returned to her breeding territory. Soon after the other invading bird rejoined its mate. Incidentally, the male of the territory was dead, having been shot just before this episode.

Late in the summer (on August 6) a pair which was flying on a straight route between islands was noted to side-slip occasionally, as though partially reverting to the switchback chase of a few weeks before.

Coupling in oyster-catchers is peculiar in involving no special preliminary or subsequent ceremony. I observed the act only once—on March 22, 1940. The cock flew onto the hen's back from a distance,

half extended his wings for balance, and finally hopped off. The hen turned her head to look at the cock on her back. After the performance, neither of them having uttered an audible sound, both began preening and dozing as though nothing had occurred.

“As with so many birds, the oyster-catcher has the habit, in certain moments of excitement, of pecking at the ground, and at small straws on the ground in a curious, aimless and excited manner” (Huxley and Montague, 1925). On the nest this is particularly noticeable when the brooding bird is distrustful of the observer’s camera or blind; it nibbles and pecks at straws and blades of grass. Huxley and Montague noted pecking at the ground, “Occasionally, after the close of a piping performance; occasionally, after coition; occasionally, when males or pairs on adjoining territories were close to each other in a state of nervous tension. Nervous tension is also characterized by bobbing.” Bobbing, or bowing, is also a sympathetic action when a bird hears or sees other individuals at some distance in a true piping performance.

Despite a recent statement to the contrary (Lack, 1940), there is good evidence that oyster-catchers remain mated for life: (1) The writer has always observed Black Oyster-catchers segregated into pairs, even when flocking. This observation seems to check with those of other ornithologists, for example, Michael (1938). (2) Dirksen (1932) once saw a complicated offering ceremony, and once a fight between two cocks. The simple absence of other such observations indicates that the mating ceremony is so infrequent as to occur but once in the lifetime of each oyster-catcher. (3) Dirksen recorded a case in Germany in which a pair of banded oyster-catchers nested for seven successive years in the same spot.

During the ten days to two weeks preceding egg laying, Black Oyster-catchers usually build several “play nests,” which are in most cases inferior in construction to the nest finally used. Which sex does the actual work of carrying the rock flakes, often from a distance as great as fifty yards, is not known. On the single occasion when actual nest building was observed, the hen was arranging the nest just after deposition of the first egg, and the cock was feeding. At any rate, nearly always construction of the final nest is not begun until a very few hours before deposition of the first egg. The hen squats on the nest but a short time in deposition—not long enough to warm any other egg which may be present.

The nest lining (Buxton, 1939 and Dirksen, 1932) is added to in two ways. The brooding bird often absent-mindedly nibbles and arranges with its bill, and once in a while brings a decoration such as a rock or shell from a distance.

At the first alarm call from the lookout bird, the incubating bird rises, then flies on a circular course to join its mate. (See Dawson, 1923). Alarm calls from Oyster-catchers 300 or more yards away cause

the incubating bird to merely cock its head in interest, as it does when Crows caw angrily nearby. Incubation is not left to the heat of the sun, as I learned by long observation on one of the hottest days of the year (80°F.) at Sitka. The birds covered the eggs closely all day.

Observations of nest 5, Kayak Island, on May 30 from a point seventy-yards north of the nest show the schedule followed by the pair. In general, the lookout bird put its bill under its scapulars for a two or three minute period, looked about for five minutes or so, then put its bill under its scapulars again. Such observations are omitted below.

- 12:55—Both birds on S W Point, fifteen yards south of the nest as I walked to the blind; both gave a few alarm calls.
12:59—Both alert; A preened.
1:05—B gave a single all clear call.
1:06—B flew to a point of rock eight yards south of the nest.
1:08—B flew to the nest, squatted.
1:32—A looked up, walked a few feet nearer nest, to the regular lookout spot.
1:34—Two oyster-catchers piped on S E Rock; both A and B cocked their heads, listened; A pecked the ground.
1:55—A looked up, shook tail, preened, stood alert.
2:00—A flew down to the rock just north of S W point, which was just well clear of the receding tide, began feeding.
2:05—B looked up from the nest; A looked up every half minute or so while feeding.
2:16—A flew up, circled my blind twice, flew out of sight through the crevice to the east. B looked up from the nest.
2:20-2:22—Piping on S E Rock; presumably A had invaded territory.
2:23—A returned to S W Point from the south.
2:24—Eighteen minutes before low tide. B flew from the nest, flew 100 yards straight out to sea (southwest), turned, flew at an altitude of fifty feet back to S. W. Point, landed on the rock pinnacle six yards west of A; bowed and piped; A bowed but did not pipe.
2:26—A flew to twelve yards south of the nest.
2:27—A flew to the nest; B flew to Crevice Rock, stood alert.
2:29—A squatted; B flew to seventy-five yards north of the nest, landed near the water's edge, crouched on rock.
2:42—Tide at low point.
2:49—B flew north, soon returned with E (from nest 1); the two circled my blind, then flew back north, E leading.
2:51—B returned alone.
2:52—B resumed feeding.
2:55—B flew to the lookout spot on S W Point, walked around, shook its head.
3:10—B preened at length.
3:15—B walked to far side of S W Point, out of sight.
3:37—Piping on S E Rock—A looked up from the nest, pecked the ground.
3:41—B flew up, calling several times, circled the nest, landed eight yards south of the nest.
3:44—B put its bill under its scapulars.
3:59—I left.

On June 11 the changing-over of this pair was again observed. This time the incubating bird left the nest just four minutes after the

tide had turned and flew directly to a point near its mate on S W Point. Both bowed and piped; then, after two minutes of inactivity, the other bird began moving toward the nest. These cases, together with stomach analyses of specimens taken and the fact that many hours of observation at high and middle tides failed to record a change of incubating bird, have led to the formulation of the following theory: A pair of Black Oyster-catchers change places on the nest very near the time of



Figure 4. Nest 10, Kayak Island, with six eggs laid by two hens.

each low tide; that is, every twelve hours. Possibly this routine is changed if the birds are disturbed.

The parent Black Oyster-catchers are careful and anxious. During the first day or day and a half the chicks are brooded almost continuously; then for one week commonly; during the second and third weeks only when it is raining; after that not at all. The offer of cover includes a clucking note, similar to that given by the incubating bird as it squats down on the eggs. Whether both sexes cluck, however, is not certain. When there is danger near, the old birds give their special cry and the chicks crouch until the all clear signal is given.

Routine is the same as during incubation. One parent stands guard and feeds himself while the other feeds the chicks (and, probably, eats a little); then they change off at the turn of the tide and the second parent stands watch or eats while the first feeds the chicks. During high tide, one bird stands near the chicks or covers them and the other stands at some distance, usually at a greater elevation than its family.

Behavior of young European Oyster-catchers was analyzed in detail by Dewar (1920) and his work should be read for a full understanding of the progress of the young birds.



Figure 5. Black Oyster-catcher incubating.

By the third day the chick can run well and swim expertly; it can scramble over large obstacles, and fall from a veritable precipice without injury. The wings are frequently exercised until actual flight begins in the fifth week.

In a chick just out of the shell, with down still wet, crouching is readily induced but does not last long, and the chick struggles when seized. By the fourth day the chicks spread out at the parent alarm, and crouching persists even on handling. Toward the end of the second week crouching is maintained even in an inverted position, and may last for an hour and a half. The chick raises its head at this age when

the parents cease calling for a few seconds, if the danger is not visible, and then lays its bill on the rock again as the old bird flies overhead, calling loudly. In the fourth week crouching is often supplemented by hiding in vegetation, and in the seventh week tends to be replaced by flight.

Preening begins about the fifth day of the chick's life, and about the same time the bill, when soiled, is wiped on the plumage. In the fifth week the chick commences to rest on one foot and sleep with the bill under the scapulars.



Figure 6. Black Oyster-catcher one week old. Note the egg tooth.

Feeding begins on the second day, when food is brought by the parents to a point near the nest and offered in small fragments which are pointed out. The parents bring limpets and chitons and those mussels which are torn entire from the rock to the chick and clean them from the shell there. Barnacles, of course, are brought in the flesh. Disposition of mussels when the chick is not near the foraging place and the shells cannot be torn from their anchorage (See Webster, 1941.) is not certain. Probably most mussels opened by the foraging bird are eaten immediately rather than carried to the chick. It may be, however, that only mussels with the ventral border up are taken when the chick is not following, and those few can be opened, torn loose and cleaned near the chick. The chick does not follow the foraging parent until the

third to fifth week, depending on the difficulty of descent to the feeding areas. By the fifth day the chick picks insects off vegetation or rocks. At least by the thirtieth day it can neatly remove limpets and mussels from their shells—a complicated process; but chitons are too tough for it until the sixth week. In the fifth week the chick probes tentatively at the mussels, with little success; not until it is three or four months of age can it open mussels and barnacles rapidly and remove chitons and limpets from the rocks. Williams (1927) records adults obtaining food for young chicks as late as November 3.

Excitement or alarm are indicated from the sixth day onward by bobbing and tapping the ground. From the thirteenth day onward satisfaction is shown by sidewise wagging of the tail after feeding.

Observations of fledged chicks were few, but two banded young which had often been studied before fledging, were found again on August 10, at the age of 57 days, two miles from the nest. Dirksen (1932) and Buxton (1939) record a shift of territory as chicks move before learning to fly. The calls of these juveniles were at this time, as they continued for another month, more shrill than those of the adults, but they were given similarly—that is, a steady flow of alarm notes, which were run together in more rapid succession just as the bird took wing. The parents were much alarmed, but did not hover close to the young, one of which let the observer row within ten yards before flying. The juveniles' path of flight followed that of the parents. These two juveniles joined the flock at high tide as early as their sixty-seventh day, but held somewhat aloof (See figure 3). At low tide, of course, they followed their parents to be fed.

One juvenile was kept in captivity from her thirty-fifth day until her sixtieth. When mussels were opened several feet from her cage, she gave two or three squeaky, expectant calls. It was found that 120 large mussels per day were necessary for continued growth.

During spring and early summer of 1940, a census was made of the Black Oyster-catchers in eastern Sitka Sound, that is between Point of Shoals and Whitestone Narrows on the north and Kita Island on the south. There were found to be 26 non-breeding birds, presumably sub-adults, and 76 breeding birds defending territory. This is on a linear strip of about twenty-five miles. In early September a careful survey of ten miles of this strip, which had contained 62 Oyster-catchers, showed that they had for the most part gathered into flocks. One flock of 24 birds, including two juveniles, ranged around Cormorant Rock, The Twins, and Indian River flats. A second flock of 24 birds, including three juveniles, roamed the rocks and islets near Povorotni Point, seven miles south of Sitka. Further southwest, 10 birds, of which four were juveniles, occupied the rocks just northeast of Kita Island where they had bred. And on Kayak Island, one pair still had an

unfledged chick. The total was 51 birds in adult plumage and 10 juveniles. Four of the eleven missing birds had been collected by the writer; at least four had been shot by poachers.

With data on 84 pairs of nesting European Oyster-catchers on the island of Norderoog, in the North Sea, Dirksen (1932) calculated that the life expectancy of a fledged young is eight and three-fourths years. He trapped one breeding bird which had been banded as a juvenile on the island nineteen years before.

Figures obtained by the writer at Sitka give an average life span of about seven years by the same method, as follows:

Twenty-four breeding pairs raised ten young in one year.

A pair of adult birds would therefore, raise two young in five years.

Five plus two and three-fourths (the age at which the young first breed) equals seven and three-fourths years, average life span of fledged young. If two of the three juveniles collected had instead been fledged—a probable figure—then this life span would be six and three-fourths years.

Of the total of 133 museum specimens examined of Black Oyster-catchers more than four weeks of age, there were 68 females, 64 males, and one not sexed. This suggests a sex ratio of 1.06:1.00.

SUMMARY

The incubation period of the Black Oyster-catcher is usually 27 days. During the winter Oyster-catchers congregate in flocks which are scattered at low tide for feeding and crowded together at high tide for resting and sleeping. The breeding territory of a pair of Oyster-catchers contains important feeding places; it is defended from April to August. Both male and female incubate, changing places each low tide. The non-incubating bird, when not feeding, stands guard near the nest. The piping ceremony variously expresses sexual excitement, territorial jealousy, or social excitement. Pecking at the ground and bowing indicate nervous emotion. Parents caring for chicks exchange places each low tide; one cares for the chicks for twelve hours, then feeds and stands guard for twelve hours.

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NEWARK, CALIFORNIA

THE BELLIGERENCY OF THE KINGBIRD ¹

BY DAVID E. DAVIS

ANALYSIS of the aggressive, belligerent behavior of the Eastern Kingbird (*Tyrannus tyrannus*) should assist in the understanding of the psychology of territorialism. Territory in bird life as first conceived pertained solely to intraspecific fighting. The careful study of other species has clarified and in certain respects altered the concept. It is now becoming clear that, while there is a general pattern of behavior, each species manifests territorialism in a manner peculiar to that species. This paper describes and analyzes the manner in which the Kingbird shows territorialism and discusses this behavior in relation to the territorialism of other species.

The Kingbird is notorious for its habit of driving away other species and of pursuing predators. This behavior is interspecific; the behavior usually considered in papers on territory is intraspecific. A comparative study of many species indicates that fighting has at least two important motivations (Davis, 1940a). The defense of the sex-partner is one cause and the defense of the piece of land (nest site) is another. A third type of fighting which comes into prominence in the Kingbirds (Tyranninae) is the pursuit of predators. Other types of fighting are present in certain other species of birds. This classification of motivations holds for fish and lizards as well as for birds.

Belligerency is a widespread characteristic of this group of flycatchers. My observations in Cuba on *Tyrannus dominicensis* and *Tolmarchus caudifasciatus*, in British Guiana on *Pitangus sulphuratus*, and in Argentina on *Tyrannus melancholicus* indicate that the fighting of the Eastern Kingbird is typical of the whole group. An analysis of the behavior of *Tyrannus tyrannus* is probably valid for the whole subfamily (Tyranninae) and perhaps even other subfamilies.

This study was made by the usual field observational technics. It was not found necessary to use colored bands for individual birds although certain observations, incidental to the major problem investigated, could have been made had colored bands been used. No blind was used since the birds were sufficiently tame for observation. The sexes may be easily distinguished by the behavior as described below or by the presence, only in the female, of the brood patch. This area is noticeable as a dark line down the middle of the abdomen where the contour feathers of each side fail to meet. Sometimes in a strong wind the feathers are blown aside so that the patch is plainly visible. The red spot in the crest of the male is reputed to be larger than that

¹ This research was made possible by a Summer Fellowship at the Edmund Niles Huyck Preserve. I am greatly indebted to the officers of the Preserve and to its scientific advisory committee for the opportunity and assistance provided. I wish to acknowledge the stimulating criticism received during the field work from the late Dr. G. K. Noble, Dr. Ernst Mayr, and Dr. Eugene P. Odum; Mrs. Margaret M. Nice afterward made helpful suggestions, especially concerning the literature.

of the female. But this difference, if it exists, is of no value for the determination of sex in the field.

The observations were made on the Edmund Niles Huyck Preserve at Rensselaerville, New York, during the summer of 1940. The preserve is a tract of land in the Helderberg Mountains just north of the Catskills. The altitude is about 1,500 feet, resulting in slightly cooler weather than in the nearby lowlands. Most of the land is, or has been, under cultivation. There are several small streams and two ponds, providing ideal habitat for the Kingbirds.

A perusal of the literature concerning the species produces a mass of incidental notes, little of which is pertinent to the problem under consideration.

BELLIGERENCY

The fighting of the Kingbird may be divided into three types. (1) The fighting against the members of the same species (intraspecific) is the most fierce and conspicuous. (2) The battles with other species (interspecific) occur frequently but lack the violence of intraspecific fighting. (3) The fights with predators show distinct behavioristic differences from the types above mentioned.

The fighting against members of the same species (intraspecific) occurs in nature only when there is an intrusion onto the territory by a strange bird. During the beginning of the breeding season such encounters are frequent. The method of acquiring territory in this species is as follows. Single birds fly about searching for mates. After these single birds find mates, then the pairs wander around for several days looking for a suitable territory and nest site. This acquisition of the territory after pairing differs from the method used by many other species and permits frequent encounters between birds which have a territory and those which are still wandering about. When a single bird enters the territory of a pair it is driven out at once. The pair which has already acquired a territory defends the area in violent fights. A most important point is that both sexes cooperate to drive out the intruder. The female fights as vigorously as the male. Another important point is that the territory defended decreases in size as the season progresses. Towards the middle of the incubation period the territory is relatively small and the encounters with strangers are infrequent, in part due to the small territory and in part due to the fact that there are few birds wandering around looking for mates. At the end of the breeding season, more single birds are traveling about and more skirmishes occur.

The fighting consists of air battles, conducted with a great chattering and display. A note *b-zee* is used in addition to the *tik* note. A great tumbling display occurs when the intruder is some distance away. This display has many of the characteristics of the song-display of certain

passerine birds. The male certainly uses this display and, although at no time was the female certainly identified performing the display, it is possible that at times she also displays. The bird flies high in the air chattering with wings quivering and then, after tumbling, climbs high again and repeats the tumble several times. This tumbling performance was on several occasions performed simultaneously by birds of adjoining territories. On one occasion in the evening, the male sat in a tall tree, called and then performed just before going to his favorite place to sleep. No other male was known to be present at that time. This tumbling display, as used in fighting, serves the same ends as the territory song in many passerine birds.

In order to examine further the behavior involved in the defense of the territory against the strangers, experiments were performed with stuffed dummies. These dummies were museum skins arranged to resemble more or less a live bird and attached to a stick. Three species, *Tyrannus tyrannus*, *T. dominicensis*, and *T. verticalis* were used. The dummy was placed near the nest and in one case put directly on the nest. As was the case with live birds, both the male and the female fought against the dummy. The reaction of individual birds against the same dummy varies greatly but usually consists of a startled hovering at first, followed by direct attacks. If the dummy remains for an hour or more the birds get accustomed to it and resume the normal behavior. There was no observable difference in reactions towards the three species of dummies used. The following field notes describe some of the encounters in detail. On June 23, I put the dummy about a foot from the nest of the Pond pair. "The female went to the nest, hovered above the dummy. She then touched it with the bill, sat beside it and went on the nest, twittering. The male came in and sat near (6 inches) and looked around. He then went back on the wire. At 9:18 the female went off the nest and the male came and hovered over the dummy. She came back at 9:24 and sat on a twig before flying to the dummy. She called, peered at the dummy and then went onto the nest twittering." This incident is much milder than the following with the Dam pair of birds. The dummy was put near the nest. "At 7:15 A.M. the male (as proved by later identification) sat on a twig, and hovered over the dummy, snapping the bill and using the territorial *b-zee* call." Once it chased away a Grasshopper Sparrow (*Ammodramus savannarum*). The male went away for a short time but soon came back. At 8:00 the female carried in nest material and hovered over the decoy, this being the first time she had seen it. "She attacked it, snapping her bill and knocked it over. The male hovered over it and snapped his bill. At 8:20 both birds left." It should be noted that while the female actually hit the dummy, the male did not do so, a sex difference which occurred with other pairs. These observations are typical of many experiments and show that while the male does

at times actually dive at the dummy, the female is far more aggressive. The behavior of the two sexes in reference to the intruder differs in other small details of perching and use of the notes. These details are indescribable, but after experience may be used to distinguish the sexes of the birds.

Some observations on the defense of the territory when an enemy (human) is present are of interest. On June 28, while I was putting up the dummy, the female dove at it and hit it violently. This indicates that she was more concerned about the presence of a Kingbird stranger than of a human predator. At other times this particular bird was greatly concerned over my presence and attacked me violently. On another occasion at another nest when I approached, the adults were greatly concerned because the young had just left the nest. A bird from a nearby territory came near to investigate the situation and sat calling in a tree about 40 feet away. In this case the parents ignored the intruder although it is certain that under normal circumstances it would have been attacked and driven out in a moment. In both cases the birds attacked the object which was closest to the object defended, that is, nest or young. These observations on intraspecific fighting show clearly that the Kingbirds defend a territory against other members of the species; this fighting will be analyzed in the discussion below after the data concerning the interspecific fighting are mentioned.

The term "interspecific fighting" refers to battles between Kingbirds and all other species except obvious predators such as Crows and hawks. This fighting occurs only in the immediate vicinity of the nest. With one exception no interspecific fighting was observed more than 30 feet from the nest. In this one case a male attacked a young Barn Swallow (*Hirundo erythrogaster*) about 50 yards from the nest without any obvious cause. Witmer Stone (1937:671) has remarked that Kingbirds are "valiant defenders of their nest" and attack "nearly every bird that passes near." The important characteristic of this interspecific fighting is that only the male fights. On no occasion was the female seen to fight. The following observations emphasize this fact. "June 18. When a warbler came into the nest tree the incubating female paid no attention to it. A Song Sparrow (*Melospiza melodia*) sang in the tree for 10 minutes but the female paid no attention to it. The male was some distance away. A Magnolia Warbler (*Dendroica magnolia*) came into the tree, just as the male came onto the wire. It fiercely drove the warbler out at once." "June 25. At one time the female sat within two yards of a Song Sparrow which the male drove away when he came." Olive Thorne Miller (1892) records one case in which the female joined the male in attacking an intruder. But the behavior of the female is not described in detail; possibly the female flew off the nest at the same time the male attacked the intruder. Another characteristic of interspecific fighting is that the

male does not raise the crest when attacking another species. When fighting with another Kingbird both male and female erect the crest.

In order to incite the wrath of the male Kingbird, the intruder must satisfy certain conditions. As a rule a bird merely passing over the nest tree is not disturbed; swallows swooped by unharmed, and on one occasion a Flicker (*Colaptes auratus*) flew over unmolested. Another condition is that the bird must be moving into, about, or from the nest tree. The male seldom attacks a perched bird, although sometimes when the bird is singing in the nest tree the male drives it out. A last condition is that the bird must be above the ground to incite molestation. Robins (*Turdus migratorius*) and Catbirds (*Dumetella carolinensis*) feeding on the ground under the nest tree are left alone. This horizontal stratification of the defense area is of great interest. The male does not come from a distance to drive out intruders even though the bird satisfies these conditions. These three conditions seem to be necessary to stimulate the male to attack. On some occasions, especially after a wandering Kingbird has been driven away, the male attacks birds at a greater distance from the nest site. The battle with an invader seems to excite the male. A further point of interest is that in the evening shortly after sunset the male loses the desire to defend the territory, even against strangers and will permit any bird to come into the nest tree.

The interspecific fighting wanes very noticeably during the progress of the breeding period. In order to give some quantitative idea of the diminution of the fighting impulse the following data indicate the number of times an intruding bird was driven out. These data are crude observations; in many cases it is not certain that all the conditions were fulfilled; furthermore not all the encounters but only those witnessed are enumerated. Nevertheless these rough data show a definite trend. During the nest building period the intruding bird (various species) was driven away 8 out of 17 possible times; during incubation the intruder was attacked 3 out of 10 times. In the feeding period the invader was driven away only twice out of 16 times. The diminution of the attacks is more noticeable to the observer than these quantitative data can indicate. Gilbert H. Trafton (1908) observed a nest in a gutter of a house and states that "this pair showed none of the reputed pugnacity of the Kingbird toward other birds." However, his observations refer primarily to the feeding period and he does not state how near the other species came to the nest.

The Kingbird is usually the victor in the skirmishes with other species but on some occasions the intruder emerged victorious. In two encounters Robins won and in one other battle a Baltimore Oriole (*Icterus galbula*) repelled the attacks. Both species resisted the attacks by using the bill and fluttering the wings.

Many other species drive intruders away from the nest area. The

behavior of Hummingbirds and Song Sparrows (Nice, 1937) are examples. The latter species drives away most other species, unless they are too large or indifferent. House Sparrows (*Passer domesticus*) and Goldfinches (*Spinus tristis*) ignore the threats of the Song Sparrows. Field Sparrows (*Spizella pusilla*), although attacked, succeeded in nesting among the Song Sparrows. Although Nice does not state under what circumstances an intruder is driven off, apparently the Song Sparrow differs from the Kingbird. The latter drives off all birds which satisfy certain characteristics of behavior. The former does not attempt, or at least is unable, to drive certain species away.

Interspecific fighting has different behavior characteristics from that of defense against a predator. Both sexes attack predators and, it is most important to note, go far away from the nest and outside the territory. The male is the more aggressive and goes the farther away from the nest site. Crows and Red-tailed Hawks (*Buteo borealis*) are pursued and attacked from above. It is not uncommon to see the little bird clinging to the back of the larger and pecking out feathers. A Cooper's Hawk (*Accipiter cooperi*) is, however, treated with the respect due his superior ability. The Kingbirds fly up to the hawk but never get within more than a couple of yards and hesitatingly follow it till the danger is past. Cats are pursued with the usual *tik* note and sometimes attacked from above. When a person approaches very near to the nest or handles the contents, the birds may dive at him and frequently click the bill.

LIFE HISTORY

During the investigation of the belligerency of the Kingbird many observations were obtained on the habits of the species. During the summer seven nests were followed in detail, two of which were observed from the very start of courtship to the dispersion of the young. It is not the purpose of this section to record every observation of the birds but only those which seem significant or add information about the relation of the behavior of Kingbirds to the habits of other species.

The pairing of this species differs from that of many other birds. Single birds wander around until a mate is found. Under these circumstances it is impossible to see the exact mechanism of pairing for the investigator is seldom so fortunate as to be on the spot when pairing takes place. The unpaired birds of both sexes give a call which is different from that of a mated bird. This call is the *b-zee* note but does not descend in pitch and is slightly shorter in duration. It is very difficult to distinguish the two calls but it can be done with practice. After pairing has occurred, the birds settle down in a suitable place. Frequently the pair searches for a location, going sometimes a great distance.

After pairing the birds select a territory around the nest site. The

observations on the Dam pair showed without doubt that the nest location is selected first and then the territory acquired around it. This pair built two nests and each time obtained the territory around the nest site. Other observations of the *Myosotis* pair show that the nest site is the first object acquired. This pair built three nests in different locations and each time acquired the territory around the nest site. Several days are required for the pair to outline the territory around the nest site and during this period the birds wander over a large area. After the boundaries are defined the birds restrict their activities to the territory.

The nest is located typically out near the end of a limb in a small shrubby tree. All the nests under observation were located in apple trees. This tree seems to provide the ideal site for the birds; the tree is bushy out to the end of the limbs and the small branches provide adequate support for the nest. One nest was started in an oak tree but was soon abandoned. The pair then built in an apple tree. The birds have a decided preference for water, building near a stream or pond in nearly all cases. A. W. Schorger (1920) observed this characteristic in Wisconsin and quoted R. W. Chaney's similar notes from Michigan.

The female selects the site for the nest, hopping about a tree and trying various forks by revolving about in them. The male is an interested follower but has no choice in the final selection. The construction of the nest is also done entirely by the female. She picks the grasses, twigs, and rootlets from the ground. In no case was the male seen to carry material or assist in any way in the building. The male, however, is a zealous guardian of the nest site while the female works and greets her every time she returns with material. He often accompanies her for a short distance out from the nest while she works and then returns to guard the nest while she is absent. Towards the middle of the day when the female stops working he relaxes his vigilance and feeds.

The eggs are laid at intervals of one day, usually in the morning before 10 A.M. Two of the nests studied had four eggs and three nests had three eggs. The incubation period in two cases was 16 days. The female begins to incubate when the penultimate egg is laid and gradually increases the time spent on the nest until she is incubating regularly the day after the last egg is laid. She remains on the nest for about 15 to 20 minutes and then goes off to feed for 5 to 10 minutes. During the time the female is on the nest the male is away feeding, usually within 300 yards. After she leaves the nest he returns to his favorite perch and guards till she returns. Her return is greeted with chattering and a quivering wing display. She usually feeds in a place different from his feeding area. In one case she fed across the lake in a section where he never went.

The eggs are pipped two days before hatching. The female carries away the broken shell. The young are blind and nearly naked. Some white down covers the head, the dorsal, and the ventral tracts. Brooding continues for some time but gradually gives way to feeding. The amount of time occupied in brooding decreases as the young grow. In rainy or cold weather the young are brooded nearly continuously. The behavior of the male changes radically when the young hatch, for he now for the first time takes interest in the contents of the nest. He feeds the young, although on the whole not as frequently as the female. However, only the female shields the young from the rain and sunlight. After feeding, the adults usually wait for the young to defecate and then carry away the sac containing the feces. The young remain in the nest for 16 to 17 days. The day before leaving the nest the young start to give the *tik* call of the adults and after one day's practice give it so perfectly that it is indistinguishable to the observer. They exercise the wings frequently at this time. The first day out of the nest the young stay within a few yards of the site; in one case the young came out late in the afternoon and went back into the nest for the night. The second day out of the nest the young leave the nest tree and begin to wander around. The family group now moves about, usually staying near the territory but by no means stays within the territory. The birds do not use the territory as food reserves in any way.

In this region the birds raise only one brood. The fledging success was high, 79 per cent in the nests studied, for 15 young were fledged from 19 eggs laid. During the progress of the nesting cycle the anxiety of the adults increases. After the young have hatched the parents are greatly alarmed by the investigator. There is an interesting difference in behavior between the sexes. When approaching the nest for feeding the young birds, the male, at the nests under observation, alighted on his favorite perch before giving the insect to the young. The female, on the other hand, flew directly to the nest. This difference in habits is probably consequent upon the difference in behavior during the incubation period.

The notes of the species are all loud and harsh. The note *b-zee* is used in the territory by the adults. An unmated bird has a slight difference in this note as described above. A loud harsh *tik* is the most common note and is used on many occasions. The young use it and the adults use it when greeting each other. It seems to be a social note used to keep the birds together and aware of the location of the other member of the pair. This *tik* is used in the tumbling display. A chatter consisting of a series of rapidly repeated *tiks* is used in the greeting ceremony when the female comes back to the nest. When the female goes onto the nest she frequently twitters quietly for a few moments. L. A. Hausmann (1925) comprehensively discusses the

notes of the species, calling attention to the matin song, used early in the morning, and the use of the *kitter* for alarm, chase, and victory.

A peculiar behavior was observed at one nest. The apple tree was infested with tent caterpillars. Frequently the male and sometimes the female swooped down, seized a caterpillar and carried it to a boat which was tied on the edge of the pond about 50 feet away. One day I found 33 caterpillars in the boat. When the boat was not there the birds placed the insects on the dock. No explanation can be suggested for this behavior.

Another observation of interest is that the male in one case slept in the same tree from June 10 until August 16 when observations were discontinued. He frequently called from the top of a nearby tree before diving down to his sleeping place.

DISCUSSION

This study of the Kingbird was undertaken for the purpose of analyzing the relation of the notorious belligerency of the species to the general concept of territorialism. The evidence obtained indicates to the author that the excessive fighting of the *male* is merely exaggerated territorialism. (For the moment we are not concerned with fighting against predators). For an adequate understanding of this interpretation it is desirable to review certain ideas concerning territorialism. For reasons stated elsewhere (Davis, 1940a) it seems necessary to separate the fighting observed into two psychological entities; the fighting over the piece of land (the nest site) and the fighting over the sex-partner. While there are other causes of fighting these are the two which have been grouped under the term of territorialism. Further strength is added to this provisional division by the observations on the Kingbirds. According to this scheme the male defends the territory and also, naturally, the sex-partner. When a male Kingbird is fighting with another Kingbird within his own territory he is simultaneously defending territory and sex-partner. The female defends the sex-partner only. (The phrase "defend the sex-partner" refers to those actions of the male or female which prevent a rival from obtaining the mate. Thus the female drives away other females which might attract the male away). This interpretation explains why the female never drives away other species from the nest; why the behavior of the male is different in intra- and interspecific fighting; why territorial defense (as shown by interspecific fighting) diminishes during the breeding cycle while the defense of the sex-partner is as vigorous after the young are out of the nest as during the building of the nest. It is further in accord with this hypothesis that the territory is secondary to the nest. After the young have fledged, the family group may leave the territory but in spite of this fact, the adults defend the sex-partner with great vigor. This discussion suggests that the interpretation outlined will fit the facts more

closely than an interpretation which combines the fighting for the piece of land and the sex-partner under one psychologic motivation. In summary, this hypothesis suggests that territorialism should be limited to the fighting in defense of the nest site, while sex-partner fighting refers to the defense of the sex-partner.

This scheme differs radically from that of Tinbergen (1939). In my opinion even Tinbergen's data on the Snow Bunting agree with the separation of fighting into territorial and sex-partner categories. Tinbergen considers territorialism as a type of sexual fighting. His definition would exclude defense of territory in the fall but include that which occurs shortly before the formation of the sexual bond. It seems impossible to include the defense of a piece of land as a type of sexual fighting without confusing the distinctly different motivations.

A point of interest concerning the defense of the territory is that the male loses his impulse to fight at evening. About sundown he ceases to patrol the nest site and prepares for retiring. This is in accord with the observations on another Tyrannid, *Muscivora tyrannus*, in Argentina (Davis, 1940b). This species is violently territorial during the day but retires at evening to roosting sites where hundreds of males sleep in harmony; shortly after dawn they have returned to their territories and are defending the nest site.

A problem which assumes great importance in the studies of breeding success and of game management is the occurrence of abortive nests. These nests are built and then for no patent reason deserted. Sometimes the nest is completed and other times only the foundation is started. These studies on the Kingbirds added more data on the occurrence of abortive nests but little information for the analysis of the factors causing abortion. One pair of birds (Dam site) started a nest in an oak tree, worked on it during one morning and then deserted it. In this case it seems likely that the nest site was unsuitable; the tree was high, not near water, and thinly foliated. The extreme case of abortions was provided by the Myosotis pair. These birds built three nests and deserted each one after completion. The first nest was built in an apple tree which was severely attacked by tent caterpillars and nearly defoliated. This possibly was the reason for desertion. However, it is important to note that two other nests were built in apparently ideal locations and deserted. These facts suggest the importance of some observations on the actions of the female at the first nest. Four days after the first nest was completed she started to "incubate" the empty nest. About four days is the normal interval between the completion of the nest and the start of incubation. The behavior of the female was identical with that of a female incubating eggs. She "incubated" for 15 to 25 minutes; the male guarded in her absence and greeted her in the typical manner when she returned. The incubating rhythm was normal. A possible explanation of these abortions is that no eggs were laid. Which sex was responsible for the deficiency

could not be determined without microscopic examination of the gonads.

The experiences with the dummy birds, although designed to clarify the territorial fighting, also shed light on the problem of discrimination of sex. It will be remembered that both sexes were hostile to the dummy and that the male did not try to copulate with it as occurs in some species (Noble and Vogt, 1935). These facts suggest two interpretations. The less probable is that after pairing the fidelity of the birds is such that no other individual of either sex is attractive to a member of the pair. The more likely interpretation is that the behavior of the other bird must conform to certain patterns in order that the birds may recognize the sex.

SUMMARY

The belligerency of the Kingbird (*Tyrannus tyrannus*) was studied during the summer of 1940 in New York State for the purpose of analyzing the relation of this fighting to the concept of territorialism. Other species of Tyrannidae also are belligerent.

Three types of fighting occur: intraspecific, interspecific, and predator defense.

The intraspecific type occurs between Kingbirds when a stranger intrudes upon the territory of a pair. Both sexes participate and fight throughout the breeding cycle. Experiments with dummy birds showed that both sexes fight against specimens of three species of Kingbirds.

Interspecific fighting occurs between Kingbirds and other species. Only the male fights. He drives away intruders from the nest site under certain specified conditions.

The fighting against a predator differs greatly from the other two types of belligerency. Both sexes go far from the territory to drive away a hawk or Crow.

Observations on the life history show that single birds wander around looking for a mate and, after pairing, select a nest site and territory. The female selects the site, builds the nest, and incubates the eggs. The male assists in feeding the young. The territory is not used for food reserves. Fledging success was 79 per cent for 6 nests. In the two nests observed from laying to fledging, the incubation period was 16 days and the fledgling 16 and 17 days. One pair of birds built three nests, and deserted each in turn, without obvious reason.

Analysis of the belligerency suggests the interpretation that the male defends the territory (nest site) and the sex-partner and the female defends the sex-partner only. The defense of the territory and the defense of the sex-partner are different psychological entities.

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EFFECT OF PHOTOPERIOD ON MOLTING OF FEATHERS¹

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THE regulation of seasonal activities of birds is of great interest and requires correlation of physiological processes with changes in environmental conditions. Considerable attention has been given to the effect of increasing daily photoperiods on the maturing of gonads and the reverse effect of decreasing photoperiods. The present study is an investigation as to the possible effect of changing photoperiods on regulating the time and rate of molting and renewal of feathers.

As early as 1908 Beebe made an experimental attempt to find the cause of molt. He gradually reduced the amount of light per day and increased the food given captive male Scarlet Tanagers, *Piranga erythromelas*, in full breeding plumage. The birds skipped their normal autumn molt. During the winter sudden controlled changes of temperature either to a higher or a lower degree caused all of the birds to lose weight, and a few molted. Among other early workers, Seligmann and Shattock (1914) failed to find a relationship between seasonal assumption of eclipse plumage in the Mallard, *Anas platyrhynchos*, and the spermatogenic function of the testis.

Miyazaki (1934, 1935) was able, by manipulating the photoperiod, to induce three sexual maturations within a year in *Zosterops palpebrosa japonica*. Each time that the photoperiods were reduced from fifteen hours to nine hours per day not only did the gonads regress in size but molting also ensued. Van Oordt and Damste (1935) obtained similar results for the Greenfinch, *Chloris chloris*, in Holland. Cages containing these birds were placed in a cabinet with the door partially open. Each day the door was closed a fraction until at the end of ten days (May 22) it was completely closed. The birds began molting in June and completed the process in July. Since the size of the testes also decreased with the reduction of the photoperiod, Van Oordt and Damste believed that molting may be due to an interacting influence of the gonads and the thyroid.

Very little is known as to the effect of increased photoperiod on the spermatogenic development of birds living in tropical regions where the days are of nearly the same length throughout the year. However, Brown and Rollo (1940), working with whydahs and weaver finches of the species, *Steganura paradisea*, *Pyromelana franciscana*, and *Vidua principalis*, found that the normal breeding plumage in these equatorial birds could be obtained in one year, instead of the normal two years, by artificially subjecting them to increased periods of daily light. *Steganura* underwent a complete molt before assuming nuptial

¹ Contribution from the Zoological Laboratory of the University of Illinois, No. 589.

plumage whereas the other two genera renewed only the feathers that changed color. Of direct concern in this connection are the observations of Witschi (1935) that the season of year when plumage changes occurred in the African weaver finch, *Pyromelana franciscana*, one of the species used by Brown and Rollo, was the same for birds caged in his laboratory in Iowa City as it was for birds in Africa, although the seasonal changes in the photoperiod are just reversed in these two localities.

In a recent paper Burger (1941) states that the European Starling, *Sturnus vulgaris*, came into molt under a constant light ration of fifteen to sixteen hours per day. However, Starlings, whose light rations were reduced to nine hours, molted earlier and the new feathers grew more rapidly than in the birds which remained on a constant long photoperiod. On a basis only of observations made in the field, Salomonsen (1939) predicts that the season of molt is controlled by time and rate of changes in temperature rather than length of day. Although the literature is thus suggestive of various controlling influences over molt, it is confusing and often contradictory.

MATERIALS AND METHODS

We have carried out two experiments (1939-40 and 1940-41) of like nature and observed the reactions of four species. All the birds were trapped on or near the University of Illinois Campus, Urbana, Illinois.

The White-throated Sparrow, *Zonotrichia albicollis*, is a migratory species in this locality. According to Dwight (1900: 196), it goes through two molts each year. The pre-nuptial molt occurs during April and May and involves only body feathers. The post-nuptial molt is complete. It starts in July and extends into late September or early October. The English Sparrow, *Passer domesticus*, a non-migratory species, has no pre-nuptial molt but does have a complete post-nuptial molt beginning in early July and extending into October. The Slate-colored Junco, *Junco hyemalis*, a migratory species, has only the complete post-nuptial molt, starting in July and continuing into September. The Bob-white, *Colinus virginianus*, a non-migratory species, has a very limited head molt in the spring and a complete post-nuptial molt from August to October (Bent, 1932: 17).

The experiments here to be reported were performed in a glass house exposed on four sides to normal daylight, from the north, south, west, and ceiling. The room was sufficiently isolated to eliminate any but minor reflections at night from the street lights and sky. The room was divided into two parts by an opaque partition by which the light over the experimental cages was completely shut off from those containing the control birds.

The cages used for retaining the birds in the first experiment were entirely metal, cylindrical in shape, and covered with fine screen wire. They were one and a half feet in diameter and five feet long. All waste food and excrement were removed from the cages at least twice weekly. New cages were built for the second experiment. The frame work was constructed of wood, then enclosed on the top, bottom, and front with hardware cloth and on the other three sides with pressed wood. The open mesh bottom permitted elimination of waste food and excrement, thereby reducing opportunities for spread of pathogenic bacteria and coccidiosis. Each cage was individually lighted with 150 watt, incandescent, frosted bulbs; two being required for each cage in the first set of experiments but only one in the second. In the second experiment the average light intensity at the level of the roosting perches was 39 foot candles; at the bottom of the cage, 14 foot candles. Two additional metallic cages of the type used in the first experiment were set up to house the unlighted controls for the second experiment.

Fresh water and feed were kept constantly before the birds. At the beginning of the first experiment the food consisted of cracked grain, mostly corn, and fresh lettuce leaves. The birds were weighed at the beginning of the experiment and at irregular intervals thereafter. A noticeable drop in body weight together with a tendency towards droopiness of the birds made it necessary to make changes in the diet. The grain portion was changed to hemp, which is high in fat content, and canary seed. The birds rapidly gained weight and were soon normal. In the second experiment a commercial preparation, which included irradiated yeast and cod-liver oil added to a base of ground sweet meal, was fed daily in addition to the grain mixture to all except the English Sparrows. Fine gravel and cuttle bone were placed in each cage. Every effort was made to eliminate any vitamin deficiency which might influence the results of the experiment. On the later diet the birds remained constant in weight and slightly higher than birds being trapped in the wild at the same time.

At the beginning of both experiments (Table 1) the lights were turned on at two o'clock in the afternoon and continued fifteen minutes beyond sunset. Each day the light period was increased fifteen minutes except in the controls. As the length of normal day light at this time of the year was decreasing at the rate of two minutes a day, actually the artificial lights were left on for an additional seventeen minutes daily. After the artificial day reached its full length of fifteen hours, which is comparable to the maximum length of a summer day, the lights were turned on and off manually at the same time each day. The time the birds were held at the full fifteen-hour day was 45 days in the first experiment and 139 days in the second. After all molt due to increased photoperiod had ceased and the birds had reached an apparently constant physiological state, the length of day was shortened.

TABLE 1
DATA ON TIME RELATIONS OF EXPERIMENTS
(Molt is here used to include the period of feather loss only)

	First Experiment	Second Experiment
Date experiment begun	December 4, 1939	October 14, 1940
Date photoperiod of 15 hours attained	December 23, 1939	November 4, 1940
Date partial molt started	December 25, 28, 1939	November 10, 1940
Date partial molt ended	January 8, 1940	November 24, 1940
Date shortening of photoperiod started	February 6, 1940	March 23, 1941
Date photoperiod of 9 hours attained:		
Cage A	February 6, 1940	June 2, 1941
Cage B	February 29, 1940	April 15, 1941
Cage C	February 29, 1940	March 23, 1941
Cage D	April 17, 1940	Held at 15 hours
Cage E	Controls	Held at 15 hours
Cage F	Controls	March 23, 1941
Cage G		March 23, 1941
Cage H		April 15, 1941
Date complete molt started:		
Cage A	February 16, 1940	April 15, 1941
Cage B	February 21, 1940	April 5, 1941
Cage C	February 24, 1940	March 30, 1941
Cage D	March 4, 1940	Held at 15 hours
Cage E	Controls	Held at 15 hours
Cage F	Controls	March 30, 1941
Cage G		March 30, 1941
Cage H		April 8, 1941
Date complete molt ended:		
Cage A	February 25, 1940	June 8, 1941
Cage B	March 19, 1940	April 29, 1941
Cage C	March 19, 1940	April 11, 1941
Cage D	May 11, 1940	Held at 15 hours
Cage E	Controls	Held at 15 hours
Cage F	Controls	April 11, 1941
Cage G		April 11, 1941
Cage H		May 2, 1941

This shortening of the photoperiod was at various intervals to determine any possible effect on the rapidity of the produced molt (Table 2).

EFFECT OF INCREASED PHOTOPERIODS

First Experiment—Two days after the added light had increased the photoperiod to fifteen hours in the first experiment, the White-throated Sparrows in cages A and B (Table 2) began dropping feathers from the anterior region of the ventral tract. Three days later the birds in cage D began losing feathers from the same tract. The molt progressed from anterior to posterior in both the ventral and spinal tracts with the molt beginning in the spinal tract soon after the first signs of molt in the ventral tract. Feathers also were dropped from the posterior region of the capital or head tract. No remiges or rectrices were

TABLE 2
DISTRIBUTION OF BIRDS IN DIFFERENT CAGES

CAGES	White-throated Sparrow	English Sparrow		Slate-colored Junco	Bob-white Female	Rate photoperiod reduced from 15 to 9 hours
		Male	Female			
First experiment						
A	8					Immediately
B	8					15 min. daily
C		1	8			15 min. daily
D	8					5 min. daily
E		4	4			Control
F	5					Control
Second experiment						
A	8					5 min. daily
B	8					15 min. daily
C	8					Immediately
D	3			3		Held at 15 hours
E		8				Held at 15 hours
F		4	4			Immediately
G					1	Immediately
H			8			15 min. daily
I		4	4			Control
J		4	4			Control

molted. The White-throated Sparrows of the unlighted control cage (F) showed no signs of molting. The testes of six birds, sectioned and examined microscopically during this partial molting period, were in complete spermatogenic development. The molt was short in duration and by the end of the second week was completely over (Figure 1). None of the English Sparrows showed any sign of molt although the blackening of the bill in the males showed that the gonads were increasing in size in the expected manner.

Second Experiment—In the second experiment, six days after the photoperiod had reached its full length of fifteen hours, the White-throated Sparrows began molting. The molt in this experiment was more extensive than in the first experiment. This time it included the rectrices and a few scattered secondaries in all except the birds in cage D, which were birds that were carried over from the first experiment, and five birds in cage A. The molt progressed rapidly to its peak in eleven days, then ceased entirely after another three days. The gonads of those birds examined at the start and during the molt were in complete spermatogenic development. During this period of extended day length and up to the time that the light was reduced, the White-throated Sparrows showed many signs of mating behavior and often attempted copulation. Early in the morning and again at night before the lights were turned off, their singing was loud and natural.

The Bob-white (cage G) molted only a few feathers around the head and throat. One hundred twelve days after the photoperiod reached fifteen hours, this solitary female laid an egg and followed this with one every six days for four successive weeks, until the photo-period was

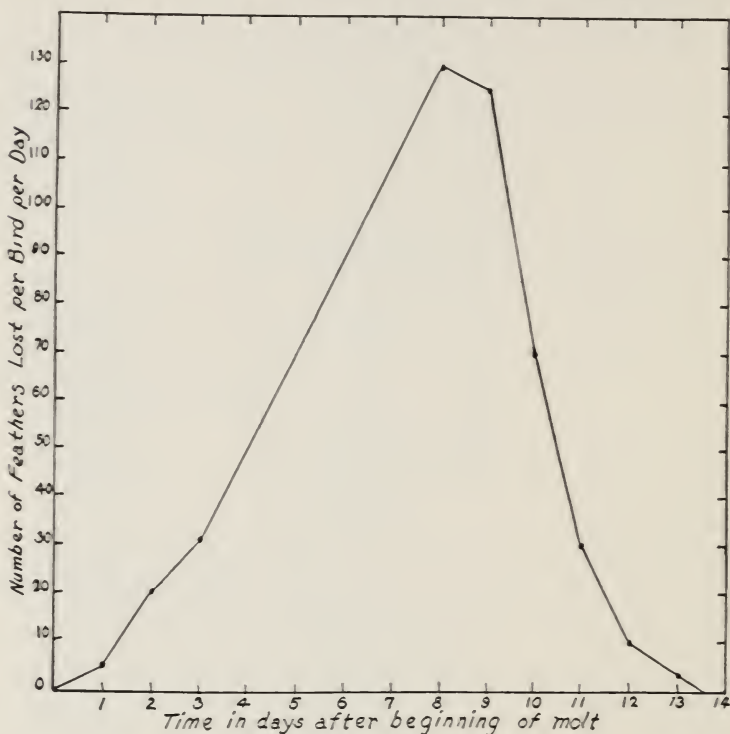


Figure 1. Average rate of feather loss in White-throated Sparrows during a partial molt induced in two experiments by increasing the daily photoperiod to fifteen hours.

reduced. None of the control White-throated Sparrows, nor any of the English Sparrows, nor the Slate-colored Juncos showed any sign of molt.

EFFECT OF DECREASING PHOTOPERIODS

First Experiment—All of the birds in the first experiment, both White-throated Sparrows and English Sparrows, molted as the day length was decreased. The beginning of complete molt and the rate of progress appeared to depend upon the rate of the reduction in daily light. Birds reduced suddenly on February 6 from fifteen to nine hours light (Table 2, cage A) began molting ten days later. The molt began

with the loss of primaries but thereafter the feathers fell so rapidly and in such great numbers that it was impossible to trace any definite sequence. The molt was completely over nine days after it began (Figure 2). All birds lost weight rapidly and by February 29 all were dead. The shortened feeding hours together with the sudden molt and the energy requirements for growing new feathers were apparently too great a drain on their body reserve.

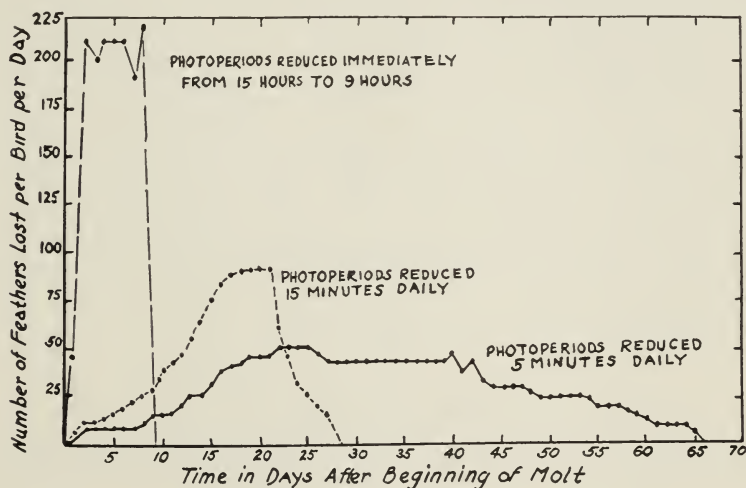


Figure 2. Comparison of rate and duration of feather loss in the complete molt of English and White-throated Sparrows in the first experiment, induced by shortening the daily photoperiod at different rates.

The birds subjected to a light reduction of fifteen minutes daily beginning February 6 (cages B, C), began their molt 15 days later in the White-throated Sparrow and 18 days later in the English Sparrow. The molt in both species was still irregular in sequence but extended over a period of four weeks. In spite of the more gradual molt, the weight of all birds decreased, although they recovered and developed new feathers.

The molt of the birds reduced from fifteen hours to nine hours at the rate of five minutes daily (cage D) began 27 days after the beginning of the light reduction and more nearly approached the normal molt as it occurs in nature. The weight of the birds dropped slightly. The new feathers quickly replaced the ones lost so that the birds never acquired the ragged appearance such as characterized the more rapid molt in the other cages. The count of feathers lost per day (Figure 2) is only an approximate one as some feathers were eaten by the birds and

others were lost. The total feather loss was 1500 per bird in those exposed to an immediate decrease in the photoperiod, 1700 per bird in those exposed to a fifteen minute daily decrease, and 1900 per bird in those exposed to the five minute daily decrease. This is to be compared to a total loss about 740 feathers in the partial molt (Figure 1).

Second Experiment—The factors made evident by the first experiment were confirmed by the second. In the birds exposed to a suddenly shortened photoperiod of nine hours (Table 2, cages C, F, G) the molt began almost simultaneously in the White-throated Sparrows, English Sparrows, and Bob-white; but it was more intense with the Bob-white and English Sparrow than with the White-throated Sparrow. The molt began seven days after the photoperiod was shortened. The loss of feathers was not as extensive as in the first experiment and at the end of the twelfth day it ceased. The Bob-white and White-throated Sparrows were given vitamin food with their regular grain rations and suffered no ill effects from their molt. The English Sparrows were fed only their grain rations and though they appeared to be more sturdy, three of the five birds were not able to recover from the effects of the heavy molt (Table 3).

TABLE 3
AVERAGE WEIGHT OF BIRDS IN GRAMS AT DIFFERENT TIMES
IN THE SECOND EXPERIMENT

CAGES	A	B	C	D ¹	D ²	E	F	H
Just trapped, short days	26.2	26.5	24.1	25.1 (1939)	17.3	26.2	25.3	26.1
After one week in captivity	25.9	26.1	23.9	17.1	25.4	25.0	25.7
At stage of photoperiod increase represented by 12 hours of daily light	26.3	26.9	24.1	29.0	18.0	25.7	25.2	26.0
After one week in 15-hour photoperiod	27.1	28.0	26.3	29.4	21.0	27.1	26.1	26.0
During period of partial molt	25.7	26.2	24.8	29.5	21.2	27.1	26.3	26.1
After four weeks in 15-hour photoperiod	27.7	28.5	26.6	30.1	21.2	27.2	26.5	26.2
At beginning of complete molt on decreased photoperiod	27.6	28.6	26.6	(29.9) ³	(20.9)	(27.1)	26.4	26.3
At end of complete molt	25.4	25.7	23.1	(29.3)	(18.9)	(24.0)	23.1	24.2

¹ White-throated Sparrows only.

² Slate-colored Juncos only.

³ Weights in parenthesis are of birds that did not molt but taken at the same time as for birds in other cages that did molt.

The White-throated Sparrows and English Sparrows subjected to reductions in day length by fifteen minute (Table 2, cages B, H) and five minute intervals (Cage A) went through a more gradual

and orderly molt, but this was not as complete a molt as in the first experiment. The birds were in excellent condition but suffered some decrease in weight (Table 3). The birds subjected to photoperiods reducing at fifteen minutes per day began their molt 13 to 16 days after the start of the reduction; those subjected to photoperiods reducing at five minutes per day began 23 days after the start of the experiment.

In addition to the cages subjected to a reduction in photoperiod, two cages (D, E) were kept at a constant fifteen-hour day. As the days were rapidly increasing in length, the amount of added artificial light was reduced each day at a corresponding rate. Neither group of birds molted. The White-throated Sparrows skipped the normal partial molt which occurs in spring.

The three White-throated Sparrows retained from the first experiment (Cage D) were more uniform and natural in their molt than those freshly secured for the second experiment. Since these three White-throated Sparrows were trapped in October, 1939, they had experienced three partial and two complete molts, namely: an induced partial molt beginning December 25, 1939; an induced complete molt beginning February 16, 1940; a partial molt in May, 1940; a normal complete molt in August, 1940; and an induced partial molt beginning November 10, 1940.

Many remiges and rectrices of the White-throated Sparrows, which replaced feathers molted during the complete molts, came in as albino feathers. All the feathers in the other tracts were normal in color. This occurred in forty per cent of the birds of this species, but did not occur in the English Sparrow, Slate-colored Junco, or Bob-white, although these birds were under comparable conditions. No explanation can be advanced for this phenomenon at the present time.

DISCUSSION

These experiments demonstrate definitely that, at least under certain experimental conditions, changes in the length of the daily light period will induce molt and renewal of feathers at other than the normal time of year. Not only that, but the rate at which the photoperiod is reduced will affect the time the molt is initiated and the rapidity at which the feathers are lost. The inference is not justified at the present stage of the investigation, however, that the season and regulation of molt is determined only by changes in the photoperiod. As yet we have only started the investigation of the influence of changes in temperature, which Salomonsen (1939) claims to be the primary factor, and other factors may also be important.

The molt brought about by the reduction in the photoperiod occurred in three species and was more or less complete (less so in the second than in the first experiment), as is true for natural conditions

when birds undergo their post-nuptial molt in the autumn. The molt produced by increasing the photoperiod occurred only in those species where a pre-nuptial spring molt is known to occur under natural conditions and not in the others. This molt in nature is a partial one, and this was true for the artificially produced molt, except in the second experiment with many of the White-throated Sparrows when it was abnormally heavy.

The total time required for birds to lose their feathers and then completely replace them was nearly the same (65 to 73 days) regardless of the rapidity at which the feathers were lost (Figure 3). This

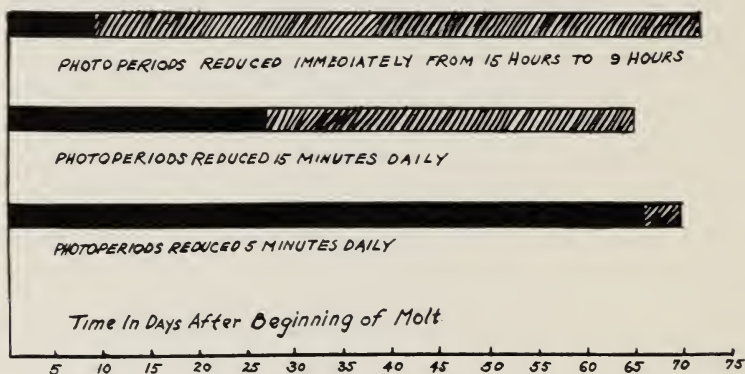


Figure 3. Comparison of time required to lose old feathers and to grow new ones in English and White-throated Sparrows exposed in the two experiments to daily photoperiods decreasing at different rates. The solid portion of the bar represents the period during which the feathers were lost, while the cross-hatched portion is the additional period required for the complete growth of new feathers.

would seem to indicate that the feather papilla begins growth very soon after the photoperiod is reduced and proceeds at nearly the same speed regardless of the rate at which the photoperiod is decreasing. It is possible that loss of feathers and growing of new ones are somewhat independent processes but both related to changing day lengths.

The intermediary mechanism by which length of day produces its effect upon the feather papilla is not known. Length of day supposedly influences the size of the gonads by way of the pituitary gland, and the gonadotropic hormones of the pituitary have received considerable study. Perhaps the pituitary gland is also involved in producing molt, but there is very little evidence for such a direct relationship. There is as much reason to believe that the thyroid glands may be involved as the gonads, but it is realized that the activity of both of these glands is affected in turn by the pituitary. In these experiments the testes

varied in size and development with increasing and decreasing lengths of light period in the manner to be expected. It might be reasoned that they regulated the loss and renewal of feathers. Molt occurred in females similarly as in males, although very likely their ovaries did not reach as complete development as did the testes of the males, except in the Bob-white. It is very possible that the influence of the photoperiod over gonad development and feather molt is entirely independent. We have made plans to test this point with castrated birds. Contrary to what Burger (1941) found, molt did not occur in our birds maintained continuously at the fifteen-hour day.

Length of day may affect molt through some other mediation than by direct hormone stimulation. Changes in nutritive balance may be important, as Beebe (1908) hinted. In future experiments we hope to measure rate of energy metabolism at various stages in this molting cycle, but in the present experiments reliance had to be placed solely on changes in weight. With longer days and shorter nights, length of time available for feeding is increased, and the corresponding daily period without food is shortened. The reverse is true with shortening days and lengthening nights. Table 3 shows a strong tendency for birds to increase in weight when subjected to a fifteen-hour photoperiod. The White-throated Sparrows that underwent a partial molt on the long photoperiods decreased in weight at this time, but not as much as did all birds that underwent a complete molt on the shortened photoperiods. The results are not entirely consistent as the Slate-colored Juncos in cage D and the male English sparrows in cage E also decreased in weight, although they were being held at a fifteen-hour light period and were not molting. The average weights of the control birds in cage I, taken eight times during the course of the experiment, varied only between 24.9 and 25.3 grams. Even if a correlation is fully established between loss in weight and molt, this will not demonstrate which is the cause and which is the effect. Perhaps both functions are independently affected, but the growth of feathers must certainly be energy demanding. The death of all birds when thrown into full molt in the first experiment by the sudden decrease of the photoperiod from fifteen to nine hours would seem to demonstrate this requirement.

The present paper is a preliminary report, but the results obtained to date are suggestive, promising, and leading toward future researches.

SUMMARY

1. White-throated Sparrows and a Bob-white, which normally go through a partial pre-nuptial molt in spring as the days are increasing in length, were forced to molt out of season by artificially increasing the length of day, and this was followed by a new growth of feathers.

2. White-throated Sparrows, English Sparrows, and a Bob-white, all of which have a complete post-nuptial molt as days decrease in

length in late summer and autumn, were forced into a similar molt out of season by artificially reducing the length of day to which they were exposed. This was followed by a new growth of feathers.

3. The time for beginning the complete molt and the rate at which the feathers were lost were accelerated by increasing the rate at which the length of day was artificially decreased.

4. The total time (65 to 73 days) required to molt feathers and completely grow new ones was approximately the same at all rates of decrease in the photoperiod and irrespective of the rate at which the feathers were lost.

5. The weight of the birds increased when they were placed on a better balanced diet and when they were subjected to longer photoperiods, but it decreased during the progress of molt and renewal of feathers.

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A COLLECTION OF BIRDS FROM THE LA SAL MOUNTAIN REGION OF SOUTHEASTERN UTAH

BY WILLIAM H. BEHLE

AS part of a continuous biological survey of the state, a party from the University of Utah, under the leadership of Dr. A. M. Woodbury and the author, made a trip of ten days duration during early April of 1938 to the La Sal Mountain region of southeastern Utah. This was in the nature of a reconnaissance trip and a general collecting trip but nevertheless the author, assisted by various members of the party, secured and prepared as study skins 176 birds. This collection has much to offer in the way of distributional and systematic data. In view of the fact that Utah and neighboring states comprise perhaps the least known area of the country from the standpoint of birds, it seems well to place the data on record as a contribution to our knowledge of the birds of the state.

The time chosen for the trip was determined by the spring vacation at the University and thus was too early for gathering much data on breeding birds. This was partly compensated for by our obtaining specimens of migratory species that probably would not have been encountered later. We left Salt Lake City April 1, 1938 and made our first camp in Block Canyon near Kane Spring, San Juan County, some 19 miles south of Moab, Utah. The elevation at this point was about 5,400 feet. We had hoped to be able to collect high in the mountains in the coniferous forest but snow drifts blocked most of the roads. As a result we established base camp at the above mentioned locality and for several days worked in the surrounding juniper-piñon forest or in canyon bottoms where occasional cottonwoods were found. On April 7 and again on April 8 we reached the higher oak belt and got into some scattered groves of western yellow pine at 8,000 feet. Then on April 9 we moved to Moab and collected along the Colorado River near the town and on April 10 returned to Salt Lake City. The specimens of birds comprising the collection represent 43 species and subspecies. This report is based solely on the collection; no sight records are included. All localities mentioned are in San Juan County unless otherwise stated.

Accipiter velox velox (Wilson). Sharp-shinned Hawk. One specimen, a female, was collected among yellow pines at an elevation of 8,000 feet, 5 miles northeast of the La Sal post office on April 8.

Falco sparverius sparverius Linnaeus. Eastern Sparrow Hawk. Two females collected in Block Canyon, near Kane Spring, 19 miles south of Moab, 5,400 feet, one on April 4, the second on April 6.

Oxyechus vociferus vociferus (Linnaeus). Killdeer. One male was shot on April 5 near our Block Canyon camp.

Otus asio mychophilus Oberholser. Grand Canyon Screech Owl. Two females were collected from holes in cottonwoods along the canyon bottom near our Block Canyon camp (April 3 and 5). The first one was kept alive several days in camp during which time it laid two eggs. When we dissected the bird we found three other large eggs which evidently would soon have been laid.

H. C. Oberholser has recently (*Jour. Wash. Acad. Sci.*, 27, 1937:356) described a new subspecies of Screech Owl, *Otus asio mychophilus*, with a range as follows: "Northern Arizona and southern Utah, north to north central Utah (Provo); west to southwestern Utah; south to northern Arizona; and east to central eastern Utah (Moab)." The two La Sal specimens, as compared with one topotype of *mychophilus* at hand from Grand Canyon Village, are a little browner on the back and more heavily streaked below. The heavy streaking on the breast is one of the distinguishing characters between *mychophilus* and both *inyoensis* and *cineraceus*. The La Sal specimens, as compared with representatives of *cineraceus*, are also larger and darker. Specimens from northern Utah which seem to be closest to *inyoensis* have the vermiculations on the underparts less prominent, hence the mass effect is of a lighter hue. This is also an accompaniment of the less heavily streaked condition.

Bubo virginianus occidentalis Stone. Montana Horned Owl. A female was taken at the Block Canyon base camp on April 6, 1938. Its nest was discovered April 2 and kept under observation until the bird was collected. It was located on a rocky ledge some 12 feet above the canyon bottom. On April 3 at 8:00 A.M. when the nesting site was visited one bird was on the nest and its mate was flushed from a piñon pine 25 yards from the nest. From numerous pellets at the base of the tree it would seem that this tree was a regular roosting site. When finally the bird on the nest was shot, it proved to be the female with a pronounced brood patch and a thick layer of oily fat beneath the skin of the brood patch. The mate was not secured, seemingly having deserted the area. Only one egg was in the nest. It rolled out and broke, exposing a large embryo.

The single specimen seems to be intermediate between the races *occidentalis* and *pallescens*, perhaps closer to the former.

Asio wilsonianus (Lesson). Long-eared Owl. A female was collected at Big Indian Wash, 10 miles north of Monticello, April 3.

Colaptes cafer collaris Vigors. Red-shafted Flicker. A female was taken at the Block Canyon location April 4.

Sphyrapicus varius nuchalis Baird. Red-naped Sapsucker. A total of five specimens collected; 2 males and a female from Block Canyon on April 4 and 5; a female taken at 8,000 feet, 5 miles northeast of the La Sal post office, April 8; and a male from Moab, 4,870 feet, Grand County, April 9.

Dryobates pubescens leucurus (Hartlaub). Batchelder's Woodpecker. A single male collected in Block Canyon, April 7.

Sayornis saya saya (Bonaparte). Say's Phoebe. Two specimens, a male and female collected in the Block Canyon area, April 2 and 6.

Otocoris alpestris occidentalis McCall. Montezuma Horned Lark. Twelve Horned Larks were collected from three localities as follows: 3 males and one female from midway between Woodside and Greenriver, Emery County, April 1; 6 males and one female from 5 miles south of Crescent Junction, Grand County, April 9; and one female from Dry Valley, San Juan County, 33 miles southeast of Moab, April 4. All were breeding birds.

These specimens are indistinguishable from breeding topotypes of *occidentalis*.

Cyanocitta stelleri diademata (Bonaparte). Long-crested Jay. Two males, both taken in the yellow pines, 8,000 feet, 5 miles northeast of the La Sal post office, April 8.

Aphelocoma californica woodhouseii (Baird). Woodhouse's Jay. Two females from the Block Canyon locality, April 2 and 4.

Cyanocephalus cyanocephalus (Wied). Piñon Jay. One female collected at the Block Canyon locality, April 4.

Nucifraga columbiana (Wilson). Clark's Nutcracker. A female was taken at the Block Canyon locality, 5,400 feet, April 4 and a male April 7 at an elevation of 8,000 feet 5 miles northeast of the La Sal post office.

Penthestes gambeli gambeli (Ridgway). Mountain Chickadee. Two males collected at 8,000 feet, 5 miles northeast of the La Sal post office, April 7.

Baeolophus inornatus griseus (Ridgway). Gray Titmouse. Having in mind that the subspecies in the area might be *plumbescens* described by Grinnell from Silver City, Grant County, New Mexico, but ranging as far north as the San Francisco Mountains of northern Arizona, a series of 22 titmouses, 9 males, 13 females, was obtained from the Block Canyon area. The type locality of *griseus* is Iron City, Iron County, Utah, a town and iron furnace site long deserted, but in the Great Basin portion of Utah. The series from the La Sal region is, however, clearly of the race *griseus*, showing no approach to the New Mexico race.

Psaltriparus minimus plumbeus (Baird). Lead-colored Bushtit. A series of 18 specimens, 11 males and 7 females, was secured at the Block Canyon locality, a few each day. They are typical of *plumbeus*, having the pinkish cast on the flank feathers and brown cheeks. As compared with California specimens, there seems to be a little more brown back of the forehead.

Sitta carolinensis nelsoni Mearns. Rocky Mountain Nuthatch. On April 7, two males were shot from yellow pines, 5 miles northeast of the La Sal post office, 8,000 feet.

Sitta pygmaea melanotis van Rossem. Black-eared Nuthatch. Two males and a female are represented in the collection, having been taken on April 7 and 8, 8,000 feet, 5 miles northeast of the La Sal post office.

Thyromanes bewickii eremophilus Oberholser. Baird's Wren. Three males are present, two from the Block Canyon locality, taken April 3 and 5 and one from 5 miles northeast of the La Sal post office, 8,000 feet, April 7.

Telmatodytes palustris plesius (Oberholser). Western Marsh Wren. A single specimen, a male, from Moab, Grand County, April 9.

Catherpes mexicanus conspersus Ridgway. Cañon Wren. A male was taken at Block Canyon, April 4 and a male and female at Moab, Grand County, April 9.

Salpinctes obsoletus obsoletus (Say). Common Rock Wren. A pair was taken April 5 at the Block Canyon locality.

Oreoscoptes montanus (Townsend). Sage Thrasher. A single female was shot in the vicinity of the Block Canyon camp on April 5.

Turdus migratorius propinquus Ridgway. Western Robin. One female was taken at the Block Canyon locality April 5 and a pair was secured from 5 miles northeast of the La Sal post office, 8,000 feet, on April 8.

Sialia mexicana bairdi Ridgway. Chestnut-backed Bluebird. Two males were collected among yellow pines at 8,000 feet, 5 miles northeast of the La Sal post office, April 8.

Sialia mexicana occidentalis Townsend. Western Bluebird. One male was secured among the junipers at our Block Canyon camp, 5,400 feet, April 6. It is significant to note that this individual, evidently a migrant, occurred in the lowlands while the preceding two, probably representing the resident race, were found in the habitat where bluebirds of this species normally nest.

Myadestes townsendi (Audubon). Townsend's Solitaire. A female was taken 5 miles northeast of the La Sal post office, 8,000 feet, April 7.

Agelaius phoeniceus utahensis Bishop. Utah Red-wing. While at Moab on April 9 we saw many Red-wings and secured 11 males. These are identical in their characters with birds from the vicinity of Salt Lake City and are referable to the race *utahensis* recently described by Bishop (*Trans. San Diego Soc. Nat. Hist.*, 9, No. 1, 1938:1-4).

Carpodacus cassinii Baird. Cassin's Purple Finch. One male was collected at 8,000 feet, 5 miles northeast of the La Sal post office on April 8.

Carpodacus mexicanus solitudinus Moore. Six males were collected throughout the week at the Block Canyon camp. The specimens were borrowed by Robert T. Moore in connection with his revision and were pronounced to be intergrades between his new race *solitudinus* and the more eastern race *frontalis* as he limits the range of the latter. (See *Condor*, 41, 1939: 191.)

Spinus pinus pinus (Wilson). Northern Pine Siskin. Two females were collected on April 3 and 4 at the Block Canyon locality.

Loxia curvirostra benti Griscom. Red Crossbill. A single male which was shot from a flock among yellow pines at 8,000 feet 5 miles northeast of the La Sal post office on April 8 has been identified by Griscom as an intergrade between the races *benti* and *grinnelli*.

Pipilo maculatus montanus Swarth. Spurred Towhee. This species was abundant in the oak chaparral at 8,000 feet, 5 miles northeast of the La Sal post office. On April 7 and 8 a series of 22 specimens were obtained, of which 14 are males.

Junco hyemalis hyemalis (Linnaeus) Slate-colored Junco. A male was taken at 8,000 feet, 5 miles northeast of the La Sal post office on April 7.

Junco hyemalis cismontanus Dwight. Cassiar Junco. A male and female were taken April 3 and 6 at the Block Canyon locality among mixed flocks of juncos. These specimens were submitted to Dr. Alden H. Miller who commented that they showed more than the usual amount of *oreganus* characters.

Junco oreganus montanus Ridgway. Montana Junco. These were numerous but only three were collected, all males, on April 3 and 7, from the Block Canyon locality.

Junco oreganus mearnsi Ridgway. Pink-sided Junco. Two males were taken at 5,400 feet in the vicinity of our Block Canyon camp April 3 and 6 while two other males were taken at 8,000 feet April 7, 5 miles northeast of the La Sal post office.

Junco caniceps caniceps (Woodhouse). Gray-headed Junco. Six typical specimens and two hybrids with *mearnsi* are represented in the collection. Five male *J. c. caniceps* were collected at various times at the Block Canyon locality and one male was taken 5 miles northeast of La Sal at 8,000 feet, April 7. The male hybrid was also taken at this high locality April 8, but the female lower down in Block Canyon on April 6.

Zonotrichia leucophrys gambelii (Nuttall). Gambel's Sparrow. Two males were obtained April 5 at Block Canyon. They were first year birds undergoing a molt.

Melospiza lincolni lincolni (Audubon). Lincoln's Sparrow. Three males and 2 females were shot along the river bottom land at Moab, 4,000 feet, Grand County, April 9. These were migrant birds, not of the resident race *P. l. alticola* as Miller and McCabe (*Condor*, 37, 1935:144-60) have worked it out. These birds are large in size, too heavily streaked to be of the summer resident race and a few represent the reddish extremes that are more common in the northern race. Considerable variation is shown among the lot but it all falls within the limits of variability of the race *lincolni*.

Melospiza melodia fallax (Baird). Mountain Song Sparrow. Three females were secured near the Block Canyon locality on April 4 and 5 and 4 others of both sexes were collected at Moab, Grand County, April 9. All are fairly typical of *fallax*.

DEPARTMENT OF ZOOLOGY, UNIVERSITY OF UTAH, SALT LAKE CITY,
UTAH.

AN EXPERIMENTAL STUDY OF BROWSE AS A WINTER DIET FOR PRAIRIE CHICKEN

BY F. N. HAMERSTROM, JR., FRANK HOPKINS, AND ANTON J. RINZEL

FOOD habits studies begin as lists of what an animal eats, but soon become measurements of the nutritive values of the different foods. Examples of food lists are too numerous and too well known to need mention; examples of nutritive measurements are still scarce. Leopold (1933:258-72) set up a classification of wildlife foods based on preference as a measure of quality; a few others have measured quality directly by bio-assay, particularly for foods of Bob-white (Errington 1931, 1933, 1936), Ring-necked Pheasant (Errington, 1936, 1937), and deer (Maynard *et al.*, 1935; Davenport, 1937; Nichol, 1938). Such studies as these seek to answer the question, "Will this food, or that combination of foods, keep this particular animal alive and in good condition?" There is an obvious need, from the standpoint of wildlife management, for direct measurement of the nutritive values of more foods of more animals.

The Prairie Chicken¹ is a case in point. As a member of the grouse family, can it, like most of the others, live through the winter on a diet of browse alone? The issue has been a controversial one for many years.

The question is open to two approaches, one observational, the other experimental.

DIET: OBSERVATIONAL DATA

According to Schmidt's (1936) report and the unpublished notes of F. N. Hamerstrom and Frances Hamerstrom, the main winter foods in Wisconsin are:

Grains—corn, buckwheat, soybeans, barley, oats, rye.

Weed seeds—many kinds, such as lesser ragweed (*Ambrosia artemisiifolia*), climbing false buckwheat (*Polygonum dumetorum*), and other members of the same genus, green foxtail (*Setaria viridis*).

Browse—white birch (*Betula alba* var. *papyrifera*), bog birch (*Betula pumila* var. *glandulifera*), hazel (*Corylus americana*), aspen (*Populus tremuloides*), sweet fern (*Myrica asplenifolia*), and blueberry (*Vaccinium pennsylvanicum*) are most heavily used; to a lesser degree, willow (*Salix* spp.), maple (*Acer* spp.), elm (*Ulmus* spp.), pine (*Pinus banksiana*, *P. resinosa*, perhaps also *P. strobus*), and apple (*Pyrus malus*).

* A cooperative project by the Department of Wildlife Management of the University of Wisconsin and the Wisconsin Conservation Department.

¹ *Tympanuchus cupido americanus*.

Fleshy fruits and mast—in winter, limited mainly to rose hips (*Rosa* spp.) and acorns (*Quercus* spp.)

Greens—such green leaves as they can get, as dewberry (*Rubus* sp.), clovers, and sometimes grass.

Schmidt (1936) found that the Prairie Chickens he was studying lived almost entirely on buds when the temperature was above zero, but ate, and probably needed, corn at temperatures below zero; the Hamerstroms found Prairie Chickens regularly eating corn and other grains and weed seeds through the autumn and mid- and late winter, but for a time in early winter found them absent from their accustomed grain and weed fields.

It is likewise clear from observation alone that Prairie Chickens are found in greatest numbers in farming regions, not only in Wisconsin but in the North Central States generally. Not in all farming regions, to be sure, for most are now so completely under cultivation that too little cover remains. Too much cultivation has driven Prairie Chickens from most of their original range; too little is having the same effect in parts of their acquired northern range, where areas once open are growing up solidly to brush (Hamerstrom, 1939).

Although Prairie Chickens are found in farming regions and are known to eat grains, it does not follow that cultivated crops are *essential* foods. Farm lands are open lands, and openness is an essential part of Prairie Chicken range. It may even be that good farming soils are good Prairie Chicken soils.

The fact that cultivated fields are used consistently as feeding grounds comes closer to the point. Weed seeds are eaten in quantity, particularly in autumn, but in the northern states cannot be relied upon as winter food because of snow cover. Of the two sorts of winter food, cultivated grains therefore seem to be the more important. This argument is supported by the fact that the Prairie Chickens' southward migration in winter (Cooke, 1888:104-6; Leopold, 1931:173-5) was markedly lessened by the introduction of corn into the northern states (Spurrell, 1917; Swanson, 1940).

On the other hand, we have reports of a few instances in which a few Prairie Chickens winter in places that have little or no winter grain to offer. Our two best authenticated examples are a flock in Oneida County, Wisconsin (Schmidt, 1936), and the Seney Migratory Waterfowl Refuge, Germfask, Michigan (John H. Steenis, 1940, *in litt.*).

DIET: EXPERIMENTAL DATA

Since the observational approach does not present a clear answer, we tried a feeding experiment on captive Prairie Chickens in the winters of 1939 and 1940.

The purpose of the experiment was to determine whether a diet of browse (i.e., buds and catkins) alone, in unlimited quantity and freely selected, could maintain the weight of Prairie Chickens in winter.

Thirty-eight wild Prairie Chickens (22 in 1939 and 16 in 1940) were trapped and sent to the State Experimental Game and Fur Farm

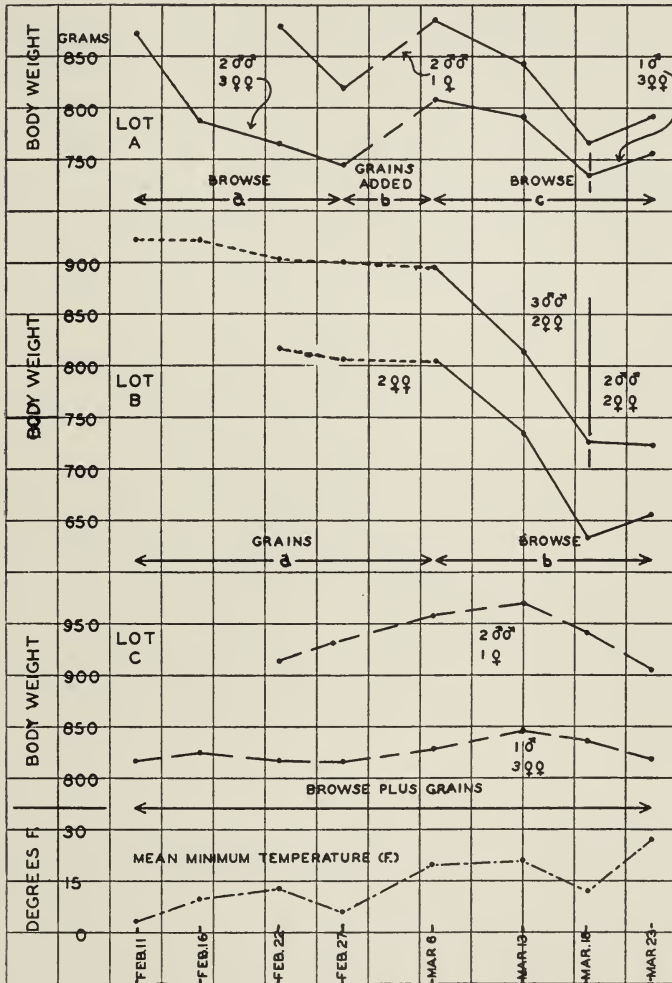


Figure 1. Effect of browse diet on Prairie Chickens, as shown by body weight: 1939.*

* After a bird died during an experiment, the succeeding weights were corrected to permit the weight curves to be unbroken, by adding (or subtracting) average weight changes for the remaining live birds to the average weight of all birds of that lot at the time the individual died.

at Poynette, where they were brailed and held on browse plus grains for seven to ten days to accustom them somewhat to captivity. They were then divided into lots of about eight birds each, half males and half females. Each lot was held in a 12 x 12 foot pen which was open to the weather except for an 18 inch baseboard and a few small shelters, roofed but open to the weather on two sides.

One lot was kept each year on browse plus grains to serve as controls. One lot each year was fed on browse alone, then on browse plus grains, then (in 1939 but not in 1940) on browse alone again. One lot started the 1939 experiment on grains without browse, then was shifted to browse alone. All birds were weighed about every five days, except during the initial holding period.

For details concerning the kinds of browse and the manner of feeding, see below²; dates and the exact numbers of birds per lot are given in Figures 1 and 2. Temperature records were provided by the

TABLE 1
EFFECT OF DIET OF BROWSE ALONE, AS SHOWN BY BODY WEIGHT

Lot	Diet	No. birds	Average Weight per Bird					Average period of time
			At start	At finish	Max. loss below starting average	Max. recovery	Max. gain above starting average	
Aa	Browse	8	89.2%	78.8%	10.4%		0.0%	11.9 days
Ac	Browse	8	85.4%	78.6%	9.2%	2.4%*	0.0%	16.4 days
Bb	Browse	7	90.2%	73.0%	17.8%	0.6%**	0.0%	16.3 days
Da	Browse	8	93.6%	80.2%	13.4%		0.0%	10.0 days
Average	Browse	7.75	89.6%	77.8%	12.5%	0.7%	0.0%	13.6 days

* 7 birds.

** 6 birds.

² Experimental diets:

(a) Browse—(1) white birch, bog birch, hazel, sweet fern, aspen, blueberry, grit; (2) willow, elm, maple, river birch (*Betula nigra*), alder (*Alnus incana*), rose hips and fruiting heads of smooth sumac (*Rhus glabra*). River birch sometimes had to be substituted for white birch in 1939, but white birch was used throughout the 1940 experiment.

(b) Grains—yellow corn, buckwheat, soybeans, oats, barley, wheat, and rye; grit. The straight grain diet was used only in 1939.

(c) Browse plus grains—diets (a) and (b) together.

Grains were hopper fed, each kind in a separate compartment. Browse was fed in the form of cut branches, rather than hopper fed. All kinds of group (1) were before the birds at all times (with the exception noted above), and were replaced with new material at least every ten days and sometimes more often; group (2) plants were fed somewhat less regularly. White birch browse was generally taken from open-grown trees or from the edges of thickets, as a preference for such browse has been noted by Schmidt (1936) and the Hamerstroms (unpub.). Brushy marsh willows were used instead of tree willows.

Hopkins and Rinzel cared for the birds throughout the experiment. Dr. T. T. Chaddock, Departmental Pathologist, Wisconsin Conservation Department, made pathological examinations of the birds which died during the experiment.

U.S. Weather Bureau station at Arlington, Wisconsin, about five miles southwest of the Game Farm.

The effects of the several diets on body weight are shown in Figures 1 and 2. Tables 1 and 2 express the same data on a percentage basis, using weights at the time of capture as the base. (Weight changes for each lot are calculated from the wild weights of its own members, rather than from an average of all birds together.)

Weight losses on browse alone were severe. Two males and one female starved to death, at 63.5 per cent, 58.3 per cent, and 70.1 per cent respectively, of their weights at the time of capture, in five, nine, and 11 days, respectively. More birds would certainly have died, had not grains been added to the browse diet in time.

The two instances of partial weight recovery on browse came during the spring break-up in 1939, at the time of a sharp and marked rise in temperature.³ It may be that a diet of straight browse is adequate in mild weather, or it is possible that some supplementary food was found on the ground in the pens after the snow melted. In any case, we do not think that this weight recovery has any bearing upon the insufficiency of browse as a *winter* diet.

TABLE 2
EFFECT OF DIETS OF GRAIN ALONE AND BROWSE PLUS GRAINS,
AS SHOWN BY BODY WEIGHT

Lot	Diet	No. birds	Average Weight per Bird				Average period of time
			At start	At finish	Max. loss below starting average	Max. gain above starting average	
Ba	Grains	7	92.4%	90.2%	2.2%	0.0%	19.9 days
C	Browse plus grains	7	88.2%	87.9%	0.3%	4.4%	35.3 days
E		8	88.8%	85.7%	3.1%	1.0%	43.0 days
Average		7.5	88.5%	86.7%	1.8%	2.6%	39.4 days
Ab Db	Grains added to browse diet	8	78.8%	85.4%	0.0%	6.6%	7.0 days
		7	81.5%	86.3%	0.0%	4.8%	15.0 days
Average		7.5	80.1%	85.9%	0.0%	5.8%	10.7 days

³ Temperature for the five day period, March 18-23, during which the recovery occurred: mean 42.6°, maximum 75°, minimum 20°.

A comparison of Tables 1 and 2 shows very clearly that diets including grains are far superior to those without them. By converting the different time periods to uniform periods of two weeks each, the difference may be summarized thus: the birds on browse alone lost an average of 12.9 per cent per bird and three starved to death; addition of grains to the browse diet caused a gain in weight of

7.6 per cent; the birds on grains alone and browse plus grains lost only 1.5 per cent and 0.6 per cent, respectively, of their weights.

This contrast between diets with and without grains would probably have been even greater but for two things:

Infectious disease got into the control pen in 1939. Two males died of disease so early that they were not included in the calculation, and three males died of disease at the end of the experiment. No evidence of disease was found in the other pens. The rather minor weight fluctuations of Lot E (See figure 2) probably give a more accurate picture

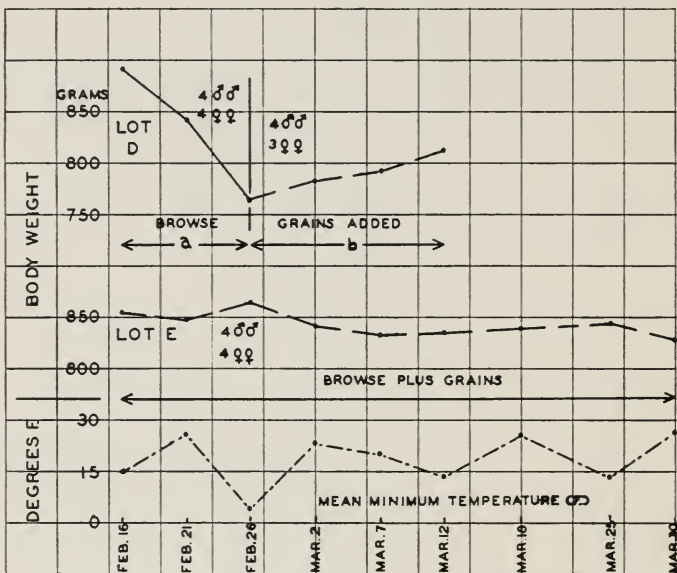


Figure 2. Effect of browse diet on Prairie Chickens, as shown by body weight: 1940.**

than the average of the two control lots. Secondly, the 1940 browse birds (Lot Db) show a poor recovery after the addition of grains, which we suspect is misleading. The females of this lot continued to lose weight during the first five day period of the supplemented diet (from 78.8 to 77.7 per cent), barely held their own during the next period (to 77.9 per cent), and made a slight gain during the last five days (to 80.3 per cent). Examination of sample droppings from this pen showed that very little grain was being eaten by some of the birds—perhaps by the females which did not respond to the change in diet. In contrast, the males of the same lot regained weight in a manner

** See footnote to Figure 1.

comparable to the behavior of the birds in Lot Ab, from 83.1 per cent, when grains were added, to 90.2 per cent at the end of the experiment. Part of the birds in Lot Ab regained slightly more weight after the addition of grains than they had lost on the browse alone (Figure 1).

Whether or not our interpretations of the few discrepancies in the data are correct does not alter the trend, but only—and slightly—the degree, of the main points: birds fed only browse lost weight rapidly, and three starved to death; the addition of grains to the browse diet was followed by a recovery of weight, in some cases to or above the weights at which they started the browse diet; birds on browse plus grains and grains alone practically maintained their weights.

Were these weight changes caused by anything other than differences in the diets? We think not.

The other factors most likely to influence the experiment are probably penning and weather. To pen so wild a bird as the Prairie Chicken introduces an unavoidable difficulty; unavoidable because pen-reared stock was not to be had. Although the birds became considerably tamer during the holding period, the effect of captivity ("penning factor") could not be entirely eliminated; witness the fact that no lot was at any time up to full wild weight. Judging by the behavior of the controls, penning depressed average weights by about 10 to 12 per cent. However, since the details of penning and handling were the same for all lots, it seems reasonable to suppose that the penning factor was the same for all lots, and that direct comparisons in weight behavior may be made among the different lots.

Of the various factors which together make up "weather," temperature is probably the only one which might have influenced weight behavior. The birds were protected against wind by a board wall 18 inches high around the bottom of the pens, and by small board shelters. Snow depth did not affect the food supply. Wild Prairie Chickens often roost under the snow, presumably to conserve body heat. Since the snow within the pens soon became packed down after each new fall, roosting under the snow was generally impossible; this, however, resolves itself into a question of temperature.

The range of winter temperatures included in the experimental periods apparently had not controlling effect on body weight. Between consecutive weighings, weights on browse went down as the temperature rose five times, went down as the temperature lowered four times; after the addition of grains weights went up as temperature went down twice, went up as temperature went up twice. The weight fluctuations of the controls, and of the birds on grains alone, did not at all parallel the weight changes of the experimental birds, either in time or in degree.

The paragraph above refers only to winter conditions. The weight increase at the end of the 1939 experiment has already been discussed.

There seems to be little room for doubt, then, that the weight changes in the experiment were due to diet—that browse alone is inadequate, and leads, at least in some cases, to death by starvation. We do not believe that the data are extensive enough to warrant more detailed analysis—rates of loss and recovery, and differential sex behavior, for example.

How closely the insufficiency of the experimental browse diet may be translated to conditions in the wild is probably a matter of opinion. It is true that the experimental birds were started on the different diets at sub-average weights, but wild birds may be reduced naturally to as low and lower average weights (Hamerstrom, unpubl.); what if they then have nothing but browse to eat? A comparison of weather conditions in the pens and in the wild does not weaken the argument, as the experimental birds had a slight advantage in this respect, since temperature alone was not important: they had protection against the wind, never found their food unavailable because of snow, and could always feed with a minimum of effort and exposure.

The question hinges upon whether or not captivity so upset the birds that they were unable to maintain weight on a diet which would be adequate for birds without that disadvantage. We cannot be certain.

Combine the experimental and observational approaches, however, and the answer seems to be quite plain: browse alone will not carry Prairie Chickens through the winter. Small numbers may be able to supplement a browse diet with an uncertain supply of weed seeds, but to have Prairie Chickens in quantity in the North Central States, winter grains are necessary.

EXPERIMENTAL DIETS: INCIDENTAL NOTES

A few incidental points seem worth reporting. Catkins of white and river birch and hazel, and the fruits of smooth sumac, were eaten much more than were buds of any kind. River birch catkins were eaten as readily as those of white birch, although neither Schmidt (1936) nor the Hamerstroms have seen river birch eaten in the wild. Rose hips were eaten freely in 1939, but not particularly so in 1940. The birds on browse alone ate much more browse than those on browse plus grains; the latter ate rather little browse. Birds on browse plus grains ate more grains than those fed grains only. Table 3 lists the grain consumption during the 1940 experiment.

Hopkins calculated the grain consumption in 1939 at about 1½ ounces per bird per day, with corn generally, buckwheat sometimes, as first choice, and wheat third. During both years grain consumption in the pens was about half of Hawkins' (1937) estimate for wild Prairie Chickens. Oats, barley, and rye were not eaten at all in 1939, and were discontinued after the second week.

The figures in Table 3 seem to give clear orders of preference among the different kinds of grain. Corn was always first choice, buckwheat was second eleven times out of twelve, the others shifted about somewhat in order of consumption. Hamerstrom is convinced that no such

TABLE 3
CONSUMPTION OF GRAINS, IN OUNCES: 1940

Lot	No. birds	No. days	Yel. corn	Buck-wheat	Wheat	Soy beans	Rye	Barley	Oats	Oz. grain per bird per day	Oz. grit per bird per day
Db	7	15	125	8	17					1.4	
E	8	45	427	68	16	10	10	5	1	1.5	0.04
Average	7.5									1.5	

general preference exists in the wild. He has seen wild packs alternate between adjoining corn and buckwheat fields with a clear preference for buckwheat through most of a winter; others feeding on soybeans and refusing corn thrown on the ground for weeks at a time, then suddenly switching to corn for a few days; and still others alternating between corn and ragweed when both were equally available and in fields side by side. These shifts, with the possible exception of that from ragweed to grain, seemed not to be correlated with weather conditions; more significant, some packs preferred one grain at the very time that others would have nothing but another. While some packs were eating corn, others refused corn for buckwheat, and others refused corn for soybeans.

DISCUSSION

The foregoing data on food habits and food requirements stand up well enough as individual facts, but they seem to integrate poorly. For all that these things may be true, the Prairie Chicken is still a grouse, and may well be expected to feed as the others of the family do. Why such extravagant behavior?

It is extremely unlikely that the Prairie Chicken developed as a species along with the development of primitive cultivation. Aside from taxonomic grounds, the food habits of the other two subspecies point in the opposite direction. Gross (1928) and Forbush (1916: 386, 393) say that the Heath Hen ate grains, but Gross (1928: 550) says further ". . . in the winter months acorns, seeds, and certain berries found in abundance throughout the present range of the Heath Hen provide the birds with a livelihood. A comparatively small amount of snow falls on Martha's Vineyard, hence it is an exceptional winter when these birds are unable to secure sufficient food from native plants."

Lehmann (1939 and MS) has found that cultivated crops are not necessary to the Attwater Prairie Chicken (*T. c. attwateri*), and are but little taken. Further, according to Bogardus (1874: 73), Prairie Chickens in Illinois did not recognize corn as a food until several years after its introduction.

Perhaps on their original range and under original conditions Prairie Chickens subsisted on the typical grouse regimen of low concentrate foods. If so, there is no need to look further for an all-important native high-concentrate, such as acorns (Grange, 1939), "acorns or some legume" (Schmidt, 1936), or *Sylphium* (Hawkins, 1937). If so again, the importance of grains in the winter diet of chickens on their acquired northern range may be looked at in another light: the fact that they were adaptable enough to alter their type of feeding has made it possible for them to extend their range so far north of their original limits.

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GENERAL NOTES

A Swallow-tailed Kite in New Jersey.—On May 19, 1940, Gilbert Cant, Dave Fables, and I saw a Swallow-tailed Kite, *Elanoides forficatus*, at Edgar's Dock, on the north side of the Raritan River near Nixon, New Jersey. When the bird was first seen it was flying approximately northeast toward us. Several times it soared in circles of about an eighth of a mile radius, once passing within 150 feet of us. We could then distinguish the white underparts and the bluish-black colorings of its wings and tail.

According to Witmer Stone ("Bird Studies at Old Cape May," p. 269), there are six records of this species for New Jersey, the last record having been made in southern Cumberland County on June 4, 1893.—WILLIAM F. RAPP, JR., 130 Washington Avenue, Chatham, New Jersey.

Bald Eagle Nesting in Kentucky.—For many years no occupied nest of the Bald Eagle (*Haliaeetus leucocephalus*) has been known in Kentucky. One of the few published references to breeding eagles in the state is found in an article on the birds of Fulton County by Leon O. Pindar (*Wilson Bulletin*, 37, 1925:85.) in which he mentions several pairs that were nesting during the 1890's on Island No. 8 in the Mississippi River near Hickman, Kentucky. Consequently we heard with keen enthusiasm rumors of Bald Eagles nesting in Ballard County, Kentucky, near Wickliff. We are indebted to Captain R. C. Soaper, federal warden stationed at Henderson, for reports as to the actual location of the nest.

On June 28, 1941, the junior author visited the area of Swan Pond, four miles west of Wickliff in Ballard County, and directly across the Mississippi River from Cairo, Illinois. After considerable search in the heavy cypress growth at the west end of the 500-acre pond he was able to locate the nest, which at that late date was unoccupied. However two immature Bald Eagles and an adult bird were seen in the immediate vicinity, and local residents were unanimous in asserting that young had been reared in the last two seasons. Unfortunately the situation of the nest, high in a very large cypress, and well screened from below, was unsuited to photography.—BURT L. MONROE and ROBERT M. MENGEL, Louisville, Kentucky.

The Dance of the Sandhill Crane.—On May 2, 1939, at Portage Lake, Jackson County, Michigan, the following observations were made by Leonard Allison and the writer. The observations were made while lying in the sedge flats approximately 300 feet from a couple of Sandhill Cranes (*Grus canadensis tabida*).

When first seen the two cranes were quietly feeding along the moist banks of a shallow pond. Presently they ceased their feeding and retired a few feet to drier ground. One of the birds picked up a stick and dropped it quickly. The other bird became quite erect and slowly walked across the marsh with its neck very straight, but with the entire rigid neck and head swinging forward and backward. It gave the appearance of a crane moving forward with its head fastened by some invisible force which suddenly relaxed and let the stiff neck swing forward from its junction with the body, only to be temporarily held back again.

In the next stage of the dance the birds began bowing to each other and slowly flapped their wings. This presently developed into a drunken weaving motion with the birds reeling from side to side and also rocking to and fro. Finally they began jumping backwards, leaping into the air 2 or 3 feet, with their wings flapping and their legs dangling forward. The frenzy of this stage gradually subsided until the birds began bowing again, and both birds picked up sticks only to let them fall to the ground. The entire dance took about 3 to 4

minutes and was repeated again after 4 or 5 minutes of less active bowing or walking, and took place in a rather small area of perhaps 25 feet in diameter. After five dances, all of which were of the type described, the birds resumed feeding.—
JOHN L. GEORGE, *Department of Zoology, University of Michigan, Ann Arbor, Michigan.*

The Starling in Jackson, Wyoming.—On the morning of April 5, 1941, at my home at Jackson, Wyoming, I saw a bird fly off in a characteristic fluttering manner that instantly marked it as a Starling (*Sturnus vulgaris*). It was snowing lightly at the time. The bird alighted for a moment on a neighbor's lawn, then went into a row of willows. With field glasses I pursued it for a time but finally lost it among a lot of English Sparrows in the thick brush. A Sharp-shinned Hawk had dashed through the neighborhood and all the birds about me had taken to cover. Upon my return to my own yard, there was the Starling, and this time I had an opportunity to observe it closely, to note the yellow beak and characteristic plumage before it flew away.

McCreary ("Wyoming Bird Life") records the Starling in southern Wyoming in 1937 and 1938. This is apparently the first occurrence in Jackson Hole.—
OLAUS J. MURIE, *Fish and Wildlife Service, Jackson, Wyoming.*

The Strange Death of a Young Grackle.—In a small swamp just south of Ithaca, New York, on the morning of May 18, 1941, we found a dead fledgling Bronzed Grackle (*Quiscalus quiscula aeneus*) dangling by a string from a willow twig. Instead of the usual string mortality caused by entanglement of the head, wings, or feet, this bird died through *swallowing* the string. Death occurred after a loop of the string hanging from the mouth caught around a leaf. Death must have occurred, at the very earliest, during the prior evening, since the bird was quite fresh.

Dissection of the digestive tract revealed the following: One corner of the mouth was grossly irritated, probably as a result of rubbing of the string during the bird's struggles. A double length of string passed through the esophagus terminating in a tightly packed wad of string in the proventriculus and ventriculus, thus making an exit through the pylorus impossible. The wad of originally white cotton string was sticky and stained yellow from the action of gastric juices. The total length of the string, including some three or four inches which protruded from the mouth, was eleven feet, ten inches, although the bird had probably swallowed a much shorter tangled mass rather than the entire length of string inch by inch. The condition of the bird was otherwise apparently normal.

How this young grackle, perhaps two weeks old, and still dependent upon the parents for food, happened to get this unusual item in its digestive tract is purely conjectural.—KARL W. KENYON and LEONARD J. UTTAL, *Cornell University, Ithaca, New York.*

Unusual Behavior of a Banded Cardinal.—On April 24, 1941, three small boys in my neighborhood brought me, alive, an adult male Cardinal (*Richmondia cardinalis*), which I had previously banded. They stated that they had found this bird flopping about the grass, his beak tightly clamped about his band. When handed to me he was still grasping his band. His tail feathers were gone and he was quite thin but otherwise appeared in good health. The history and behavior of this bird is so unusual that I would like to relate it chronologically.

On December 27, 1939, this bird was banded No. 39-223571. At that time he was a fully matured male and there was nothing unusual about his behavior,

except that he was a squealer and quite vicious, but this is not uncommon among Cardinals.

On New Year's Day, 1940, he repeated, and he had so worked on his band that the numbers were badly worn and the band was mashed tightly around the tarsus. I removed the band and substituted No. 39-266001.

He repeated again on March 10, 1940, and although his band was in good order, his behavior was such that I made a special note of it on my daily banding sheet. Upon removing him from the house trap, he grasped his band in his beak, and I used considerable effort in forcing him to release it. In the gathering cage he grasped the wires, and I was again put to considerable effort in getting him loose. After ascertaining his band number, I released him by placing him on the ground. Instead of flying away, he reached down and grasped his band again. My notation reads, "Even when released this bird continued to bite his band, and would not turn loose until rolled over several times and shaken. Squealing all the time."

On April 24, 1941, I found his band so worn as to be barely discernible and again it was mashed tightly against the tarsus. I again removed the band (after considerable difficulty, for he was exceedingly vicious) and fitted a new band. I placed him on a low branch of an apple tree. He seemed too weak to fly and fluttered to the ground. After taking a few steps, he saw the band and immediately clamped down on it and rolled over. He made no effort to move when I picked him up. Twice again I gave him a fresh start, but each time he no more than perceived the band than all thoughts of his own safety were forgotten in his hatred of it. It was thus obvious that if the band was not removed he would not survive the local predators. There was nothing to do but release him, unbanded. This I did, and although he could not fly, he hopped away with vigor and lost himself in the underbrush.—JAMES B. YOUNG, 2516 Talbott Avenue, Louisville, Kentucky.

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

- T. H. Bissonnette—22 reprints
- Frederick N. Hamerstrom—2 books, one pamphlet
- John B. Lewis—10 periodicals
- Margaret M. Nice—7 reprints
- James Savage—2 periodicals
- O. A. Stevens—1 bulletin
- George J. Wallace—1 reprint
- J. M. Winterbottom—23 reprints

EDITORIAL

The Wilson Club's Illustrations Committee is interested in bettering the illustrations of the *Bulletin* and in finding funds for reproducing there more pictures. The Committee has in mind amassing a sizeable sum of money which will pay for more half-tones and, eventually, one or more color plates in each volume. Donations will be gratefully received, of course, but the Committee's present plan for increasing the size of this fund is to sell, at the coming meeting, certain originals that have already been reproduced. We hope that other artists will eventually contribute paintings or drawings for this purpose, but at the next meeting at least ten small-sized Sutton originals will be placed on display to be sold at a moderate figure for the benefit of the fund. Pictures to be placed on sale include small sized water-colors of the following species: Ruffed Grouse, Red-wing, Great Horned Owl, Crested Flycatcher, Bluebird, Bald Eagle, and Prairie Chicken.

Members are reminded that two important proposals (see page 59 of the March *Bulletin*) for increasing the Club's income from dues were placed on the table last year for final decision at the 1941 Annual Meeting. Economic changes since last November make it even more imperative that some action be taken. No other comparable bird journal is maintained on such low minimum dues. We have managed to balance the books for the last year or two only by virtue of the generous donations of a few individuals. Obviously we cannot expect them to carry permanently the burden which should be shared by all the members.

We had a number of requests in response to the offer we made last year to supply reprints of our lists of current bird papers for cutting and pasting on bibliography cards and this has now become a regular *Wilson Bulletin* service. Since the annual sets cost only a few cents, some members get two sets and maintain one set of author cards in addition to the set filed by subjects. Experience has shown that, while subject entries must for flexibility be posted on separate cards, as many as eight or ten titles by one author can be posted on one library card, thus saving much space in the author files.

Others interested in obtaining these reprints should apply to the Editor.

The Annual Meeting of the Wilson Ornithological Club for 1941 will be held on the University of Illinois campus, November 21 to 23. Dr. Kendeigh, chairman of the Local Committee on Arrangements, reports that headquarters will be in the attractive new Illini Union Building. Members and guests will find comfortable lounging rooms there for conversations and for conferences. Luncheons and the annual banquet will be in this building, which is centrally located in respect to the meeting place and the hotels. Living quarters should be arranged for in advance at any of the main hotels: Tilden-Hall or Inman in Champaign and Urbana-Lincoln in Urbana. Rates are reasonable and, in addition, tourist rooms on the main highways are available. City busses provide quick and inexpensive transportation from any part of the twin cities to the Headquarters and to the place of meeting. Most of the sessions will be held in Gregory Hall.

Members should be considering what papers they will present, for the titles will be requested in the Secretary's letter that all members will soon receive. As a special feature of the program plans are being made to portray ecological and experimental aspects of bird study. Dr. V. E. Shelford has consented to serve as chairman of a symposium dealing with some phase of ecology in relation to bird studies. Dr. Shelford has long been a leader in this country in animal ecology and his discussion will be of special value to bird students who wish to know more

about how to use ecological principles in their own field work with birds. Members will be given an opportunity to inspect the facilities and equipment for this kind of work at the Vivarium Building and to observe researches under way. The new Natural Resources building, where the Illinois State Natural History Survey is conducting many studies dealing with conservation and wildlife management, will also be open for inspection.

For Sunday there is planned a trip to the Chautauqua Wildlife Refuge near Havana, where a large number of waterfowl may be expected at that season of the year. The trip will include a stop at the new Natural History Survey Laboratory located on the Refuge, with an inspection of the work with water birds and other animals that is being conducted there.

We expect a large attendance for our Annual Meeting at this important and conveniently-located ornithological center which the Club has never before visited.

June 3, 1941.

To the Editor of the Wilson Bulletin:

For the benefit of your readers, I am submitting this report of progress on my series of Bulletins on the life histories of North American birds.

The fourteenth volume, on flycatchers, larks and swallows, will go to the printer very soon, though it will not be published before some time next spring, as the Government Printing Office is congested.

My work on the fifteenth volume, containing the Corvidae and the Paridae, is now all written and will go to the publishers this fall.

I am now starting work on the sixteenth volume, to contain all the birds on the 1931 Check-List from the Sittidae to the Mimidae inclusive. I should be glad to receive, as soon as possible, any notes, data or photographs relating to any of the birds in these six families.

The sooner these are sent to me, the more likely they are to be included in the work, and the more conveniently I can handle them.

I wish to thank all former contributors to this co-operative work for the valuable material sent to me in the past, and to solicit their help in the future. All material is welcome, though I can use only the most important part of it.

Sincerely yours,

A. C. Bent

140 High Street,
Taunton, Mass.

OBITUARY

MYRON H. SWENK, formerly president of the Wilson Club and associate editor of the *Bulletin*, died at his home in Lincoln, Nebraska on July 17 at the age of fifty-seven. Professor Swenk, long chairman of the entomology department of the University of Nebraska, was also the recognized leader in ornithology in his state. He was the founder and editor of the *Nebraska Bird Review* and in addition published there and elsewhere a series of scholarly contributions of his own to the ornithology of the West.

WILDLIFE CONSERVATION

Mining on Public Lands

The Wilderness Society calls attention to a serious potential danger to public lands (see *Wilderness News*, No. 14, March 12, 1941). Senate Resolution 53, introduced by Senator O'Mahoney, calls for an "investigation with respect to the development of the mineral resources (including oil and gas) of the public lands of the United States, and of the existing laws which relate to such development, with a view toward (1) providing for more effective development and utilization of such resources for the purpose of national defense, (2) fostering free competitive enterprise and the investment of private capital in the development of the mineral industry and the production of essential and useful minerals, and (3) conserving such mineral resources to the fullest extent which is consistent with their proper development and utilization."

In the same article, Senator O'Mahoney is quoted as having said, in part, "Anyway, we could not forever expect the resources of the National Parks to be locked up when some of the minerals might be vitally needed for national defense."

Conceivably, some of these minerals might be needed under a defense emergency, but it is disquieting to learn that "competitive enterprise" has been considered on practically equal footing, and without specific exclusion of national parks and monuments, or of wilderness areas. The situation is the more serious as our present mining law—now almost sixty years old without amendment—is wholly inadequate to protect the public interest, should more mining be allowed for any reason on public lands.—F.N.H.

Conservation and National Defense

Albert M. Day, of the Fish and Wildlife Service, was recently detailed to act as liaison officer between national defense and conservation programs. He is to ensure that the operations of the War and Navy Departments, and of commercial firms under the Office of Production Management, do not damage wildlife.

First fruits of this provision have already appeared. According to *Wildlife News* (July, 1941, 1, 5), several bombing and gunnery ranges have been shifted or adjusted to spare areas especially valuable to moose, caribou, furbearers, and waterfowl. The plan also calls for the prevention of stream pollution by sewage from encampments and by government defense-industry wastes: two mobile field laboratory crews are being organized to make sure that specifications are followed.—F.N.H.

Yellowstone Coyotes

The Murie brothers score again—this time Adolph Murie, with his study on the "Ecology of the Coyote in the Yellowstone" (*Fauna of the National Parks, Bull. No. 4, 1940*), The coyote has been accused of many things in the Park, among them destruction of Trumpeter Swans. Murie says, "The data available at the present time indicate that the coyote does not represent an important mortality factor for the Trumpeter Swan." The same may be said for other animals except rodents.—Leonard William Wing.

Waterfowl

"Within recent years there has been agitation for an increase of the hunting season on the basis of the Bureau of Biological Survey report of an increase of five to ten per cent among the waterfowl. True, there has been an increase; but at the rate of a five per cent annual increase, it would require 14 years to restore the waterfowl population to 50,000,000 birds, one-half of the 1930 population which was considered a crisis population at that time." (from G. N. Rysgaard, "A short history of waterfowl," *Conservation Volunteer*, 2, No. 9, June, 1941:75-9.)

Parenthetically, it is encouraging to find a statement of this kind in the official publication of a state (Minnesota) Conservation Department.—F.N.H.

Humane Traps

The American Humane Association, after its thirteenth annual trap contest (in 1940), announced the development of chain leg-hold traps which "will do anything the steel trap will do"; i.e., equals the steel trap in the four qualities of humanness, efficiency, practicality, and reasonableness of cost. The Association considers leg-hold traps markedly more humane, and claims that they "go the steel trap one better by obtaining [for the trapper] an undamaged pelt." (*The National Humane Review*, 28, No. 7, July, 1940:3.)

Following their fourteenth annual contest, in 1941, the Association now says, "Humane traps of all types have now come to light which [compared with steel traps] are just as cheap to manufacture, just as light to transport, easier to set and more efficient." (*Ibid.*, 29, No. 7, July, 1941:5).—F.N.H.

WILDLIFE CONSERVATION COMMITTEE

Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL NEWS

The officers charged with the arrangements for the Tenth International Ornithological Congress scheduled to have been held in the United States in 1942 announce that the proposed meeting has been indefinitely postponed.

Material for a biography of Louis Agassiz Fuertes, naturalist and bird artist, is being collected by his daughter, Mrs. Mary Fuertes Boynton, R.D. 3, Trumansburg, New York. She is eager to have letters written by Louis Fuertes, as well as anecdotes and personal recollections. Letters sent to her will be copied and returned to the owners promptly.

Burt L. Monroe has been appointed State Ornithologist of Kentucky.

Harry C. Oberholser retired on June 30 after forty-six years of distinguished service in the "U.S. Biological Survey." Since his retirement from the government service he has been appointed curator of birds at the Cleveland Museum of Natural History. Dr. Oberholser is one of the Wilson Club's members of longest standing. He joined in 1894, the year the *Bulletin* began publication.

The Annual Convention of the National Audubon Society will be held at Audubon House in New York City from Friday evening, October 17 through October 21. There will be field trips to Cape May, New Jersey, and Montauk Point, Long Island on October 18 and 19. The meeting will be featured by the showing of some of the finest wildlife motion pictures in color. The public is cordially welcome.

The Fifty-ninth Stated Meeting of the American Ornithologists' Union was held in Denver September 1 to 6. The former officers were reelected. The Wilson Ornithological Club was represented at the sessions of the Council by George M. Sutton. The 1942 meeting will be held in Philadelphia.

ORNITHOLOGICAL LITERATURE

A FIELD GUIDE TO WESTERN BIRDS. By Roger Tory Peterson. Houghton Mifflin Company, Boston. 1941: 4½ x 7¼ in., xviii + 240 pp., 6 col. pls., 40 black and white pls., 40 text figs., map. \$2.75.

The Editor of this journal may have erred in requesting the undersigned to review the present work, for the latter professes partiality for Mr. Peterson's unique style of field bird guide. The novelties introduced in this author's "A Field Guide to the Birds" (1934) and elaborated upon in the revised edition of 1939, appear to have reached culmination in the present work. At least, it seems to this reviewer that there is little room left for improvement. We doubt whether any other person in this country combines Mr. Peterson's qualities for conciseness of expression, both in illustration and in print, of the essential identification points of birds, features which are expressed in every page of this book.

With these words of well merited praise, we turn to a brief description of the book. Although it contains 260 pages of material plus 46 unnumbered pages of plates, the book is not beyond "pocket" size; but it would seem a pity to so abuse such a valuable little volume. The 201 pages of main text are interspersed with the 40 excellent pen and ink figures, many of which depict details of identification points; while each plate usually portrays from five or six to twenty or more species in Mr. Peterson's characteristic, diagrammatic style. The book's scope is conveniently indicated by a map and includes the eleven western states, western Texas including the Rio Grande valley, and the western part of the Great Plains area. Here it is noted that observers in the eastern margin of the area will also require the eastern companion volume to cover adequately their regions.

The plan of the book closely follows that of its revised eastern predecessor, except as regards the treatment of subspecies. Thus, a brief preface and directions as to how to use the book comprise the 18 introductory pages. Here the novel treatment accorded subspecies is but briefly mentioned, while this important matter is more fully explained in the form of an addendum, where a list of the subspecies and their ranges is also provided. It would seem more logical to have included the remarks about subspecies in the preface and the reviewer urges readers to peruse this section before using the book. That this was not done was probably due to the author's commendable desire to de-emphasize the subspecies in field identification work. Mr. Peterson has handled this difficult subject in an admirable and courageous way. His efforts in this direction should do much to lighten criticism of similar changes contemplated for the next edition of the A.O.U. Check-list.

Briefly, in most cases only the species or the single subspecies, if but one form occurs within the scope of the book, is named and figured. Where several races of a species occur, the common and scientific names of all known from the region are listed at the end of the species' accounts. The range is here provided for the entire species only and is restricted to the scope of the book. Subspecies' ranges are, as stated, listed in the addendum. It would seem to have saved some space to have given the subspecific ranges in the main text, but such procedure might have added importance to subspecies which the author desired to avoid. There are a few exceptions to this rule, cases in which it is possible to identify subspecies in the field, like the races of the Canada Goose and White-crowned Sparrow, in which instances the field identification marks and the ranges of the subspecific forms are provided in the main text, following the species accounts.

There are included 534 forms which are treated as species. This includes practically all of the wild birds of the area, even "casuals" and seven introduced species. Under these main forms, not more than about ten subspecies in all are described as being identifiable in the field. In all other cases the subspecies are referred to as having "no apparent field differences," their field identification being

thought to be either very difficult or impossible. This is certainly a step in the right direction with which most ornithologists will heartily agree.

Each main form is named, usually with the A. O. U. Check-list's vernacular and scientific names. If there are subspecies in the area, the note "Subsp." follows. Then comes a reference to illustrations and in many instances, especially of ducks, hawks, shorebirds, and gulls, there are two or three figures of a species. Next the length of the bird is given in inches at the beginning of the word description which covers both sexes if different and sometimes immature plumages as well, always concisely stressing field characteristics. In many instances there follows a section on voice, but this is so frequently omitted that one wonders how little may be published elsewhere in this connection. In the cases of the similar appearing species of the *Empidonax* flycatchers and of subspecies of the White-crowned Sparrow, where the birds' songs may differ more than their plumages, helpful diagrammatic song analyses are provided in the text. Finally, the form's range within the scope of the work is provided, and following this, the subspecies if any, are listed.

The success of Mr. Peterson's books, we think, lies principally in his excellent diagrammatic drawings and in their number. In this respect the present volume is especially rich. Of the 534 species treated, 464 (87 per cent) are figured. A number of them are illustrated four or more times to show the sexes, ages, and various postures. Thus this is truly an illustrated manual and as such it will no doubt be especially useful to beginners in bird study. The author has expressed excellent judgment in his choice of the 70 forms which are not figured. Thus, such well known birds as the Crow and Robin are not illustrated. Other kinds so eliminated include mostly rare or casual occurrences that are either strikingly individual, as the Whooping Crane and Spoonbill, or so similar in appearance as to render portrayal of the differences difficult or impossible. Some shearwaters and the *Empidonax* flycatchers, of which only the Western is illustrated, are examples of the latter category.

The author states in the preface that the Field Guide is not intended to replace Hoffmann's *Birds of the Pacific States* in the area (Washington, Oregon, and California) which both cover, but rather the latter is to be used as a companion piece to the former. In the other western states, the present guide should fill a much needed want. Mr. Peterson acknowledges Hoffmann's more thorough treatment of bird voices and habitats with the statement that such detailed consideration was impossible in a book the size of the present one.

The entire work is so well done and free from typographical and other errors that it would be uncharitable indeed to mention the remarkably few lapses that have come to the reviewer's attention. Perhaps the frequent omissions of a species' voice or notes, already mentioned, is a criticizable point; but here many of us can blame ourselves for not publishing what we know of this important subject, rather than the author. No one person can be expected to know the notes of every bird of a region, and for North America, Mr. Peterson probably knows as many as does any other person.

The excellence, usefulness, and modest cost of this book should be incentive for everyone interested in birds to own a copy. Certainly, this should apply to all bird students in the West, while to those in the East who know their birds well, the western guide will probably be more interesting than their local one.—James Moffitt.

BIRD ISLANDS DOWN EAST. By Helen Gere Cruickshank. With photographs by Allan D. Cruickshank. The Macmillan Company, New York, 1941: 6 x 8½ in., xii + 123 pp., 50 photos.

With exceptional charm Mrs. Cruickshank writes her first book—the adventures she has shared with her ornithologist husband among the sea bird colonies of

Maine's isolated, coastal islands. Thus, we read of many experiences encountered while studying and photographing the Puffins and Leach's Petrels of Machias Seal Island, the Double-crested Cormorants of Old Man Island, the Laughing Gulls and Black Guillemots of Little Green Island, the Arctic Terns of Matinicus Rock, and the Great Blue Herons of Otter Island. We read, too, of banding Herring Gulls on Western Egg Rock, of late summer trips to Monhegan Island to view migrating birds, of Hog Island with its perennially used Osprey nest and the Audubon Nature Camp with which the Cruickshanks are associated.

The book is most attractive, its jacket appropriately embellished with a photograph of a Puffin, an avian personality which Mrs. Cruickshank believes is the one northern colonial nesting bird that bird watchers are most anxious to observe. The text is relatively brief, simply worded, and offers smooth enjoyable reading. Not a compendium of ornithological lore, the book is nevertheless sound ornithologically, with keen observations and vivid descriptions coupled with touches of good humor and warm feeling for Maine's seaboard environment. The many photographs with which the book is generously illustrated are superb.—O. S. Pettingill, Jr.

THE AUDUBON GUIDE TO ATTRACTING BIRDS. Edited by John H. Baker. Doubleday, Doran and Company, Garden City, New York, 1941: 5½ x 8 in., xviii + 268 pp., frontispiece in color, 8 pls., 11 pp. of line drawings. \$2.50.

This helpful volume is written by four members of the National Audubon Society staff, Roger Peterson, Richard Pough, Dorothy Treat, and Mr. Baker. The book is designed to be a guide to practical methods any bird lover can use in attracting birds around the home or sanctuary, and it accomplishes its purpose very well. The emphasis is upon song birds, but predators, and waterfowl, and other game species are also included. The book is broader by far than its title implies, for in addition it treats of several other topics of interest to the bird student.

In his seven opening chapters, which constitute the bulk of the book, Roger Peterson easily maintains his solid reputation. His contributions are readable and entertaining, as well as useful. Many a bird student, experienced as well as novice, will find helpful suggestions in his sections on methods of study, choice of a binocular and camera, and technique of bird photography.

In attracting birds the why of each procedure as well as the how are considered. Territorial behavior of the birds, ecological succession, the effect of insecticides upon the bird population, a sane attitude toward predators, and even a chapter on the legal aspects of trespassing, liquidating your neighbor's cat, and of other minor temptations which occasionally face the bird lover—all find their place. These and many other topics must naturally be treated very briefly, but the total effect is surely to broaden the outlook of the average student of birds.

All of the familiar, and many new and novel methods of attracting birds are described. Bird houses, bird baths, bird feeders, and the choice and arrangement of trees, shrubs, and other plants for cover and food are all treated effectively.

In such an all-inclusive work it is small wonder that there are points which a reviewer would question. Are birds really so essential that without them, as Mr. Baker says, "trees . . . would wither; crops would not thrive; lawns would deteriorate; ponds and streams would become polluted; soils would erode"? Many an entomologist, probably as capable to judge as we ornithologists, would doubt it. The old food patch mixture (p. 54) of 16 varieties of seed quoted from the Michigan Department of Conservation has in recent years been greatly improved by simplification. Wood Duck boxes (p. 115) are usually unsuccessful without a generous layer of sawdust or rotting wood in the bottom. The list of plants (pp. 226-247) would have been more useful, we believe, if it had included fewer species,

with more information about each. Red cedar, barberry, and buckthorn are all recommended with no caution against the fungus diseases for which they serve as alternate host. Beach plum is described as a "good" bird food, although actual records of its use by birds are few and far between. And why, in a book on attracting birds, does the frontispiece and only colored plate depict the Great Blue Heron, which it is practically impossible to attract?

These are all minor details, however. This book, the leader in its field, will be a profitable addition to the library of every bird lover.—Gustav Swanson.

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Figure 1. A female Cowbird taking an Oven-bird's egg from the nest. 9:10 A.M., May 30, 1941.

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THE COWBIRD AT THE NEST *

BY HARRY W. HANN

THE parasitic habit of the Cowbird (*Molothrus ater*) was known before the time of Alexander Wilson (1810), but the details of watching nest-building, visits of inspection, time of day of egg-laying, manner of approaching and entering the nest, time required for laying, and the systematic taking of eggs of the host from parasitized nests are features which have been brought to light only in the last few years. Some progress also has been made in the study of territory, mating, and length of laying season, but since these subjects are largely outside of the scope of this investigation they will be omitted from the discussion.

Early information on the Cowbird dealt with such points as came to the notice of the collector or casual observer. Naturally these dealt chiefly with the species of birds parasitized, the number of eggs laid, and the behavior of the young Cowbirds. Concerning these items there is a voluminous literature which has been summed up well by Friedmann (1929, 1931, and 1934).

Wilson (1810, pp. 154, 156), Audubon (1831, p. 495), and Burroughs (1887, p. 29) recognized that Cowbirds sometimes found the nests of the hosts by watching for nest-building, and Wilson quotes from Dr. Potter of Baltimore who saw a female Cowbird watching a Bluebird building a nest. Some of the later ornithologists, however, lost sight of these facts, and Forbush (1927, p. 423), for example, says, "A pregnant Cowbird, desiring to be rid of an egg, sneaks quietly through orchards, woods or thickets searching for an unguarded nest in which to deposit her leavings." It has been shown by recent work that female Cowbirds make a habit of watching nest-building (Friedmann, 1929, p. 187), and that they may return four or five days later to lay in these nests (Hann, 1937, p. 207) after the manner of the European Cuckoo (Chance, 1940, p. 25).

There is little actual data on the time of day that Cowbirds' eggs are laid. Before my own earlier work (1937) there was but a single recorded case of anyone observing a nest both before and after the supposed laying. Friedmann (1929, p. 185) accidentally saw a Cowbird go to a Robin's nest which he had just examined, and deposit an egg at 7:30 in the morning. The actual layings which I have observed,

* Contribution from the Department of Zoology, University of Michigan.

five in all, took place at dawn, about five o'clock (E.S.T.) or just before. In addition to these visits of the Cowbird, there were five additional visits made at the same time of day with the evident purpose of laying, but the bird was distracted by the photoflash.

Regarding the taking of eggs of the host by the Cowbird, Burroughs (1887, p. 29) says, "There is no doubt that, in many cases, the cowbird makes room for her own illegitimate egg in the nest by removing one of the bird's own." He also noted that the removal of eggs was confined to nests containing two or more eggs, an observation which I have found true in every case, although in one instance, one of the eggs was a Cowbird's, and in another, both were Cowbird's eggs, including the one taken (1937, figures 10-20).

T. S. Roberts (1932, p. 325) relates that a female Cowbird took an egg from a Scarlet Tanager's nest while he had his camera focused for a picture of the nest, and that he obtained a picture of the bird with its bill thrust into the egg. He also saw a female Cowbird take an egg from a Chipping Sparrow's nest. However, in spite of his own observations, he states that frequently the Cowbird removes an egg at the time of depositing her own.

Mrs. Nice (1937, p. 157) accidentally saw the female Cowbird take an egg of the Song Sparrow on two different occasions, both being in the forenoon, as in the case of my own observations. For the first three years of her work on the Song Sparrow, Mrs. Nice estimated that the number of eggs of the host taken by the Cowbird was 20 per cent of the number of Cowbird's eggs laid, but for the last four years she calculated that the loss was about 56 per cent, and concluded that the estimate for the first three years probably was too low.

In my own study of the Oven-bird (*Seiurus aurocapillus*) previously reported (1937, pp. 202-204) there was a loss of thirty eggs of the host attributable to the female Cowbird, and in addition to these, four eggs of the Cowbird itself. The total number of Cowbird's eggs laid was forty, thus the loss of the host's eggs was 75 per cent, and the total loss 85 per cent, of the number of eggs laid. Only a single parasitized nest retained the full number of eggs laid, and this one doubtless would have had an egg removed had I not set up a blind to see her take the eggs and frightened her away when she came (p. 203). None of these eggs in instances which were fully known was taken at the time the Cowbird laid her own egg, as is the case with the European Cuckoo (Chance, 1940, p. 27), but each was removed on a separate trip during the forenoon. As nearly as could be determined in twenty-three known cases, ten eggs disappeared on the day before the Cowbird's egg was laid, ten on the same day and three on the following day (Hann, 1937, figures 10-20). I have seen the female Cowbird take an egg of the Oven-bird on three occasions, one of these observations being

accidental, and two while I was watching for the incident to take place.

During my early study of the Oven-bird I learned to predict with some degree of accuracy when the female Cowbird was coming to a nest. Rules to be observed when one wishes to see her there are the following:

1. Begin with the earliest nests of the season, since they are the most heavily parasitized.

2. Watch for egg-laying on the mornings that the second, third, fourth and fifth eggs of the Oven-bird are laid, but not earlier lest the Oven-bird be disturbed.

3. Be in the blind by the time it begins to get light. If the Cowbird is coming she will be there during the next half hour.

4. Give preference to a nest where an Oven-bird egg has disappeared on the previous day.

5. Watch for the disappearance of an egg of the host during the forenoon following the laying of a Cowbird's egg early in the morning.

Up to the time of my first publication on the Oven-bird (1937) I had witnessed the laying of two eggs and had seen two Oven-bird's eggs taken, one case of egg taking being seen accidentally and one while watching purposely at the nest. My time had been so taken up with other phases of the work that I had made no effort to obtain photographs. Early in 1939, however, I began preparations for the season which was to follow, with the idea of getting some pictures of the female Cowbird as she came to the nest to lay, and, if possible, photographing her as she was taking an egg of the host. Also, additional observations which threw light on the habits of the Cowbird were to be recorded.

Certain problems in connection with photography had to be solved before I could get a picture. First, the Cowbird lays early in the morning before it is possible to get a daylight picture, and I met this problem by securing a portable photoflash apparatus. After some preliminary tests I found that I could get satisfactory pictures at close range with my 9 x 12 cm. Voigtländer camera, using panchromatic plates exposed 1/200 of a second with the stop at 22. This arrangement gave plenty of speed and depth and practically assured a picture, if the Cowbird and the operator performed their parts. The problem of operating the camera at a distance of seventy-five centimeters from the nest, and at the same time having the blind far enough back so that the birds would not be disturbed was solved by attaching the camera firmly to a portable rack which was placed in front of the nest, and releasing the shutter by a heavy thread attached to a lever which pressed on the releasing cable. The rack with the mounted camera and photoflash was carried to the woods each morning when watching. Its place was taken at the nest at other times by dummy racks which had tin cans mounted in place of the camera and reflector, so that the birds would not be frightened or confused by the sudden presence of the

apparatus. The blind ordinarily was left at the nest during the egg-laying period, but at one nest which was near the highway the blind was put up daily.

OBSERVATIONS IN 1939

My first contact of the season with the Cowbird, other than observing its presence, was a purely accidental one on May 18. I had found an unfinished Oven-bird's nest on the side of a bank at the edge of a creek-bed, and was sitting on a log twelve meters away on the opposite side, watching the female as she carried material to the nest. The Oven-bird left the vicinity with her mate for a time, and in about two minutes a female Cowbird appeared on the side of the bank about twelve meters from the nest. She came down to the thick vegetation along the lower edge of the bank and walked toward the nest, stopping frequently to look around, but walking rapidly when she went. She apparently saw me, but was little concerned with my presence. It took her about two minutes to reach the nest, and I raised my glasses to watch as she approached. She walked directly to the nest, stuck her head in and apparently pecked once. She then backed up and flew to the left without uttering a sound. In another part of the woods a few days later I saw a female Cowbird approach and examine a recently deserted nest of the Oven-bird, as if she knew previously where it was located. From these and other observations it seems probable that such visits to nests take place commonly if not always where a Cowbird lays her eggs, and in this manner she keeps in touch with the conditions at the nest, and also in some cases takes an egg of the host.

The nest mentioned in the first part of the last paragraph was only well started at this time, but on the following morning a Cowbird's egg was laid prematurely in the nest, and consequently the nest was deserted. Knowing, however, that Cowbirds often lay in deserted nests, I watched with the camera on the two following mornings, and on the second morning a female came. It was 4:57 A.M., about twenty-seven minutes before sunrise. The sky was cloudy, and I was nearly seven meters from the nest. I saw her alight near the nest and watched nervously for her to enter, but could not see well on account of poor light. Before I was aware she suddenly flew away, and I realized then that I had missed my chance to get a picture, because I was too far away to see her enter the nest. This taught me to place the blind closer, but as we shall see, not always close enough.

At the second nest I had seen no indications of a Cowbird, but watched on May 25, on the morning after the first egg was laid. I arranged the camera and other apparatus by flashlight and automobile light, and when I entered the blind the day was beginning to break. Seventeen minutes later, at 4:54 A.M., a female Cowbird lit on the ground about two and one-half meters from the nest. She stopped there for a minute or two, then moved up just back of the nest. After

another pause of nearly a minute she walked around in front, where she hesitated a moment, then entered. I could not see her position in the nest, but I pulled the thread. It was then 4:57. At the flash she flew upward from the nest, and lit on a limb about six meters away. Obviously she had not laid her egg, and after an interval of about two minutes she returned to the ground a meter or so from the nest, then in another minute reentered. She left in about thirty seconds, having deposited an egg in the meantime. I remained in the blind to watch the female Oven-bird, which entered the nest at 5:23 and did not seem to notice the extra egg. She left the nest at 6:44 after being



Figure 2. A female Cowbird in an Oven-bird's nest. Nest in natural position. 4:57 A.M., May 25, 1939.

in the nest an hour and twenty-one minutes. Upon development of the plate I found that it showed the Cowbird quite within the nest and somewhat hidden by the overhanging top (Figure 2). This was satisfactory for one picture, but when I set the camera on succeeding occasions I pushed the top of the nest back so that it would show the Cowbird better in case I got a picture.

I continued my efforts at other nests, and on the morning of June 5 was successful in getting a second picture in a distant part of the woods. At this nest the second Oven-bird's egg was laid on June 4, and later in the day one of these eggs disappeared. I was watching at

another nest at the time, but after getting this cue I set up a blind here and was in it next morning at daybreak. At 4:42 while it was still quite dark a Cowbird flew across between the blind and the nest and lit on the ground. Though the blind was only five meters from the nest it was still so dark that I could not see clearly. After three minutes something moved near the nest, and I pulled the thread, but this proved to be a false alarm. Having learned that the Cowbird might return, I left the blind immediately and reloaded the camera. In a few minutes she lit again near the nest. I saw her three or four times as she walked around back of the nest then near the front, and

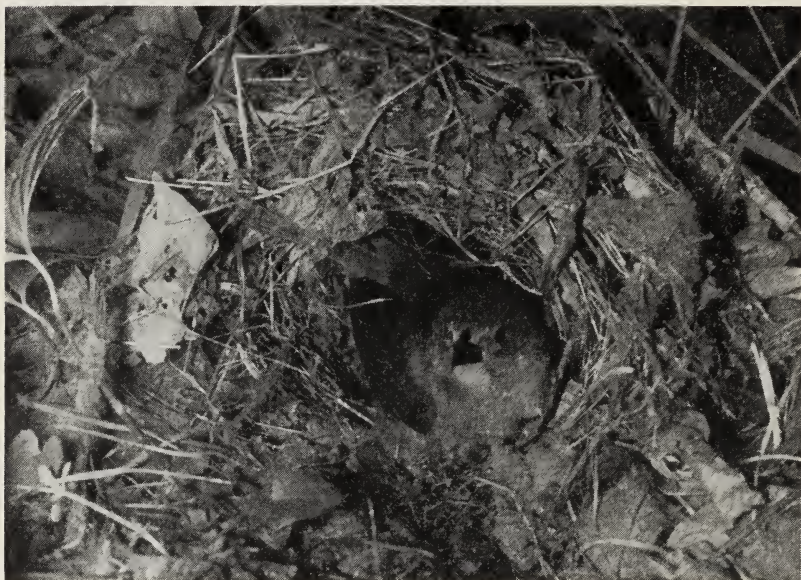


Figure 3. A female Cowbird in an Oven-bird's nest. Top of nest pushed back to give better view of the bird. 4:52 A.M., June 5, 1939.

in a few moments I snapped another picture, thinking she must have entered, though I could not see clearly whether she was in the nest or not. She flew upward at a sharp angle following the second flash, and when I went to the nest I found a Cowbird's egg, which she had laid in record time, for she could not have been in the nest more than a few seconds. These pictures were taken at about 4:45 and 4:52 respectively. Upon development of the plates the first revealed only the empty nest, but the second showed the Cowbird quite distinctly (Figure 3). I resolved after this experience to place the blind close enough really to see, and so thereafter set it at about three meters.

All of this work was intensely interesting and exciting, but I have said nothing about the times when the Cowbird did not appear. In all I watched sixteen mornings from May 20 to June 20, thus securing one picture for each eight mornings of watching during the first season's work.

As a part of the program I was hoping to get a picture of a Cowbird taking an egg from a nest. At one nest where a Cowbird's egg had been laid in the morning I watched from 7:00 o'clock until 10:30, and concluded that she wasn't coming back. I left and returned in forty minutes to find that an egg had disappeared. Such occurrences as these remind one that he is on the right track, but must have more perseverance when the opportunity presents itself.

OBSERVATIONS IN 1940

During the season of 1940 attempts to photograph the Cowbird were beset with misfortune. On the evening before the first trial I broke one of the camera attachments, and though a Cowbird came to lay two mornings in succession on May 29 and 30, I failed to get a picture because of faulty mechanism. Following this was a period of rainy weather in which some of the nests under construction were deserted by the female Oven-birds. Though I spent much time hunting for new nests and watched at daybreak five more mornings, I failed to make any additional contacts with the Cowbird during the season.

OBSERVATIONS IN 1941

The season of 1941 had its ups and downs, but withal was quite successful. The first bright spot of the year was a visit from Mr. Edgar P. Chance, who has done so much in the study of the European Cuckoo. We hoped to see together the laying of a Cowbird's egg, but finding nests was slow, and Mr. Chance had to leave before we had opportunity to make the observation. If I had met Mr. Chance and received his helpful suggestions a few years earlier, I would have been better able to interpret the problems of territory, similarity of eggs, and length of laying season during the progress of my study.

I might have taken a valuable clue, during the search for nests early in the season, from a female Cowbird which flew up from the side of a woods road on May 15, for ten days later I flushed an incubating Oven-bird from a nest containing two Oven-bird's eggs and two Cowbird's eggs, about fourteen meters from where the Cowbird was sitting. It is very probable that the Cowbird was watching the nest or nest-building when I approached. I collected the eggs from this nest on the following day, but failed to find the second nest which doubtless was built soon afterwards.

Aside from the incidents just mentioned, the Cowbird work of the season centered around a single nest found in the process of construc-

tion on May 26. On the morning of May 28 at 7:30, it contained one Oven-bird's egg, and I proceeded to set up a blind and place a dummy camera rack in position before the nest. At 8:02 o'clock as I was sitting on a log seven meters away, I suddenly saw a Cowbird perched about a meter from the nest. She appeared to be looking for the nest and at the same time watching me. I arose and stepped where I could get a better view of the nest location, and she left. At 8:50 Mr. John L. George and I were watching some Crested Flycatchers at a nest near by when Mr. George saw the Cowbird near the Oven-bird's nest again. I approached quickly for I did not want her to disturb the nest when I did not have the camera, and she flew away after calling in a scolding fashion.

The next morning, May 29, I was in the blind at daybreak and a female Cowbird appeared three meters from the nest at 4:56 o'clock. She slowly approached and was at the nest in about two minutes. I pulled the thread for the first exposure when she was in front of the nest with her back to the camera, before she had time to enter. After reloading the camera I was back in the blind by 5:00, and she soon reappeared three meters back of the nest. After a half minute she entered the nest and I made the second flash before she had time to lay. I placed the third plate in the camera and reentered the blind but the Cowbird did not return. Neither did she return to take an egg, though I watched during the forenoon until 11:15. At 10:06 a female Cowbird was seen looking around intently near the Crested Flycatcher's nest which was in a near-by tree about fifteen meters from the ground.

It is embarrassing to have to say that neither of these exposures produced a picture. In my excitement I failed to get one plate properly covered, and the other was blank apparently on account of a lack of synchronization of flash and shutter, though I had tested the apparatus and found it in working order. To say that I was discouraged would be putting it mildly, and I decided that afternoon to give up the efforts at getting more pictures.

A night's rest will sometimes do wonders, however, and the next morning, Memorial Day, I was awake at daybreak thinking about the camera. I arose quickly, went to the laboratory and tried out an exposure of 1/50 of a second instead of 1/200, and found that it worked perfectly. I was in the woods before seven o'clock thinking that if there was a Cowbird's egg in the nest I would watch for the taking of an egg during the forenoon. The Oven-bird was a late layer and remained on the nest more than an hour after I arrived, and not wishing to disturb her I waited for her to leave. At 7:26 a female Cowbird appeared six or eight meters from the nest and came closer, even after I started to approach, but I chased her away not wanting her to disturb the Oven-bird or nest before I was ready. Finally I flushed the female Oven-bird from the nest, marked the newly laid

egg No. 3, and placed it nearest the opening of the nest. Chance (1940, p. 94) believes that the Cuckoo always takes the egg nearest to her, and I wanted to see if this was true of the Cowbird.

After setting the camera I entered the blind at 8:20 o'clock and waited. At 9:10 the female Cowbird fluttered and lit three or four meters from the nest. She moved slowly and rather nervously to the nest, reached in and pecked at least twice. She turned to the left then, holding an Oven-bird's egg in her bill, and seemed to pause. I pulled the thread so hard that it came in two where I had tied it, but not until a picture was taken (Figure 1). The Cowbird dropped the egg about fifteen centimeters from the nest when the light flashed, and obviously knocked another egg from the nest with her wing, for egg No. 3 was lying in front of the nest on the ground. The egg taken was No. 1, which lay farthest from the opening, and No. 2 was still in the nest. I replaced egg No. 3 and the Oven-bird laid two more on the two following mornings, apparently not disturbed by all of the ado going on at the nest. Egg No. 1 was pierced in three places, one hole obviously being made at the first peck. The other two holes where she was holding the egg as seen in the picture were small, the upper one visible only with the aid of a lens, but showing plainly the shape of the beak.

I stated that the Cowbird "seemed to pause" when turning from the nest, but the picture shows her slightly in motion. This may have been due to her starting to move after the flash, and 1/50 of a second was not fast enough to stop the action. I had feared that if the Cowbird did take an egg in front of the camera, she might turn and fly so quickly that I would not have time to get a picture, but her performance, though not perfect, was quite satisfactory.

I assume that only a single Cowbird was involved in the activities in the vicinity of this nest, but I have no particular proof for this assumption.

SUMMARY AND CONCLUSIONS

A brief review of the literature is given on the finding and watching of nests by the Cowbird, the laying of eggs, and the taking of eggs of the host.

The present study is a continuation of the work done previously on the Oven-bird and Cowbird, five miles southwest of Ann Arbor, Michigan.

The author has observed the female Cowbird at the Ovenbird's nest a total of fifteen times: five times when eggs were laid; five when she came for the purpose of laying, but was frightened away by the photo-flash; three times when taking eggs; and twice while making observations. In addition to these there were two cases when she intently watched nest-building from a little distance, and other times when she was seen near nests, apparently making observations.

The direct information and indirect evidence gained during the study warrant the following conclusions:

1. The female Cowbird regularly finds the nests of the host by seeing the birds building.

2. She sometimes watches the building process intently and this doubtless stimulates the development of eggs, which are laid four or five days later. This theory, first suggested by Chance for the Cuckoo, accounts for the delicate synchronization of the egg-laying of the Cowbird with that of the host, and does not preclude the possibility of laying several eggs on successive days.

3. The eggs of the Cowbird are usually laid during the egg-laying time of the host, but exceptions are common. Extremes noted during the study were three days before the first Oven-bird's egg was laid, and three days after incubation began.

4. A Cowbird lays but one egg in a nest unless nests are scarce; in that case she lays more.

5. The female Cowbird makes regular trips of inspection to nests during the absence of the owners, between the times of discovery and laying, and knows in advance where she is going to lay.

6. Her regular time for laying is early in the morning before the host lays, and she will frighten the owner from the nest if she happens to be there first. Cases of laying later in the day described by occasional observers are probably irregular and delayed ones. The fact that the Cowbird lays very early in the morning accounts for the laying not being seen oftener.

7. The Cowbird is both alert and determined when she comes to the nest to lay. She moves about in the vicinity of the nest and looks carefully for as much as three minutes before entering, but will return to the nest if she is frightened away.

8. She spends from a few seconds to a minute in the nest when laying and flies directly from the nest as soon as the egg is laid.

9. The Cowbird disturbs the nest of the Oven-bird but little when she enters to lay, and I have found no broken eggs which were attributable to her entering.

10. Parasitized nests regularly have one or more eggs removed by the female Cowbird. These are not removed at the time of laying, but during the forenoon of the previous day, or the day of laying, or rarely on the following day. In removing an egg the Cowbird pierces it with her open beak and flies away with it. Through poor technique, egg contents are sometimes left in the nest, causing the owner to desert.

11. Eggs removed are eaten by the Cowbird, but are not removed for that purpose alone, or their disappearance would not be correlated so closely with the laying of her own eggs. The number of eggs removed from parasitized Oven-birds' nests was eighty-five per cent of the number of eggs laid and included four eggs of the Cowbird itself.

From non-parasitized nests of the Oven-bird only a single egg disappeared during the study.

12. The statement by Burroughs that a Cowbird takes an egg from a nest only when two or more eggs are present is borne out by this investigation.

13. In removing an egg from a nest, the Cowbird does not necessarily take the one nearest to her, as Chance believes to be the habit of the Cuckoo.

14. There has been no evidence that the Cowbird takes an egg from the nest at the time of laying, as the Cuckoo does.

15. The Cowbird has not been known to give any attention to parasitized nests after laying, other than to remove eggs.

16. Two photographs are shown of the female Cowbird while she was in the Oven-bird's nest to lay, the first ever taken of a Cowbird in any nest.

A third photograph shows the female Cowbird taking an egg of the Oven-bird from the nest, the first picture of this behavior taken during purposeful watching.

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STUDIES OF THE FLOCK ORGANIZATION OF
THE WHITE-THROATED SPARROW

BY JOHN P. WESSEL AND W. HENRY LEIGH

SCHJELDERUP-EBBE (1935) performed pioneer and classic investigations on the social order in chickens. He found that in flocks of less than ten individuals the peck-order is usually so arranged that no triangular pecking occurs. This type of social order is based on an almost absolute "peck-right." In flocks of ten individuals or more, although the social order is of the firmly fixed, despotic sort, straight-line pecking is a rarity.

Masure and Allee (1934a) working with the common chicken obtained results similar to those of Schjelderup-Ebbe. However, the same investigators working with the pigeon (1934a) and the Shell Parakeet (1934b) failed to find a flock organization based on an absolute peck-right, but on what Allee calls a "peck-dominance." This type of flock organization involves many return pecks. Shoemaker (1939) reports that the peck-dominance type of flock organization is also characteristic of canaries.

The purpose of the present investigation is to (1) present an improved method for observing the social behavior of wild-caught birds, (2) to determine whether the White-throated Sparrow (*Zonotrichia albicollis*) exhibits the firmly fixed, despotic sort of social order or the peck-dominance type, (3) to learn whether or not there is any correlation between the number of White-throats in a given flock and the number of triangular relationships. The present paper presents studies on correlation of flocks of three, four, five, and six.

IMPROVED METHOD FOR OBSERVING THE SOCIAL BEHAVIOR OF WILD
BIRDS IN CAPTIVITY

The accompanying figure illustrates the improved method for observing the social behavior of wild-caught birds. The observations are carried on within a dark room. The investigator is seated behind an observation screen which is furnished with a transparent mirror, B. Thus, the investigator has a clear vision of the birds, whereas the birds are unable to detect the presence of the investigator. Illumination is furnished by an electric light, A. Any light rays reflecting directly on the transparent mirror decreases its visibility. The cardboard shade, C prevents reflection on the transparent mirror.

By keeping the flock in complete darkness except when observations are made (feedings are made during observations), all or most of the contacts may be recorded. The fact that the birds are relatively inactive and not feeding, drinking, and bathing between observations provides greater activity and more frequent contacts during observation periods.

The English Sparrow (*Passer domesticus*), the White-crowned Sparrow (*Zonotrichia leucophrys*), and the White-throated Sparrow were used to test the efficiency of the foregoing method.

Observations with all three species were made with and without the use of the transparent mirror. Although man may gain the confidence



Figure 1. Dark observation room. A. Nickel-plated reflector with 150-watt bulb. B. Transparent mirror. C. Cardboard shade to prevent reflection on transparent mirror.

of English Sparrows in the open field, in captivity they seem to remain intractable. The senior author has been in the presence of the same individuals daily for as long as six months without observing any change in their attitude toward him. The birds seldom feed or bathe during periods of observation. They would retreat to a far corner of the large observation cage and peck viciously for what appeared to be a perch right. He has seen a female draw blood from the eye of a male, an injury which resulted in the permanent loss of sight. This retreating and then pecking might be referred to as a "retreat peck." Under these conditions (a method similar to that used by Schjelderup-Ebbe and Allee) the birds behaved as though they were under a psychological strain. At least for English Sparrows, such a method did not represent ideal experimental conditions in our laboratory.

Using the same flock of English Sparrows, observations were then conducted with the use of the transparent mirror. The birds had been kept in individual cages where they were unable to see one another for three weeks prior to the observations. Schjelderup-Ebbe (1935) states: "Separation of a little over a week may be enough to make the birds quite uncertain, hesitation characterizing their attitude toward each other (the first objective indication of the weakening of recognition). After a separation of a fortnight or three weeks birds usually show no signs of recognition of other birds of the same species." Repeated observations on the same flock of birds after a period of 11 to 17 days separation gave no evidence of forgetfulness, since the same social order was immediately re-established without preliminary "jousting" for rank such as occurred during first contacts. Observations were made every day during the feeding period for the duration of the experiment. After the observer had been sitting quietly for about five minutes behind the observation screen the birds began to move freely about the cage, hopping, flying, chirping, feeding, and bathing. There seemed to be a total absence of any psychological strain. The conditions seemed to be ideal for experimental purposes.

The same general results were obtained with the White-crowned and the White-throated Sparrows. However, these two species do not show as high a degree of apparent nervousness in the presence of an observer as do the English Sparrows. Although the improved method is evidently an excellent one for observing wild birds in captivity, apparently it is not necessary for observing tame birds, as chickens, canaries, and Shell Parakeets. The use of the screen in the study of any wild-caught bird should be considered good technique for it reduces to a minimum the possible errors in making observations.

FLOCK ORGANIZATION OF THE WHITE-THROATED SPARROW

All of the following observations were made with the use of the improved method. Studies of flocks of three and four birds were made by the senior author and studies of flocks of five and six birds by both authors. Some of the observations were made by both investigators concurrently, using two screens. Each investigator served as a check on the other. All such observations showed a marked agreement. Some observations were made in which two separate recordings were made simultaneously, one in which all pecks were recorded and one in which only strong and aggressive pecks were recorded. In these studies there was perfect agreement in social order patterns.

Some difficulty was experienced in determination of sex prior to autopsy. While in most cases plumage differences were sufficiently great to make sex determination relatively accurate, there were some intergrading individuals whose sex could be determined only by autopsy. In most of the experiments the birds were not killed until four to six

weeks after termination of the experiments. During this post-observation period the birds were watched daily for any irregularity and to see if there was any correlation between the occurrence of death during this time and position in the social order. No correlation was noted.

In flocks of three and four birds, colored celluloid bands were used for identification purposes. In flocks of five and six birds, oil paints were used. The crown and neck were painted.

The total number of pecks recorded in the following experiments were 1966. The total number of actual minutes of observation were 3345.

The birds were trapped in Park Ridge, Illinois, and then transported to Chicago where the observations were made. Series B, Experiment 1, conducted during the spring of 1939, contained fall migrants carried over from the autumn of 1938. In all of the other experiments, the birds were trapped and studied in the fall.

SERIES A, EXPERIMENT 1

This study included a flock of three birds. Bk was a single-testes bird (L.V. Domm and J. P. Wessel, 1940), Bl was a male, and W was a female.

During the first observation period of two hours, a total of 37 pecks were delivered. Bk pecked Bl seven times and Bl returned two pecks. Beginning on the second day and for the duration of the experiment there were no return pecks. Table 1 does not include the 37 pecks observed during the first observation period, October 11, 1938. The table includes recordings from October 12 to October 20, 1938 inclusive.

TABLE 1

SERIES A, EXPERIMENT 1

Bk pecked	Bl - 58,	W - 65	
Bl pecked		W - 22,	Bk - 0
W pecked	Bl - 0,		Bk - 0

SERIES A, EXPERIMENT 2

The birds of Experiment 1 were separated from October 20 to November 1, 1938, a period of eleven days. They were then brought together in the large observation cage. There were no return pecks on the first day or any following day of the entire observation period. The observations lasted from November 1 to November 10 inclusive.

TABLE 2

SERIES A, EXPERIMENT 2

Bk pecked	Bl - 63,	W - 24	
Bl pecked		W - 49,	Bk - 0
W pecked	Bl - 0,		Bk - 0

SERIES B, EXPERIMENT 3

This study included a flock of four birds. Y and B were males, G and R females. During the first observation period of two hours there was a total of 43 pecks. Y pecked B eight times and B returned three pecks. This occurred on April 3, 1939. Between April 4 and April 7, there were no return pecks. Table 3 does not include pecks delivered on April 3.

TABLE 3

SERIES B, EXPERIMENT 3				
Y pecked	B - 34,	G - 20,	R - 32	
B pecked		G - 21,	R - 29,	Y - 0
G pecked	B - 0,		R - 19,	Y - 0
R pecked	B - 0,	G - 0,		Y - 0

SERIES B, EXPERIMENT 4

The birds of Experiment 3 were separated from April 7 to April 24, 1939, a period of seventeen days. There were no return pecks on the first day, April 24, nor any subsequent day. Observations were made from April 24 to April 28 inclusive.

TABLE 4

SERIES B, EXPERIMENT 4				
Y pecked	B - 33,	G - 44,	R - 43	
B pecked		G - 57,	R - 33,	Y - 0
G pecked	B - 0,		R - 24,	Y - 0
R pecked	B - 0,	G - 0,		Y - 0

SERIES C, EXPERIMENT 5

This study included a flock of five birds. V, Br, and Bl were males, Y and Bk were females. During the first observation period of one and one-half hours there was a total of 92 pecks. Y pecked Br two times and Br returned one peck. V pecked Br eleven times and Br returned one peck. This occurred on November 26, 1940. Between November 27 and December 2 inclusive there were no return pecks. Table 5 does not include pecks delivered on November 26.

TABLE 5

SERIES C, EXPERIMENT 5				
Y pecked	V - 16,	Br - 4,	Bl - 41,	Bk - 32
V pecked		Br - 26,	Bl - 18,	Bk - 5, Y - 0
Br pecked	V - 0,		Bl - 46,	Bk - 17, Y - 0
Bl pecked	V - 0,	Br - 0,		Bk - 6, Y - 0
Bk pecked	V - 0,	Br - 0,	Bl - 0,	Y - 0

In this experiment there developed what might be called a territorial triangle. The term territorial is here used in a restricted sense to indicate the fact that when V, Y, and Br approached each other within the cage, V always moved away from Y, Br moved away from V, and Y moved away from Br. Naturally such behavior prevented bodily contact and the delivering of a large number of pecks.

The question arose concerning what effect the introduction of a sixth bird into the flock would have on this territorial triangular relationship. One of three things might occur. First, the territorial-triangle might develop into a peck-triangle; second, the territorial-triangle might be dissolved without any replacement by a peck-triangle; third there might be no change whatever.

SERIES D, EXPERIMENTS 6 AND 7

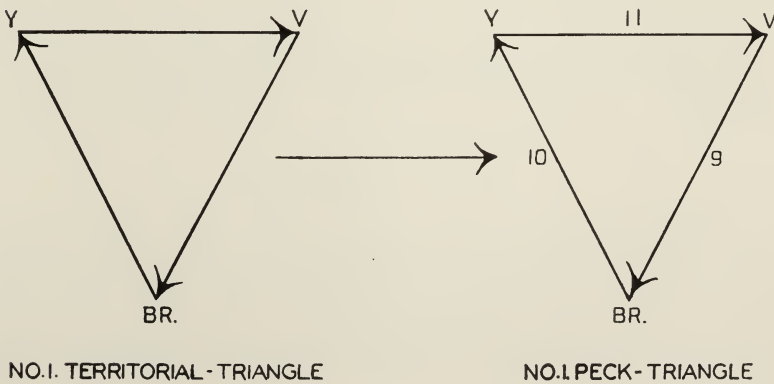
This study includes the five birds of Experiment 5 with the introduction of a sixth bird W, a male. W was introduced during the afternoon of December 2, 1940. During a one hour period 35 pecks were delivered. W first encountered Y. Y pecked W once and W returned pecks viciously on four different occasions during which Y gave way. Almost immediately following the defeat of Y, Br charged Y, delivering an aggressive peck. Y did not return the peck. Y maintained her dominance over V. W pecked Br two times and Br returned one peck. There were return pecks between Y and W, W and Br and one reversal between Y and Br. On subsequent observations of December 3, 4, and 5, there were no return pecks. Table 6 does not include pecks delivered on December 2.

TABLE 6

SERIES D, EXPERIMENT 6

W pecked V - 0,	Y - 13,	Br - 6,	Bl - 19,	Bk - 6,	
V pecked	Y - 0,	Br - 6,	Bl - 4,	Bk - 2,	W - 5
Y pecked V - 11,		Br - 0,	Bl - 25,	Bk - 8,	W - 0
Br pecked V - 0,	Y - 10,		Bl - 16,	Bk - 2,	W - 0
Bl pecked V - 0,	Y - 0,	Br - 0,		Bk - 2,	W - 0
Bk pecked V - 0,	Y - 0,	Br - 0,	Bl - 0,		W - 0

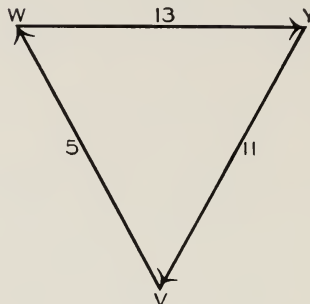
The territorial triangular relationship, present before the introduction of the sixth bird W, has now developed into a peck-triangle.



NO. I. TERRITORIAL - TRIANGLE

NO. I. PECK - TRIANGLE

A second triangle is present, having no territorial history, involving Y, V, and W.



NO.2. PECK-TRIANGLE

During the morning of December 5, Br was especially aggressive toward Y. In the afternoon of the same day a revolt took place in which Y became dominant over Br. On subsequent days and until the experiment was brought to a close on December 13, Y remained dominant over Br, and during this time there was no return pecking. Table 7 shows the flock organization after the revolt took place.

TABLE 7

SERIES D, EXPERIMENT 7

W pecked	V - 0,	Y - 36,	Br - 30,	Bl - 83,	Bk - 46		
V pecked		Y - 0,	Br - 20,	Bl - 38,	Bk - 13,	W - 24	
Y pecked	V - 71,		Br - 115,	Bl - 71,	Bk - 32,	W - 0	
Br pecked	V - 0,	Y - 0,		Bl - 16,	Bk - 16,	W - 0	
Bl pecked	V - 0,	Y - 0,	Br - 0,		Bk - 14,	W - 0	
Bk pecked	V - 0,	Y - 0,	Br - 0,	Bl - 0,		W - 0	

Triangle No. 1 no longer exists but Triangle No. 2 persists. The triangle can be considered a fairly fixed characteristic of this flock of six birds.

SERIES D, EXPERIMENT 8

Three days after experiment 7 was brought to a close Br died. The other five birds used previously in Experiment 7 were brought together in the large observation cage to see whether the single stable triangle (No. 2) would persist in this reduced flock of five birds. Table 8 includes all pecks delivered from December 16 to December 19, 1940. During this time there were no return pecks.

TABLE 8

SERIES D, EXPERIMENT 8

W pecked	V - 0,	Y - 12,	Bl - 37,	Bk - 7	
V pecked		Y - 0,	Bl - 2,	Bk - 0,	W - 9
Y pecked	V - 16,		Bl - 7,	Bk - 8,	W - 0
Bl pecked	V - 0,	Y - 0,		Bk - 1,	W - 0
Bk pecked	V - 0,	Y - 0,	Bl - 0,		W - 0

Triangle No. 2 persists in this reduced flock of five birds. The total peck relationship in this triangle as observed in Experiments 6, 7, and 8 are: W pecked Y 61 times; Y pecked V 86 times; V pecked W 38 times.

DISCUSSION

When White-throated Sparrows strange to one another are brought together in a laboratory observation cage they are very nervous and extremely alert. During the first day return pecks generally occur between members that are destined to occupy relatively high positions in the peck order. By the second day each member of the flock seems to recognize its natural position and from then on the flock organization is of the firmly fixed, despotic type originally described by Schjelderup-Ebbe (1935).

In our experiments with flocks of three, four, and five, the flock organization is of the straight-line type. In our flock of six, two triangular relationships appeared. Although the absolute straight-line relationship no longer existed, the flock organization was still based on an absolute peck-right phenomenon.

There appears to be a close relationship between territorial right and peck right. In experiment 5, there was a clear case of a territorial-triangle in which V gave way to Y, Br to V, and Y to Br. However, this triangle was in no sense also a peck-right triangle, for although Y definitely avoided Br, Y when the occasions called for it would successfully attack Br demonstrating a strong peck-right over Br. When, however, a sixth bird W was added to the flock (Experiment 6) Y challenged W and lost. During the conflict Br seemed to observe Y's movements and after the defeat challenged Y. Again Y lost. This development of a territorial-triangle into a peck-triangle seemed not to have much permanency as three days later a revolt took place in which Y regained her dominance over Br. Y not only regained her peck dominance over Br but now for the first time achieved also a territorial dominance.

In White-throats there seems to be no relation between sex and position in the social order. In Series A the alpha position was occupied by a single testes bird, in Series B by a male, in Series C by a female, in Series D, Experiment 6 it was shared by two males, and in Series D, Experiments 7 and 8 it was shared by two males and one female. However, in all the experiments the low bird was a female. The most aggressive bird in all of the experiments was Y, a female.

In general there is a correlation between position in the social order and time of feeding and bathing. The alpha birds generally feed first. In none of the experiments did the low birds bathe at any time during the observations.

SUMMARY

1. An observation screen with a transparent mirror provides a situation in which the psychological factors are conducive to satisfactory experimental conditions. This is especially true when studying English Sparrows. The use of the screen in the study of wild birds in captivity is good technique for it reduces to a minimum the possible errors in making observations.

2. Keeping birds in total darkness between periods of observation and providing food only during observations (generally two hours per day) make possible the recording of a majority of the contacts and gives greater quantitative returns during observation periods.

3. The social order among White-throated Sparrows is of the firmly fixed, despotic sort originally described by Schjelderup-Ebbe. In our flocks of three, four, and five the straight-line type was shown to exist. In our flock of six two triangles developed. Peck triangle No. 2, having no territorial history, persisted after the reduction of the flock to five members.

4. In White-throated Sparrows there seems to be no correlation between sex and position in the social order.

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A NEW RACE OF *CHAETURA VAUXI* FROM
TAMAULIPAS

BY GEORGE MIKSCH SUTTON

IN his "Check-List of Birds of the World" James L. Peters (1940: 236) follows Ridgway and Hellmayr in listing *Chaetura vauxi*, *Chaetura richmondi*, and *Chaetura gaumeri* as distinct species, in spite of the fact that other able present-day workers have called them "merely representative forms" of the same species (see, in particular, Griscom, 1932: 196). The writer has been obliged to study these three forms carefully in identifying recent collections from Mexico, and he is now convinced that they are conspecific.

There is no escaping the fact that they look alike. Their behavior, nesting habits, and call notes are said to be much the same. They are all essentially Middle American, even the northward ranging, strongly migratory *vauxi* returning to its tropical ancestral home for the winter months. The ranges of *gaumeri* and *richmondi* probably adjoin in Campeche and Quintana Roo, since no treeless plain, high sierra, or other barrier appears to exist between them. As for *richmondi* and *vauxi*, or *gaumeri* and *vauxi*, though the present known breeding range of the latter is, in either case, far removed from that of the former, it is quite conceivable (a) that *vauxi*, in pushing northward, has only recently become truly isolated or (b) that further work in the Rocky Mountains and the Sierra Madre will reveal the fact that a chain of breeding populations actually connects the three forms. The primary purpose of the present paper is to announce the discovery of one such breeding population, a form that is close to *gaumeri* and between *vauxi* and *richmondi* in color and size.

This new bird has been called "*richmondi*" by Phillips (1911: 77), Ridgway (1911: 720), and others. It has also been called "*vauxi*" by no less able an ornithologist than Peters who, in examining our material, perceived it to be darker and smaller than topotypical specimens of "*Cypcelus Vauxi*" (type locality Columbia River = Fort Vancouver, Washington) and who may even have suspected it of being a race of the northwestern United States bird. Need more be said as to its linking *C. v. richmondi* and *C. v. vauxi*? Since no name thus far given to any Middle American swift appears to be available, the author suggests

***Chaetura vauxi tamaulipensis*, subsp. nov.**

TYPE.—Breeding male (testes greatly enlarged) in unworn plumage, collection of George M. Sutton, No. 9601; Rancho Rinconada, along the Sabinas River, a mile west of the main Mexico City highway, at an elevation of about 500 feet, in the vicinity of the village of Gómez Farías, southwestern Tamaulipas, April 15, 1941; collected by George Miksch Sutton.

SUBSPECIFIC CHARACTERS.—Similar to *Chaetura vauxi vauxi* in wing-length and body-size, hence larger than *C. v. richmondi* (from southern Veracruz, Costa Rica, Guatemala, and interlying parts of Central America), *C. v. gaumeri* (from Yucatan), and *C. v. ochropygia* (from the Azuero Peninsula of Panama). Darker than *C. v. vauxi*, especially on the upper parts, belly, under tail coverts, and basal part of the throat plumage; crown, back, and wings noticeably more glossy, the shine being rather strongly greenish; and eyebrow without fine whitish line that is usually so distinct in *C. v. vauxi*. Less blackish than *C. v. richmondi* above; wings duller, with greenish rather than blue or bluish green gloss; and rump and under parts somewhat lighter. Less blackish on back, crown, and wings even than *C. v. gaumeri*, and more brownish throughout belly, under tail coverts, and rump. Larger and noticeably darker-rumped than *C. v. ochropygia*, a far-removed form that it would hardly be expected to resemble at all closely.

RANGE.—Breeds in heavily wooded lowlands, along streams, in southwestern Tamaulipas, southeastern San Luis Potosi, and probably contiguous parts of Hidalgo, northern Veracruz, and southeastern Nuevo Leon. May be migratory, since one November specimen from Guatemala has been examined. Probably intergrades with *C. v. gaumeri* and *C. v. richmondi*.

REMARKS.—There are some misconceptions concerning certain races of *Chaetura vauxi*. Two of these have to do with *C. v. gaumeri*. Through the courtesy of Dr. Josselyn Van Tyne the author has been able to examine several freshly plumaged specimens of this race taken recently at Chichen Itzá, Yucatan. These are, to be sure, less blackish on the crown and back, and less bluish on the wings than strictly comparable *C. v. richmondi* from Costa Rica; but the rump is not strikingly light by comparison, and there is little evidence in support of calling the race a pale one. Furthermore, *in all freshly plumaged birds the tail is fully spined*. There are several such well-spined individuals in the University of Michigan Museum of Zoology collection. The spines apparently are subjected to much abrasion in the limestone wells which the swifts inhabit, and worn specimens have given rise to the belief that the tail of *C. v. gaumeri* is spineless.

A third misconception has to do with certain Guatemalan specimens that have been called by Griscom (1932: 196) "obvious intermediates" between *C. v. vauxi* and *C. v. richmondi*. The author, who has examined two of these very birds, feels that the Finca Carolina male, which Griscom describes as "nearer *richmondi* in size, nearer *vauxii* in color" (Amer. Mus. Nat. Hist. No. 393,915) is clearly an example of *C. v. vauxi*, and not in any genetic sense of the word intermediate. It is a molting bird, with badly worn outer primaries, and therefore wholly unreliable wing-length (111 mm.). The incoming remiges are naturally dark and glossy, just as they are in freshly plumaged or molting United

States *C. v. vauxi*. The San Lucas male, said to be "nearer *richmondi* in color, near *vauxii* in size" (Amer. Mus. Nat. Hist. No. 393,928), agrees perfectly with the type series of *C. v. tamaulipensis* and must, for the present, be considered a Guatemala record of the race; but it should not be called intermediate between *C. v. vauxi* and *C. v. richmondi*, for such a designation implies an actual commingling of the two forms during the breeding season.

Migrating *C. v. vauxi* probably move northward and southward to the west of the breeding grounds of *C. v. tamaulipensis*, so transient *vauxi*-like birds seen in eastern Mexico are likely to be *tamaulipensis*. Wintering swifts will have to be identified with great care, however, in view of Lowery's recent discovery of *C. v. vauxi* in winter in Louisiana (1939).

MEASUREMENTS.—Type: wing, 111 mm.; tail, 35. Topotypical male: wing, 111; tail, 37. Topotypical females: wing, 115, 109; tail, 33.5, 32. Female from Matlapa, near Tamazunchale, San Luis Potosi: wing, 113; tail, 38.5. Female from San Lucas, Guatemala: wing, 114; tail, 37. Male from Guiaves, Tamaulipas: wing, 113.5; tail, 38. Female from Carricitos, Tamaulipas: wing, 111; tail, 40. Average of males: wing, 111.8; tail, 36.6; of females: wing, 112.4; tail, 36.2. Wing measurements are of the chord of the folded manus.

ACKNOWLEDGEMENTS.—The valuable assistance of Mr. James L. Peters and Dr. Josselyn Van Tyne has already been mentioned. Mr. Adriaan J. van Rossem was good enough to lend the author a useful series of *C. v. vauxi* (including virtual topotypes from western Washington) from the Dickey Collections. The American Museum of Natural History cooperated by lending Guatemalan and Costa Rican material. Mr. George H. Lowery, Jr., was particularly helpful in lending all of his freshly plumaged, carefully washed *C. v. vauxi* taken recently at Baton Rouge, Louisiana.

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CORNELL UNIVERSITY, ITHACA, NEW YORK.

GENERAL NOTES

Green Heron Nesting in Cheboygan County, Michigan.—Early on the morning of July 11, 1941, I discovered two adult Green Herons (*Butorides virescens*) on the shore of Mud Lake, a small bog lake located in Sections 20 and 21 of Grant Township in Cheboygan County, Michigan, about one half mile west of the northwest shore of Black Lake. It is a typical bog lake, surrounded by a Carex mat overgrown with sweet gale (*Myrica Gale*), and swamp rose (*Rosa carolina*). Encircling the mat is a cedar-fir-spruce-tamarack bog forest in which the dominant tree is the white cedar (*Thuja occidentalis*). These woods are inhabited by such birds as the Blackburnian Warbler, Myrtle Warbler, White-throated Sparrow, and Red-breasted Nuthatch, birds typical of Canadian Zone areas.

On July 14, Dr. Olin S. Pettingill, Jr., and I discovered the nest of the herons in a black spruce (*Picea Mariana*) about 50 feet from the shore of the lake. The nest was in the angle formed by a branch and the trunk of the tree, about 15 feet from the ground, and contained five young herons. The condition of the plumage indicated that the youngest was about a week old.

The discovery of the Green Heron's nest constituted a new Cheboygan County record for both the species and the nest, and apparently this is the northernmost nesting record for the Green Heron in Michigan. Bent ("Life Histories of North American Marsh Birds," 1926, p. 192) lists this bird as breeding north to Grand Rapids, Kent County. Van Tyne ("Check List of the Birds of Michigan," 1938, p. 3) describes the Green Heron as a common summer resident in the southern three tiers of counties, uncommon on Saginaw Bay, and probably an uncommon late summer visitant north of that point. In a letter to me dated August 11, 1941, Dr. Van Tyne cited two additional nesting records, one at Hess Lake, Newaygo County, 1922, by E. R. Ford, the other in the Gladwin Refuge, Gladwin County, 1934, by Verne Dockham. Mr. Bernard W. Baker, of Marne, Michigan, has informed me that he found sixteen nests of the Green Heron in Ottawa and Kent counties during the seasons of 1938, 1939, and 1940.—OSCAR M. ROOT, *Brooks School, North Andover, Massachusetts* and *University of Michigan Biological Station, Cheboygan, Michigan*.

Black-crowned Night Heron Swims.—On July 15 and 16, 1941, my wife and I visited the Lower Souris Migratory Waterfowl Refuge in north-central North Dakota. While standing on shore overlooking a large expanse of open water we were surprised to see a Black-crowned Night Heron (*Nycticorax nycticorax*) swim. The action was deliberate and had no visible explanation. The bird had been at ease for some time on the sandy shore about 100 feet away when suddenly it took wing and alighted on the water about 100 feet from shore, turned about and swam to shore again. After two or three minutes this action was repeated and after another few minutes was repeated a third time. It then remained on shore in its former relaxed posture.—PAUL WM. HOFFMAN, *8415 Kenyon Avenue, Wauwatosa, Wisconsin*.

A Late Record for the White Ibis in South Carolina.—On November 12, 1938, an immature White Ibis (*Guara alba*) was seen in company with a small flock of Snowy Egrets near the margin of an old rice field on this plantation (Middleburg). It was a bird of the year, being light grey with some black on the primaries; the face, bill, and feet were dirty orange in color. I saw it almost every day in this area until December 2.

This bird probably came from a large colony which breeds annually about ten miles away. Almost daily during the summer the adults can be seen flying back and forth or feeding in our old rice fields, but the above date is very late for the White Ibis in South Carolina.—EDWARD S. DINGLE, *Huger, South Carolina*.

The Roosting and Rising Habits of the Hungarian Partridge.—The data here reported were secured during October and early November of 1935 at the Washington State College farm. The area studied is part of the well known "Palouse Hills" of Whitman County in eastern Washington.

At about the time the first signs of daylight appear in the eastern skies the call of a single Hungarian Partridge (*Perdix perdix*) can be heard announcing the awakening of a covey of partridges. A short period of silence follows, then perhaps another call may be uttered by the same covey, or within 2 to 5 minutes other coveys may announce their awakening. The coveys answer each other for a period of from 4 to 6 minutes, when suddenly one covey may break into a vocal commotion and instantly boom into the air. They continue the chorus as they fly to some nearby cover. After this morning journey the coveys soon cease to call.

Observations on the time of awakening were taken on three occasions. The first awakening call on October 6, November 2 and November 10 respectively was uttered at 47, 53, and 52 minutes before the expected time of sunrise at the local meridian. An extremely dense fog hung over the area on October 6, thereby delaying the appearance of daylight. This delay in the appearance of daylight, however, apparently did not cause the birds to delay their awakening call by more than 5 or 6 minutes.

All but one of the morning flights from the roosting sites took place before sunrise, the average lapse of time being 19, 34, and 18 minutes before sunrise on October 6, November 2 and November 10, respectively.

On November 2, a cold clear morning, five coveys completed the performance of awakening, calling, and morning flights in a period of 47 minutes. On November 10, a single covey vocalized, and made its morning flight in a period of 35 minutes.

The evening period of activity is ushered in with a loud *chrrit*, which is shortly, sometimes immediately, answered by another covey. As the birds carry on this vocalization they usually move uphill toward a summit from which they start their evening flight. Most of the flights occurred from 16 to 18 minutes after the expected time of sunset, the extremes being 8 and 31 minutes (Table 1). Cloudiness did not affect the time or amount of evening activity. On an average, 36 minutes encompassed the entire evening performance. All the birds became quiet before a degree of darkness which would have prevented the observer with his back to the west from reading a newspaper.

TABLE 1
TIME OF EVENING FLIGHTS BY COVEYS OF HUNGARIAN PARTRIDGE

Date	Expected time of sunset at local meridian	Average time for evening flight by coveys	Interval between sunset and evening flights	Weather
October 2	5:50	6:06	16 min.	Clear
5	5:46	6:02	16 min.	Clear
6	5:44	6:02	18 min.	Clear
7	5:42	5:59	17 min.	Clear
20	5:21	5:42	21 min.	Cloudy
26	5:11	5:38	27 min.	Clear
27	5:10	5:28	18 min.	Clear
November 3	4:59	5:07	8 min.	Clear
10	4:49	5:20	31 min.	Partly cloudy

Of eight roosts found, four were in wheat stubble, one in oats stubble, two in alfalfa, and one in a slight depression on the bare ground of a cleanly cultivated

orchard. From the arrangement of the fecal droppings at the roosts I judge that the birds of a covey may roost either singly or as small groups of 4 or 5 individuals along a slight depression in the ground.—ARNOLD O. HAUGEN, *Michigan Department of Conservation, Lansing, Michigan.*

Blue Goose in Tioga County, New York.—Mr. Lee J. Loomis of Endicott, New York recently brought to my office for identification a fine specimen of Blue Goose, *Chen caerulescens*, mounted about a year ago by himself. The bird, an immature female in gray plumage, was found dead by the caretaker at Spencer Lake, near the town of Spencer, northwestern Tioga County, New York, on October 21, 1940. Its measurements are: wing, 388 mm., tail, 118; culmen, 53, tarsus, 86. The specimen is now in Mr. Loomis' private collection in Endicott.—GEORGE MIKSCHE SUTTON, *Cornell University, Ithaca, New York.*

Records of the Nevada Nuthatch in Utah.—A specimen of the Nevada Pigmy Nuthatch, *Sitta pygmaea canescens* (No. 1512 Hardy Collection), was taken from the aspen-cottonwood grove in the east part of the Pine Valley Forest Campground, Washington County, Utah, by the writer on June 1, 1939. The specimen was so damaged that accurate sex determination was impossible, but it is thought to be a female. At that time young birds were heard in the nest which was located about twenty feet from the ground in a dead cottonwood tree. A Red-shafted Flicker, *Colaptes cafer canescens*, and a Mountain Bluebird, *Sialia currucoides*, were nesting in other cavities of the same tree.

May 11, 1940, a nuthatch nest with seven eggs was taken from a cavity in this same tree. The nest was about twelve feet above the ground.

August 23, 1941, a female (No. 2225 Hardy Collection) was taken from a foxtail pine near the summit of Lookout Peak (10,200 feet), Pine Valley Mountains, about eight miles southwest of the campground site.

These seem to be the first records of this race for Utah. This provides an 180 mile northeastward extension of the range from the Charleston and nearby mountains of Nevada, the only previous known habitat of this subspecies.

I wish to thank Dr. H. C. Oberholser and Dr. Clarence Cottam of the Fish and Wildlife Service at Washington, D.C. for their determination of specimen No. 1512.—ROSS HARDY, *Dixie Junior College, Saint George, Utah.*

Another Case of String-eating.—In the *Wilson Bulletin* for September, 1941, Kenyon and Uttal report the death of a young Bronzed Grackle resulting from obstruction of the digestive tract by a long piece of string. This reminded me at once of a similar case that came to my attention two years ago.

On May 21, 1939, Dr. Harold B. Wood, of Harrisburg, Pennsylvania, picked up a young Robin (*Turdus migratorius*) which he found "standing normally in the grass." Although it showed no symptoms of disease, it died in his hand within a minute. He promptly forwarded it to me for post mortem study.

The bird was a fledgling, apparently only a few days out of the nest. There were no signs of external injury. Nutrition was moderately impaired.

Internal examination revealed that a piece of heavy wrapping twine, seven inches long and a quarter of an inch in diameter, filled the crop, proventriculus and gizzard. The twine was just the size, shape and general color of a large earthworm, though it may have become somewhat swollen within the bird. The proventriculus was greatly distended and thinned out, while the constriction between proventriculus and gizzard was fully obliterated. No part of the twine had passed farther than the gizzard. A complete impaction and obstruction was apparent. The liver, pancreas and spleen were normal. The gall bladder was fully distended.

Intestines and kidneys were normal and the gonads were in the expected undeveloped state.

Gross diagnosis was obstruction of the digestive tract by a foreign body with consequent gradual starvation. Kenyon and Uttal say that it is "purely conjectural" how their Grackle came to have eaten string. In the case of my Robin, I could scarcely conclude otherwise than that it mistook the piece of string for a worm. Students of bird behavior might enlarge upon these two instances by experiments in order to learn the order of appearance of the various factors involved in the recognition of food by growing birds and the parts played by instinct and experience.—C. BROOKE WORTH, *Swarthmore College, Swarthmore, Pennsylvania.*

Wilson's Thrush in Oklahoma.—Apparently there are but three Oklahoma specimens of *Hylocichla fuscescens* in existence. All these (male, Arnett, Ellis Co., May 27; male and female, Kenton, Cimarron Co., June 2) were taken in 1936 by the writer and identified by him as *H. f. salicicola* (*Auk*, 53, 1936: 434). Further careful comparison has shown the Kenton female to be more reddish brown throughout the upper parts, brighter buff on the sides of neck and breast, and less sharply streaked on the breast than the other two birds, however, revealing the fact that it is actually a Wilson's Thrush, *H. f. fuscescens*. The Willow Thrush, *H. f. salicicola*, is known to breed as far east as Michigan (see Van Tyne, *Occ. Papers Mus. Zool. Univ. of Mich.*, No. 379, 1938: 29) so the occurrence of *H. f. fuscescens* in far western Oklahoma is indeed extraordinary. The author is grateful to Allan R. Phillips for his assistance in identifying the specimens in question and in thus adding another form to Oklahoma's avifauna.—GEORGE MIKSCHE SUTTON, *Cornell University, Ithaca, New York.*

A Successful Method of Preventing Starling Roosts.—Louisville has been plagued with a large winter Starling roost since about 1932. During the first few years the Starlings (*Sturnus vulgaris*) roosted in trees especially on the University of Louisville Campus. Later, attracted by the warmth and bright lights of the business area, they began roosting in increasing numbers on the unused postoffice and adjacent buildings, especially on Fourth, Chestnut, Guthrie, and Walnut Streets. On the postoffice alone about 15,000 birds regularly perch, and several thousands more roost in a group of trees in the tiny park north of the building. The trouble and annoyance caused by this roost, variously estimated from one to two hundred thousand birds, has been extreme. The buildings are rendered unsightly by their guano and shoppers find walking beneath the incoming flocks hazardous to their attire. One large store raised its awnings each afternoon and posted the sign "These awnings raised because Starlings unfair to pedestrians."

Of the numerous methods advocated for eliminating the birds, two merit comment. One store purchased a dozen Screech and Barn Owls and chained them to perches along the upper window ledges after being told that Starlings are extremely afraid of owls. Unfortunately most of the owls were either injured by the chains or died from other causes and the experiment was discontinued before their value could be determined.

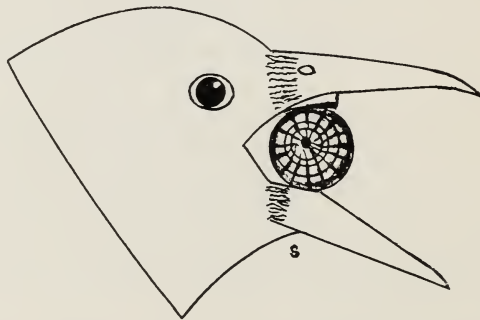
One method, however, has been invented here at Louisville which has proven extremely successful, and as no mention is made of it in E. R. Kalmbach's recent leaflet on methods of combating Starling roosts (*Wildlife Leaflet*, 172, Dec., 1940) it seems desirable to bring it to the attention of ornithologists.

In the fall of 1939, Mr. J. C. Pfeiffer, the engineer for a large department store in the heart of the Starling roost, installed a noise system based on compressed air. The air is circulated through a large pipe in the upper story of the building by an air-compressor. Horizontal pipes of smaller diameter are extended from each of the upper windows. On the ends of each, pieces of soft rubber hose about 18 inches long are attached. The weight of the hose causes it to hang down

over the end of the pipe shutting off the escape of the air. When the air pressure has built up sufficiently, it causes the hose to straighten out and emit a small explosive report. The repeated flapping of the hose accompanied by the popping noises has kept this building entirely free of Starlings for two winters. Although the expense of installing such a system may be \$100.00 or more, according to Mr. Pfeiffer the cost of operating the compressor is only \$2.00 per month. He turns it on about an hour before dark. About two hours later, when the Starlings are settled for the night on neighboring buildings, he shuts down the apparatus. He finds that it can be left off for several days at a time, the Starlings having apparently established roosts elsewhere. A minor objection to the method is the noisy popping of the numerous swinging hose. Five other buildings have installed similar methods and all have been very successful, as shown by their clean window ledges and awnings. As more and more buildings adopt this compressed air system, it will be instructive to observe the final effect upon the winter habits of the Louisville Starlings.—HARVEY B. LOVELL, *Biology Department, University of Louisville, Louisville, Kentucky.*

The Bronzed Grackle's Method of Opening Acorns.—The writer has known for some time that the Bronzed Grackle (*Quiscalus quiscula aeneus*) splits the shells of acorns in order to secure the meat. While watching the feeding operations of this species at Madison, Wisconsin, in September, 1941, it occurred to me that the procedure might not be commonly known. The reference books consulted were silent beyond the statement that acorns form a portion of the Grackle's diet. Correspondence with J. Van Tyne resulted in reference to the paper by Alexander Wetmore (*Auk*, 36, 1919: 190-7) in which the method of splitting the acorns is described.

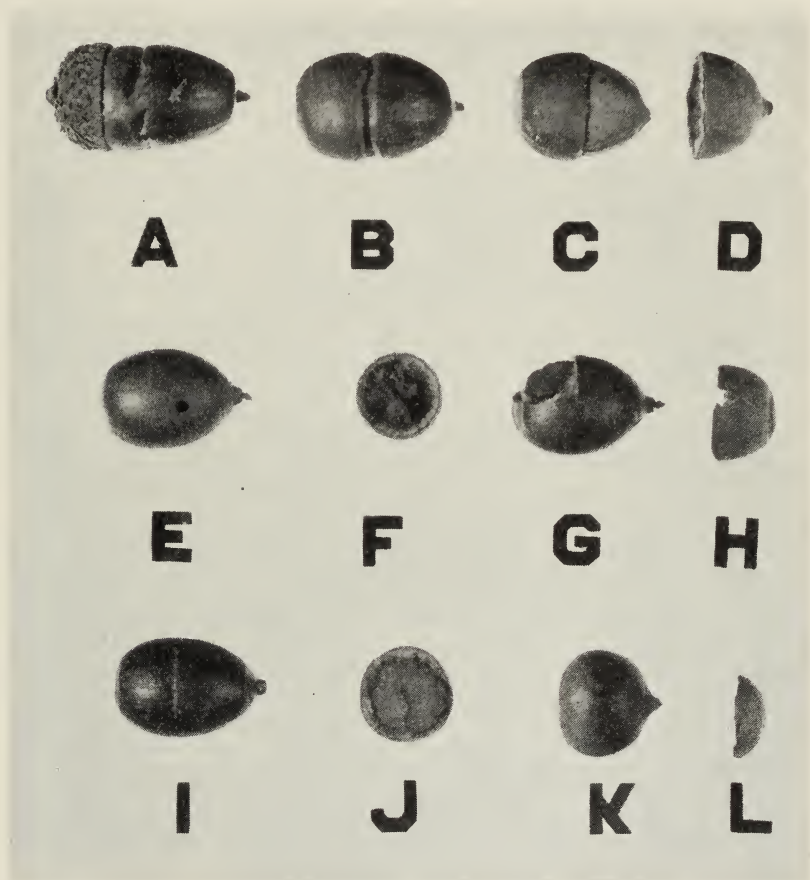
The cutting is done by a special ridge or keel in the Grackle's palate. The position of the acorn in the bill during shelling is shown in the accompanying



drawing. Pressure is applied and the acorn rotated until there is produced a circular indentation at right angles to the axis, the shell eventually falling into halves. On October 11, I chanced upon two men shooting Grackles in a field of standing corn which was infested with about a thousand of these birds. Fourteen males and eleven females were thus made available for examination. There was considerable individual variation in the height of the keel and this did not appear

to be due to wear. The keel in some cases was so low that a rule would barely strike it when drawn towards the commissure. There seemed to be no consistent differences correlated with sex.

Supplementary observations made in Wisconsin show that the Grackle opens the small acorns of the yellow oak (*Quercus velutina*), Hill's oak (*Q. ellipsoidalis*), scarlet oak (*Q. coccinea*), bur oak (*Q. macrocarpa*), and pin oak (*Q. palustris*). The normal acorns of the white oak (*Q. alba*) and the northern form of the red oak (*Q. borealis*) are too large to be manipulated. Attempts are made to open abnormally small acorns of the white oak but these are seldom successful as



shown on the accompanying plate (A, B, and C). This is due to the toughness of the shell and to the tendency of the meat of unripe acorns to stick to the shell. The largest acorn found with keel marks was 15.5 mm. in diameter.

No positive evidence was obtained that any portion of the shell is swallowed. The stomachs of the birds collected showed no shell fragments. In some cases half of the shell resisted separation (C) and this caused abandonment. Frequently the meats of the acorns of the yellow oak split with the shell. The fragment (J) was reworked in the bill and rejected if the meat did not dislodge.

A high percentage of the acorns (I) worked upon are rejected because of resistance to splitting. Frequently a bird will seize an acorn and fly into a tree where much more persistence is shown in the attempt to open it than when the bird is on the ground. It is not uncommon for the Grackles to feed on acorns that they pick from the tree.

Several pin oaks have been planted in Madison for ornamental purposes. Their acorns are approximately 12.5 mm. in length and the width usually exceeds this dimension. Curiously enough the shell fragments showed that the split was made about 3 mm. from the base (L) instead of near the middle as was the case with acorns from most species. When an acorn of the pin oak was placed in the bill of a freshly collected bird and pressure applied, the acorn automatically took such a position that the keel would cut near the base. Regardless of how the acorn was inserted on its side, the result was the same. This is due to the peculiar shape of the acorn (K), pressure causing it to incline from the perpendicular.

Wetmore stated that the kernel is swallowed entire. This appears to be the case; however, only fragments of the meat were found in the birds collected even early in the morning, the largest being 8 mm. in length. The gulping action is probably accompanied by crushing of the kernel. Unfortunately no bird was found in the act of swallowing a kernel where it could be collected with discretion. Secondary evidence for crushing is the fact that in no case was even so small an object as a grain of maize found entire in the stomach.

A large percentage of the acorns in this region are parasitized by weevils of the genus *Balaninus*. The egg is deposited in the growing acorn, the larva eventually cutting in the shell a hole by which it escapes to the soil. The Grackle appears to be unable to distinguish between sound and unsound acorns. Many opened acorns were found containing nothing but excreta and decayed portions of the meat (E, F, G, and H). In "H" it will be noted that the line of cleavage runs across the hole by which the larva made its exit. No evidence could be obtained that the acorns were opened from a desire to secure the larvae.—A. W. SCHORGER, 168 North Prospect Avenue, Madison, Wisconsin.

Crossbills Breeding in Northern Michigan.—During a field trip from January 27 to February 12, 1941, to the Huron Mountains of Marquette County, in northern Michigan, I observed unusual numbers of crossbills. Both the Red Crossbill (*Loxia curvirostra minor* Brehm) and the White-winged Crossbill (*Loxia leucoptera leucoptera* Gmelin) were present. Identification of specimens collected has kindly been made by Pierce Brodtkorb, following Ludlow Griscom's revision (*Proc. Boston Soc. Nat. Hist.*, 41, No. 5, 1937). W. B. Barrows stated ("Michigan Bird Life," 1912: 472) that "Occasionally both forms are found in the same flock, but this is unusual . . ." In the present instance they occurred together, the Red Crossbills outnumbering the White-winged by more than three to one. There were literally hundreds of the birds throughout the region, often mingled with great numbers of Redpolls (*Acanthis linaria linaria*) and Pine Siskins (*Spinus pinus pinus*). Chickadees (*Penthestes atricapillus atricapillus*) were distinctly less common in the region at this period than in previous seasons, a fact possibly due to competition with the great numbers of these other birds.

A good crop of pine cones probably attracted the crossbills, which were found everywhere in conifer stands. However, Red Crossbills were also observed in virgin hardwood forests; and about a dozen pairs of White-winged Crossbills were present in a large swamp of alders and small spruces. At one group of buildings both species were commonly seen in white birches and nearby Norway pines. Often the birds were grouped about the bases of hard maples and hemlocks, pecking at the bark; also they were greatly attracted to spots of dog urine in the snow. During this period the temperature ranged approximately from 10° to 30° F., and the snow depth from 16 to 30 inches on the level.

A continuous chattering was plainly audible while the birds were feeding in flocks on conifers. The ordinary call note was a sharp whistle. Frequently the birds were heard in full song—a sweet, warbling melody. Often they were seen flying about in pairs. In one case, a lone pair of White-winged Crossbills was present in a meadow, singing and perching in an alder at the edge of a stream. The female was collected, at which the male appeared greatly disturbed. Griscom (*loc. cit.*, p. 82) states: "I have been able to find only a very few definite records of the two species ever breeding commonly together at the same time in any particular locality or region." In the present case they certainly were. Four males and three females of each species were collected. Subsequent examination by Leslie D. Case proved them to be in breeding condition, as shown in the accompanying table.

CROSSBILLS COLLECTED AT HURON MOUNTAINS, 1941

No.	Sex	Date	Breeding condition
<i>Loxia curvirostra minor</i> :			
4B	♂	Jan. 28	Testes approximately 2 mm. greatest diameter.
6B	♂	Jan. 29	Testes approximately 2.5 mm. greatest diameter.
16B	♀	Jan. 30	Largest ovum approximately 4 mm. diameter.
27B	♀	Feb. 4	Largest ovum 9 mm. diameter.
31B	♂	Feb. 9	Testes approximately 2.5 mm. greatest diameter.
32B	♂	Feb. 9	Testes approximately 2.5 mm. greatest diameter.
33B	♀	Feb. 9	Largest ovum approximately 1.5 mm. diameter.
<i>Loxia leucoptera leucoptera</i> :			
7B	♂	Jan. 29	Testes approximately 3 mm. greatest diameter.
8B	♀	Jan. 29	Largest ovum 20.5 x 14.5 mm., about ready for shell to form.
23B	♂	Feb. 3	Testes approximately 2.5 mm. greatest diameter.
24B	♀	Feb. 3	Largest ovum approximately 2 mm. diameter.
34B	♂	Feb. 9	Testes approximately 3 mm. greatest diameter.
35B	♂	Feb. 9	Testes 4 x 2.5 mm.
36B	♀	Feb. 10	Largest ovum approximately 2.5 mm. diameter.

The vagrant and erratic habits of the crossbills have been pointed out by Griscom (*loc. cit.*). In the Huron Mountains they have occurred irregularly for many years. S. S. Gregory, Jr. ("The Book of Huron Mountain," 1929: 181) says of the Red Crossbill: "Generally present in varying numbers from February to November. Sometimes abundant. Young scarcely able to fly were being fed by adults on May 7, 1921." One of these young was collected. Gregory writes further of the White-winged Crossbill: "Rare. This species was observed once on July 31 at the mouth of Elm Creek, and one other time on Sept. 9, on the Sand Plains about ten miles inland. A pair was collected near the upper end of Mountain Lake on Sept. 6, 1922." Bayard H. Christy (*Wilson Bull.*, 37, 1925: 213) says of the Red Crossbill: "A few wandering bands were seen in conifers, usually in spruces" between May 24 and June 17, 1925. Josselyn Van Tyne collected two red males (apparently *pusilla*) on June 24, 1936, from a flock of eight in a jack pine clearing ten miles inland. In the past two years I have observed the Red Crossbill in the Huron Mountains in all months except April, August, September, October, and December; the White-winged Crossbill I have seen only in July and September.

There are very few authentic breeding records for crossbills in the state of Michigan. Barrows (*loc. cit.*, p. 471) reports a nest of the "Red Crossbill" with two eggs found at Hillsdale in February of 1893 or 1894, by G. E. Douglas. Henry Nehrling ("Our Native Birds of Song and Beauty," 1896, vol. 2: 44) reports a nest of the White-winged Crossbill with two eggs found ten miles west of Escanaba on April 27, 1891, by A. J. Schoenebeck. The few other reports are all subject to doubt.—RICHARD H. MANVILLE, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

Additional Records of the White-crowned Sparrow in South Carolina.—On October 20, 1928, I saw an immature White-crowned Sparrow (*Zonotrichia leucophrys*) on a rice field bank near the Cooper River.

The species was not observed again until October 8, 1938, when a young male was found on a canal bank a few hundred feet from the river; it soon flew into a dense growth of canes and bushes and was not seen again that day. The following day it was back in the same place and was collected.

The White-crowned Sparrow is very rare in coastal South Carolina and these are the only two specimens I have encountered. All the South Carolina coastal records are of birds in "brown livery," as Audubon said.—EDWARD S. DINGLE, *Huger, South Carolina*.

Gambel's Sparrows in Ohio.—During May, 1941, I banded 17 White-crowned Sparrows (*Zonotrichia leucophrys*) at South Euclid, Ohio. Two of these, trapped on May 10 and 15, had different markings on the head and I immediately suspected that they were Gambel's Sparrows (*Zonotrichia l. gambeli*). I confirmed this by comparing them while in the hand with the colored plate in T. S. Roberts' "Birds of Minnesota." The birds were then banded and released. There are few previous records for Gambel's Sparrow in Ohio.—M. B. SKAGGS, *Julian Road, South Euclid, Ohio*.

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

- T. Hume Bissonnete—3 reprints
- John B. Calhoun—1 reprint
- Edgar P. Chance—5 pamphlets
- F. N. Hamerstrom—30 pamphlets and reprints
- Leon Augustus Hausman—11 bulletins
- Margaret M. Nice—15 books, 12 magazines
- Dayton Stoner—6 reprints

EDITORIAL

Our 1941 Annual Meeting, held November 21 and 22 at Champaign-Urbana, Illinois, was one of our largest and most successful. Members came from points as distant as New England, New York City, Georgia, and Winnipeg and they were well rewarded by the program arranged by our Secretary and the Local Committee of Kendeigh and his associates.

The program included not only thirty-three papers and movies but special demonstrations of the work of the University of Illinois Zoology Department and the Illinois Natural History Survey and, last but not least, a rousing auction by James Boswell Young of seven Sutton pictures generously donated by the artist to be disposed of for the benefit of *The Wilson Bulletin* illustrations funds.

The full proceedings of the meeting will be published in our next issue but a few important points may be mentioned here. The new officers are: President, George Miksch Sutton; First Vice-President, S. Charles Kendeigh; Second Vice-President, Olin Sewall Pettingill, Jr.; Secretary, Maurice Brooks; Treasurer, Gustav Swanson. The 1942 Annual Meeting will be held at Cornell University, Ithaca, New York. Affiliation was completed with the Georgia Ornithological Society, the Virginia Society for Ornithology, and the Inland Bird Banding Association.

Unreported changes of address continue to cause unnecessary postage bills on forwarding notices and returned *Bulletins*. In so far as members can remember to notify the Editor of these changes we shall be able to use that money for a larger and better illustrated *Bulletin*.

We are grateful for editorial help and suggestions received during the past year from Helen T. Gaige, James Moffitt, Gustav Swanson, and George M. Sutton.

ORNITHOLOGICAL NEWS

Bernard W. Baker has purchased a 491-acre tract of Sandhill Crane marsh in Calhoun County, Michigan, and presented it to the Michigan Audubon Society as a sanctuary for these rare birds. Further particulars will be found in the forthcoming issue of that society's fine journal, *The Jack Pine Warbler*.

Jessop B. Low and William H. Elder have been appointed wildlife technicians to the Illinois Natural History Survey.

The northeastern states are experiencing an unusual migration of Snowy Owls this year. The large number of records already received seem to indicate that this flight will rival the great invasion of 1926-1927. It is highly desirable to record such cyclic migrations but an adequate account must be based on a great number of widely separated reports. Your co-operation is solicited. Please send records of owls seen or collected to Dr. Alfred O. Gross (Bowdoin College, Brunswick, Maine) who is compiling the records of this Snowy Owl flight as he has of others in the past. Dr. Gross is also anxious to secure information on the food of these owls. Remember that taxidermy shops are often good sources of Snowy Owl records.

Earl G. Wright, formerly of the Chicago Academy of Sciences, has been appointed Director of the Neville Public Museum, Green Bay, Wisconsin.

WILDLIFE CONSERVATION

Conservation Notes from Canada

Following the recent discovery of the nesting-grounds of Ross's Goose near the Perry River, in a remote part of the Northwest Territories, Canada has placed a complete closed season on this species in the Northwest Territories and Alberta, which are the only parts of the Dominion in which it usually occurs.

James Bay, the southern arm of Hudson Bay, is an important area for migrating geese, ducks, and shorebirds, because the conformation of northeastern North America causes several migration routes to meet there and abundant food is available over large areas. The principal waterfowl species in that region are the Blue Goose, Lesser Snow Goose, Canada Goose, Pintail, Black Duck, and Green-winged Teal. Sanctuary areas in which waterfowl receive complete protection throughout the year have been established on the islands and coast of James Bay in recent years as shown below. Those established by the Dominion Government are in the Northwest Territories and the Province of Quebec, the governments of which concurred in each case in the action taken.

<u>SANCTUARY</u>	<u>APPROXIMATE AREA</u>	<u>ESTAB- LISHED BY</u>	<u>YEAR</u>
Hannah Bay Waterfowl Sanctuary	60 sq. mi.	Ontario	1938
Hannah Bay Bird Sanctuary	40 sq. mi.	Dominion	1939
Twin Islands Game Sanctuary	55 sq. mi.	Dominion	1939
Boatswain Bay Bird Sanctuary	60 sq. mi.	Dominion	1941
Akimiski Island Bird Sanctuary	1,100 sq. mi.	Dominion	1941
TOTAL AREA	1,315 sq. mi., or 841,600 acres		

On the coast and islands of James Bay there have also been established during the past decade, by complementary action of the Dominion Government and the provinces concerned, six large beaver preserves, with a total area of about 30,000 square miles, in which beaver may not be taken until the population of these animals is ascertained to be at a suitable level and where they may then be trapped only under strict control, to avoid undue depletion. Of these preserves, two are in Ontario, two in Quebec, and two in the Northwest Territories. The establishment of several additional large preserves of this kind in this region in the near future is projected.

Beaver conservation aids waterfowl by increasing the number of beaver ponds and by shifting some of the hunting pressure of Indians from waterfowl to beaver.—Harrison F. Lewis.

“Trumpeter Swan populations since annual counts have been made are as follows, according to the Fish and Wildlife Service:

1934— 33	1938—148
1935— 73	1939—199
1936—114	1940—190
1937—168	1941—211”

(*Wildlife News*, October 15, 1941: 12)

Pollution

Recently the attention of Ohio authorities has been called to the increased pollution by oil of the lower Maumee River and Maumee Bay at the western end of Lake Erie. Because of the war, traffic in oil products has increased much and has resulted in the dumping of greatly increased amounts of oil wastes in the river and bay. Because of haste in loading the boats, oil is spilled into the bilge in greater than usual quantities and this in turn is dumped with the bilge water into the river and bay.

So far, the damage to wildlife from the increased oil pollution has been slight. In July there was a killing of several species of fishes, comprising hundreds of individuals. At that time observations were made upon many hundreds of water birds, chiefly gulls and terns, for possible oil on their plumage. A few individuals with stained plumage were found, but no birds were noted with feathers soaked enough to render them flightless.

This instance is given to demonstrate an increased hazard to our wildlife which is occurring in many sections of the United States. Some addition to our waters of pollutants, in this period of stress, is unavoidable; however, in many cases the discharge of increased amounts of injurious pollutants can be avoided. In the case cited above, the bilge water from boats can be emptied farther out into Lake Erie, where the greater amount of water and wave action will minimize the effects of the oil wastes.

Fortunately the situation is not hopeless, even in those areas where an increase of oil pollutants is at present unavoidable. The dumping of oil wastes into a small stream in Wayne County, Michigan, a few years previous to 1934, so badly polluted Gibraltar Bay, a part of the Detroit River system, that many fishes were killed and some species eliminated from the bay. For a few winters thereafter ducks of several species resorted to the bay in numbers, apparently because the oily waters did not freeze as quickly as did the adjacent river. The result was that dozens of birds died and the oil soaked plumage of others rendered them temporarily flightless. The polluting of these waters had stopped by 1935, and conditions had begun to improve. By the summer of 1941 favorable conditions in the bay had been restored, the once abundant and desirable types of vegetation had returned, and there was the usual population of fishes, birds, and other animals.

The evidence obtained at Gibraltar Bay, and many other oil polluted waters elsewhere, indicates that rather rapid and almost complete recovery can be expected if the discharging into the waters of the deleterious effluent is entirely stopped, or a partial recovery if the amount is appreciably lessened.

It is suggested that observers watch for evidence of increased pollution, and if found, the proper authorities should be informed, so that possible corrective measures may be employed.—M. B. Trautman.

Indian Service

"For the first time in history, biologists have been assigned to work permanently at wildlife problems on Indian reservations. Effective August 7, and only recently made public, a cooperative agreement was signed by officials of the Indian Service and the Fish and Wildlife Service providing for a Section of Indian Reservation Wildlife under the direction of Dr. W. B. Bell, Chief of the Division of Wildlife Research of the latter Division.

"Head of the new Section is Clifford Presnall. . . ." (*Wildlife News*, October 15, 1941: 1)

WILDLIFE CONSERVATION COMMITTEE,
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE

SPECIATION IN THE AVIAN GENUS JUNCO. By Alden H. Miller. University of California Publications in Zoölogy, 44, No. 3: 173-434, 33 text figures. May 24, 1941 [our copy received August 15]. \$3.00.

This study, based upon nearly twelve thousand museum specimens, is an analysis of the variations in size and color among populations of Juncos, in order to determine the degree of unity of each form and to trace the successive stages of differentiation from individual variants to the species. Although it is not primarily a taxonomic study, a revision of the genus was made in order that the subsequent conclusions might rest upon a sound base. Twenty-one forms of Juncos are recognized, of which no less than ten are considered full species. Under each form there are stated its characters, range, and in the appendices its synonymy and notes on the type specimen. No new forms are proposed, although Dwight's name *cismontanus* is applied to the Cassiar Junco on what appears to be rather weak nomenclatural grounds.

The variable characters of each form (size, intensity of pigmentation, and color pattern) are analyzed in minute detail, and in many cases the variations shown by different populations of the same form are compared. These are well illustrated by charts and graphs. A worthy and rather novel feature is the interpretation of the mode of inheritance of characters through the correspondence to Mendelian ratios of the numbers of individuals of various phenotypes found in samples of wild populations.

Intergradation, or "hybridization," between forms is studied. Spot maps of the critical areas helps to illustrate the situation. Twelve more or less distinct successive stages of segregation are recognized, ranging from complete differentiation to nearly complete inoculation. The ranges of all the Juncos are complementary, and intergradation or crossing invariably occurs wherever it is geographically possible. Thus of the fifteen forms of dark-eyed Juncos, which Miller places in five specific units, twelve are connected by intergrades or "hybrids" in a chain of races. Two others intergrade by individual variation, and the last form is an insular one. In the yellow-eyed group, four of the five members are considered full species. Intergradation occurs between only two forms. The other three occupy isolated mountains, so intergradation is physically impossible, but some of them at least are even less different than certain forms which are treated as races.

The distinction made between hybridization and intergradation and between species and race is not entirely clear, but it appears to have some historical connotations. For example, the *hyemalis* forms and the *oreganus* forms are considered separate species, although connected by an intergrading intermediate subspecies, because it is thought that their juncture has been secondary. If this distinction is made, is it logical to rank as subspecies the connecting forms of supposed hybrid origin, such as *J. hyemalis cismontanus* and *J. caniceps dorsalis*?

Junco caniceps caniceps is considered specifically distinct from *J. oreganus*, and the two are not even placed in the same "Artenkreis." Yet the intergradation between *caniceps* and its race *dorsalis* is said to be of the same type as, and is apparently no more frequent than, that between *caniceps* and *J. oreganus mearnsi* and between *caniceps* and *J. oreganus thurberi*.

Miller's species of Juncos are not of equal rank with most other avian species. Rather, they are divisions of a species, representing groups of races which have certain characters in common, in contrast to other groups of races with different common characters. The limits of our system of nomenclature are such that it is impossible to express every degree of relationship by a name of different rank, and it confuses rather than clarifies the case to attempt to express degrees of relationship by employing Rassenkreis terms when these are used with a much more restricted meaning than originally intended. As Miller himself says, most

of his "species" and "Artenkreise" would by many people be placed in a single Rassenkreis.

In the final portion of the paper the results of breeding experiments and the phylogenetic relationships of the various forms are discussed. The breeding experiments yielded only a single F_1 offspring raised to maturity. A back cross was made between this bird and one of the parental types. The author suggests that the failures in attempted laboratory matings were due to faulty technique rather than to lack of fertility between forms.

No matter at what place the Juncos may have evolved originally, the southernmost member, *J. vulcani*, is considered to represent the most primitive stage in the genus. The yellow-eyed Juncos arose in Tertiary times, and in turn gave rise to the dark-eyed Juncos. The next stage was the splitting of the dark-eyed birds into three branches—a pale-headed *insularis*-like bird on the west coast, a *caniceps*-like bird in the interior, and a *hyemalis*-like bird in the east. These branches were isolated until the glacial periods, during which time there was a secondary juncture. Contemporaneously, a new group of dark-headed birds invaded the west.

The characters of some forms are directly correlated with climatic conditions. In other cases, while not correlated to the present environment, they possibly were to the environment of the not-distant past. Certain forms evolved independently, and others are the product of hybridization of two independently derived stocks. Under the right conditions of isolation, individual variants give rise to races, and these in turn form species.

While primarily of interest to ornithologists, Miller's paper should be studied by all students of variation and evolution. It is a very careful analysis of a difficult and plastic group, and the principles discovered in force will undoubtedly be found to apply in other special fields.—P. Brodtkorb.

TERRITORIAL AND MATING BEHAVIOR OF THE HOUSE WREN. By Charles Kendeigh. Illinois Biological Monographs, 18, No. 3, 1941. 1-120, 32 figures. (University of Illinois Press, Urbana, Ill.). \$1.50.

This account of territorial and pairing behavior of *Troglodytes aedon* is based on a 19-year study in northeastern Ohio on the estate of the late Dr. S. Prentiss Baldwin; 331 matings of 142 males and 147 females are involved. The first 58 pages cover: spring arrival of birds; establishment and defense of territories; characteristics of the territory; reproductive vigor; mating behavior; and termination of nesting. Chapter 8 gives a "History of Individual Territories" with 51 pages in small print discussing 215 territories illustrated with 32 maps. Finally five pages are devoted to histories of 98 birds that were present two or more years.

All adults and young are banded with aluminum bands, the adults being also given red or yellow celluloid bands to indicate their sex. The House Wren, dependent as he is on nest boxes, is much less insistent on returning to his former territory than the European Wren is on staying on his, nor the Song Sparrow on either staying on or returning to his. The House Wren is the most aggressive of all the wrens in that it seeks to remove possible hole-nesting competitors by destroying eggs or young of its own or other species, even in some cases of birds building open nests. In the 331 nestings eggs were destroyed in 13 instances and young in 5, i.e., 6 per cent. Miss Sherman and others believe that the House Wren has become unduly abundant because of man's providing a vast supply of protected nest-sites. Dr. Kendeigh writes, "Destruction by wrens of nestlings of other wrens, bluebirds, and house sparrows is especially prevalent under conditions of high population or perhaps over-population," (p. 33). In many places the House Wren is displacing the Bewick Wren. "The northward dispersal of this species appears to be hindered by the house wren, which in turn is probably limited in its southward distribution by the Bewick Wren." So far as I know *Thryomanes bewicki* does not destroy nests or young of any species.

Three types of song are distinguished—territory, mating, and nesting. "Territories are established and defended by singing, by taking possession of nest-sites, by assuming threatening postures sometimes accompanied with scolding, by chasing, and by physical combat. This order is one of increasing exertion and energy demand and may represent the reverse order of steps through which the territorial behavior has developed in the course of evolution" (p. 116).

Forty per cent of matings for the second brood were with the same individuals. "Remating of a pair the following year occurred in 42 per cent of the cases where both birds of the pair survived and returned to the locality" (p.118).

The histories of territories are difficult to read owing to the use of the long band numbers rather than some abbreviated system. If the birds had been individually marked with colored bands, much uncertainty in the records would have been obviated. One wishes that more comparisons had been made with the European Wren so admirably studied by Kluijver and his co-workers and also with other studies of banded populations—Laven's Ringed Plovers, Erickson's Wren-tits, Price's Plain Titmice, Kluijver's Starlings, Nice's Song Sparrows.

Despite these minor criticisms, the paper is a well-organized and valuable contribution to our knowledge of territorialism and mating behavior.—M. M. Nice.

PAGEANT IN THE SKY. By Raymond S. Deck. Dodd, Mead & Co., New York, 1941: xiv + 268 pp. Illustrated. \$3.00.

Ornithologically inclined readers of *The Saturday Evening Post* and other popular periodicals will remember occasional articles dealing with bird migration, waterfowl shortages, and other natural history subjects by Raymond S. Deck. Now Mr. Deck has presented us with a volume of his essays, each an entity, but all uniting to form a harmonious whole. The volume is illustrated by an effective selection of the author's bird photographs.

Mr. Deck's approach to birds is a personal one. He asks the reader to accompany him first to a Martian point of vantage from which bird migration in all its hemispheric sweep may be seen and followed; then he brings us back to the familiar surroundings of our own back yards for more intimate glimpses of certain birds which hold (for many of us) peculiar interest, or for a discussion of problems and techniques which relate to bird study or bird conservation.

Many writers have been challenged by the epic qualities of bird migration; many have told of their joys in attracting and protecting the birds around their homes, but few authors (or so it seems to me) have had Mr. Deck's success in portraying the esthetic and emotional appeal of bird life and movement without over-large doses of sentimentality or "fine writing," and without serious lapses of scientific accuracy. From a background that includes experience on the staff of the Children's Museum of Brooklyn, collecting for the American Museum of Natural History on the famous Mt. Duida expedition, and travel as a free-lance writer and photographer over a considerable part of the North American continent he draws his materials from an extensive field, yet he manages to impart a personal quality to each of the subjects which he discusses. One feels that his impressions, frankly set down, are genuine within him, not the *ersatz* emotions betrayed in some of the more gushing of recent bird books.

Mr. Deck has carried a gun, and knows the sportsman's lift at the rise of a flock of ducks; yet he is not allied (in spirit or by checkbook) with that school of "conservationists" whose aim in life is the production of more birds for a finer slaughter. Neither is he closely joined to any of the crusading protectionist organizations. His approach to practical conservation is, therefore, one freed from the bias which (unconsciously perhaps) creeps into the writings of those whose chief joy is in the gun, or to whom wildfowling in the old sense is anathema. His "Sportsman's Credo" (Chapter 13) seems to be an exceptionally sane and moving

statement of what a man may believe concerning the wild creatures which surround him. Many an ornithologist will find his own thoughts reflected (and wish that he might have expressed them so well) in the apologia for bird study which comprises Chapter 10.

Being something of a "lone wolf" in bird study, Mr. Deck does not frequent the haunts at which ornithologists are accustomed to assemble (so far as I know, he is not a member of a single committee!); consequently he is not overly-well known to the brotherhood. Though his present volume is for the general reader rather than the technical student, and though it is not entirely free from "omissions and commissions," it nevertheless bespeaks a place for its author among those who have the gift of words, and the sense to use them with restraint and scientific accuracy.—Maurice Brooks.

LUNDY ISLE OF PUFFINS. By Richard Perry. With photographs by Alan Richardson. Lindsay Drummond, London, 1940: $5\frac{1}{2} \times 8\frac{1}{2}$ in., 267 pp., 37 photos, map. \$4.40.

Lundy is a slender island three miles long in the mouth of Bristol Channel off the west coast of England. Its name comes from the word *Lunde* (= Island of Puffins) given it by the early Norsemen. The Island's owner and overlord is Martin Coles Harman, a person in whom the summer-residing Puffins have a staunch admirer. In fact, he admires them so greatly that he issued in 1929 and 1930 a series of commemorative "Puffin" stamps in denominations ranging from a " $\frac{1}{2}$ Puffin" and "1 Puffin" to "12 Puffin." These stamps are used on all mail passing to and from Lundy Island. Ornithologists interested in bird curios would do well to obtain a series from Mr. Harman.

In 1939 Richard Perry, author of "At the Turn of the Tide," spent five months studying the large number of resident sea birds on the island. The present book is a record of his observations. The main body of the book is divided into separate accounts of the Atlantic Puffin, Kittiwake, Razor-billed Auk, Atlantic Murre, "Bridled Guillemots" (birds with the *ringvia* plumage of the Atlantic Murre), and "Cormorants." Other sections deal with general remarks about the island and the birds of passage.

The book is decidedly not easy reading, being heavily descriptive with an abundance of sentences greatly involved and wordy. However, it is a book which must not be overlooked by ornithologists specializing in avian sociology and sea-bird life. While there are countless observations without significance, there are others which must be weighed carefully and in some cases seriously questioned insofar as their interpretations are concerned. Examples follow:

The peculiar "bill-rapping" habit of Puffins the author considers a courtship performance. He goes on to say (pp. 62-63) "Each bout of bill-rapping is succeeded by a slight, though perceptible, sipping of their scissor mandibles. It is probable, therefore, that, as in the case of so many other sea birds, a certain secretion is exuded during the rapping pleasurable to the participants." His explanation of the Puffin's ability to catch and hold a series of fish in the beak during one dive is not clear. He writes (p. 76): "Progressing thus, he [a Puffin] will first take a fish to the right of him and then one to the left, then right, then left, nipping each one with the hooked tip and working it down his bill very easily: for the elastic folds of skin at its base permit either mandible to be raised or lowered independently of the other." He noted Kittiwakes conducting communal nesting expeditions (p. 98), "excitedly plucking beakfuls of thrift, with violent stabs, from a single cushion at some special site on the cliffs." Kittiwakes (p. 93) "like many other sea birds, do not breed until their fourth year." Occasional Kittiwakes, he found (p. 106), "have an odd habit of hatching out one egg a week or more after the other..." The Razor-billed Auk (p. 124) "has a curious

though very necessary habit, considering the enormous size of her egg, of incubating it under one falling wing. . . ." This same species, he observed (p. 122), pecks material (i.e. "dust") over the egg on leaving it unattended.

The photographs by Alan Richardson are exceptionally fine; the map of Lundy Island appropriately detailed.—O. S. Pettingill, Jr.

THE BIRDS OF NORTH AND MIDDLE AMERICA. By Robert Ridgway, continued by Herbert Friedmann. Part IX. United States National Museum, Bulletin 50. 1941 [our copy received October 27]. ix + 254 pp., 16 text figures. \$.40 (paper), of Superintendent of Documents, Washington, D.C.

The National Museum is to be congratulated on the appearance of the ninth part of *The Birds of North and Middle America*, after an interval of 22 years during which publication was halted. The present part contains only the Gruiformes and is therefore much smaller than originally intended.

The form of the earlier volumes of *The Birds of North and Middle America* is too well known to need description here. In the present case Ridgway's manuscript notes have been used as much as possible, but the author has felt himself responsible for the entire contents and not merely an editor of a posthumous work.

Friedmann has carried out the general plan of the earlier volumes with a few minor changes, most of which are distinct improvements. For instance, the arrangement of families, genera, and species within the order is reversed, to commence with the lowest instead of the most specialized forms. Subspecies are arranged according to relationships as far as possible, and the nominate form is not necessarily given first. Under the generic diagnoses, the paragraph on coloration is expanded to include plumage. The figures of generic details are given at their proper places in the text, rather than all together at the end of the volume, where they were hard to find and seldom used. There is a commendable conservatism in the recognition of genera. The section on range of a given form is broken down into separate paragraphs on breeding range, winter range, and casual records, a practice which makes for greater ease in finding the desired information. An additional heading, type locality, is also a useful innovation. It is almost impossible to prevent misspellings of place names in a work of this character; nevertheless, they appear to be decidedly fewer here than in the earlier volumes. Among the most instructive features of Ridgway's work were the frequent footnotes giving comparative average measurements of a bird over its geographic range. Friedmann expands these to include extreme as well as average measurements.

Certain features of the present volume are in our opinion debatable, and if we point them out it is not because of hypercritical captiousness but in the hope that the succeeding parts may be improved. Geographic range is not mentioned in the keys, although invariably included by Ridgway. A concise statement of range is often a time-saver in attempting to "run down" closely related forms. We are sorry to see the continued use of cumbersome Roman numerals in the bibliographies. In the index Ridgway distinguished by bold face numerals the page at which a species was treated in detail. It is too bad that this practice was not followed in the present volume, since in many cases the bird may be referred to on half a dozen or more pages.

Anyone who has done bibliographic compilation will appreciate the vast amount of labor which has been expended in preparing the synonymies. It appears that there has been an 80 per cent increase in the literature on this group since 1919, when the last volume written by Ridgway was published. Nevertheless, we wonder how thorough the search of the literature has been. A casual inspection shows the complete omission of six fairly important faunal papers, namely—Wood on birds of Alger County, Michigan; Wood, Smith, and Gates on Cheboygan County, Michigan; Stone on the birds of Honduras; Van Tyne on Peten birds; the same author's Michigan check-list; and Van Tyne and Sutton on the birds of Brewster

County, Texas. These papers contain valuable distributional data and some remarks on the systematic status of gruiform birds. Several other papers have been referred to in only a part.

Since its inception in 1901, *The Birds of North and Middle America* has been a standard text, and the present volume proves that a fitting successor to the master Robert Ridgway has been found. We wish the author all speed in bringing the series to an early conclusion.—P. Brodtkorb.

SHORT PAPERS

- ADAMS, LOWELL. Aberrant Mating Activities of the California Woodpecker. *Condor*, 43, No. 6, Nov., 1941: 268-9.
- BARBOUR, ROGER W. A Preliminary List of the Summer Birds of the Summit of Big Black Mountain. *Kentucky Warbler*, 17, No. 4, 1941: 46-7. (Near Harlan, Ky.).
- BARDEN, ALBERT A., JR. Distribution of the Families of Birds. *Auk*, 58, No. 4, Oct., 1941: 543-557.
- BEHLE, WILLIAM H. Additional Data Concerning the Subspecific Status of the Cormorants of Great Salt Lake. *Condor*, 43, No. 6, Nov., 1941: 286-289. (Should be referred to *Phalacrocorax a. auritus*).
- BELL, GLENN W. The Least Flycatcher Breeding in Northeast Georgia. *Oriole*, 6, No. 3, Sept., 1941: 36-7, figs. 1-2. (The photographs and text indicate that the species observed was actually *Vireo solitarius alticola* rather than *Empidonax minimus*).
- BELLROSE, FRANK C., JR. Duck Food Plants of the Illinois River Valley. *Ill. Nat. Hist. Surv. Bull.*, 21, Art. 8, Aug., 1941: 235-280, frontisp. and 35 figs.
- BENE, FRANK. Experiments on the Color Preference of Black-chinned Hummingbirds. *Condor*, 43, No. 5, Sept., 1941: 237-242, figs. 64-68.
- BRAUND, FRANK W. and JOHN W. ALDRICH. Notes on the Breeding Birds of the Upper Peninsula of Michigan. *Oologist*, 58, No's 8 & 9, Aug., Sept., 1941: 86-93, 98-105, illus. (*Poocetes gramineus polius* subsp. nov. from 4 mi. N. of Newberry, Mich.).
- BRODKORB, P. The Pigmy Owl of the District of Soconusco, Chiapas. *Univ. Mich. Mus. Zool. Occ. Papers No. 450*, Oct. 9, 1941: 1-4. (*Glaucidium brasilianum saturatum* subsp. nov.).
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- BRUCKNER, J. H. Inheritance of White Plumage in *Phasianus*. *Auk*, 58, No. 4, Oct., 1941: 536-542, pl. 18.
- BRUNDRETT, H. M. New Bird-trapping Devices. *Bird Banding*, 12, No. 4, Oct., 1941: 164-168.
- COFFEY, BEN B. Summer Range of Mid-South Towhees. *Migrant*, 12, No. 3, Sept., 1941: 51-7, map.
- COOKE, M. T. Returns from Banded Birds: Recoveries of Some Banded Birds of Prey. *Bird Banding*, 12, No. 4, Oct. 1941: 151-160.
- CUSHING, JOHN E., JR. Non-genetic Mating Preference as a Factor in Evolution. *Condor*, 43, No. 5, Sept., 1941: 233-236.
- DAYTON, FRANCIS S. A New London (Wisconsin) Starling Roost. *Passenger Pigeon*, 3, No. 9, Sept., 1941: 81-2.
- DEUSING, MURL. Notes on the Nesting of the Florida Gallinule. *Passenger Pigeon*, 3, No. 9, Sept., 1941: 79-81, 1 fig. (At Lake Koshkonong, Wis.).
- EATON, JOHN W. Brief Notes on the Fish Crow. *Bull. Mass. Aud. Soc.*, 25, No. 6, Oct., 1941: 133-4.
- ELKINS, FRANCES and HERVEY. Waiting for the Hawks to Fly. *Bull. Mass. Aud. Soc.*, 25, No. 6, Oct., 1941: 123-6, 2 photos. (At Mt. Tom, Mass.).

- EMLÉN, JOHN T., JR. An Experimental Analysis of the Breeding Cycle of the Tricolored Red-wing. *Condor*, 43, No. 5, Sept., 1941: 209-219.
- ERRINGTON, PAUL L. Notes on Winter-killing of Central Iowa Bob-whites. *Iowa Bird Life*, 11, No. 3, Sept., 1941: 46-9.
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- GREY, JOHN H., JR. The Breeding Birds of Pea Island. *Chat*, 5, No. 4, Sept., 1941: 50-54. (North Carolina.)
- GROMME, O. J. Several Interesting Breeding Records Secured. *Passenger Pigeon*, 3, No. 8, Aug., 1941: 71-2. (Conn., Mourning, and Kentucky Warblers, and Red Crossbill in Wis.).
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- HAND, R. L. Birds of the St. Joe National Forest, Idaho. *Condor*, 43, No. 5, Sept., 1941: 220-232, figs. 61-63.
- HAWKINS, ARTHUR S. A Wildlife History of Faville Grove, Wisconsin. *Trans. Wis. Acad. Sci., Arts and Letters*, 32, 1940: 29-65.
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- JACKSON, H. H. T. Summer Birds of Northwestern Wisconsin (part). *Passenger Pigeon*, 3, No. 10, Oct., 1941: 87-90, map.
- KENDALL, J. B. Observations on Nesting Habits of the Bluebird. *Passenger Pigeon*, 3, No. 7, July, 1941: 63-5.
- LEOPOLD, ALDO. Spread of the Hungarian Partridge in Wisconsin. *Trans. Wis. Acad. Sci., Arts and Letters*, 32, 1940: 5-28.
- LOEFER, JOHN B. Some Unrecorded White-feathered Birds. *Kentucky Warbler*, 17, No. 4, 1941: 42-5.
- LOW, JESSOP B. Nesting of the Ruddy Duck in Iowa. *Auk*, 58, No. 4, Oct., 1941: 506-517, pl. 17.
- MCILHENNY, E. A. Some Interesting Records from Birds Banded at Avery Island, Retaken During the Winter of 1940-1941. *Bird Banding*, 12, No. 4, Oct., 1941: 168-174.
- MCILHENNY, E. A. The passing of the Ivory-billed Woodpecker. *Auk*, 58, No. 4, Oct., 1941: 582-4.
- MILLER, ALDEN H. Racial Determination of Bewick Wrens in the Western Great Basin Region. *Condor*, 43, No. 5, Sept., 1941: 250-251.
- MILLER, ALDEN H. A Review of Centers of Differentiation for Birds in the Western Great Basin Region. *Condor*, 43, No. 6, Nov., 1941: 257-267, figs. 74-76.
- MOFFITT, JAMES. Notes on the Food of the California Clapper Rail. *Condor*, 43, No. 6, Nov., 1941: 270-273.
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- MOORE, ROBERT T. and ARTHUR BARR. Habits of the White-tailed Kite. *Auk*, 58, No. 4, Oct., 1941: 453-462, pl. 16. (In "southern California").
- MOORE, ROBERT T. Three New Races in the Genus *Otus* from Central Mexico. *Proc. Biol. Soc. Wash.*, 54, No. 17, 1941: 151-160. (*Otus asio suttoni*, *O. a. sortilegus*, and *O. vinaceus seductus* from Hidalgo, Jalisco, and Michoacan respectively).
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- PETERSON, ROGER T. Billions of Birds. *Bull. Mass. Aud. Soc.*, 25, No. 7, Nov., 1941: 149-154, 1 photo. (Bird populations of North America).
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- PRICE, JOHN B. and C. H. DANFORTH. A Persistent Mutation in the California Quail. *Condor*, 43, No. 6, Nov., 1941: 253-6, figs. 71-73.
- ROLLO, MARIE. Photoperiodism and Migration. *Bird Banding*, 12, No. 4, Oct., 1941: 161-164.
- ROMANOFF, ALEXIS L. Development of Homeothermy in Birds. *Science*, 94, Aug. 29, 1941: 218-19.
- SAWYER, EDMUND J. On Drawing and Painting Birds. *Murrelet*, 22, No. 2, May-Aug., 1941: 27-9, frontisp.
- SLIPP, JOHN W. The California Shrike in the Northwest Coastal Belt. *Condor*, 43, No. 5, Sept., 1941: 243-5.
- SPERRY, CHARLES C. Food Habits of the Coyote. *Wildlife Research Bull.* 4, 1941: 1-70, 3 pls., 3 figs. (With much information on the relation to birds).
- STABLER, ROBERT M. Teaching a Falcon Its A B C's. *Fauna*, 3, No. 3, Sept., 1941: 75-81, illus. (Falconry).
- SUTTON, GEORGE M. The Juvenal Plumage and Postjuvenal Molt of the Vesper Sparrow. *Univ. Mich. Mus. Zool. Occ. Papers No. 445*, Aug. 6, 1941: 1-10, col. pl.
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- SUTTON, G. M. and J. B. SEMPLE. An egg of the Marbled Murrelet. *Auk*, 58, No. 4, Oct., 1941: 580-1, pl. 19.
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- WHARTON, WILLIAM P. Twelve Years of Banding at Summerville, S. C. *Bird Banding*, 12, No. 4, Oct., 1941: 137-147.
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- Bretsch, Clarence, 690 Broadway, Gary, Indiana 1925
- Ellis, Ralph, Jr., 2420 Ridge Rd., Berkeley, California 1926

¹ This list is complete to November 10, 1941. The Secretary would appreciate immediate notification of any omission of names and changes in address, or 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.

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Rogers, Charles Henry, Princeton Museum of Zoology, Princeton, New Jersey	1903
Sherman, Miss Althea Rosina, National via McGregor, Iowa	1902
Taylor, Dr. Arthur Chandler, Irving Zuelke Bldg., Appleton, Wisconsin	1929
Taylor, Mrs. H. J., 900 Santa Barbara Rd., Berkeley, California	1916
Tucker, Mrs. Carl, Penwood, Mount Kisco, New York	1928

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Barnes, Ventura, Jr., % William H. Phelps, Almacen Americano, Caracas, Venezuela, South America	1938
Berthel, Russell M[essner], 501 Portland Ave., St. Paul, Minnesota	1939
Billington, Cecil, 21060 Thirteen Mile Rd., Birmingham, Michigan	1939
Bishop, Dr. Louis Bennett, 450 Bradford St., Pasadena, California	1903
Brandreth, Courtenay, Ossining, New York	1939
Chambers, W. Lee, 2068 Escarpa Dr., Eagle Rock, Los Angeles, California...	1909
Davis, John, The Ivanhoe, Durant Ave., Berkeley, California	1939
Fargo, William G., 506 Union St., Jackson, Michigan	1923
Ganier, Albert F[ranklin], 2112 Woodlawn Dr., 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., Motor Wheel Corporation, Lansing, Michigan	1938
Harriot, Samuel Carman, 200 W. 58th St., New York, New York	1934
Havemeyer, Henry Osborne, Mahwah, New Jersey	1930
Mitchell, Dr. Walton Jungerich, 398 Vassar Ave., Berkeley, California	1893
Moser, Dr. R[euben] Allyn, Suite 612, 1504 Dodge St., Omaha, Nebraska...	1940
Mudge, Edmund W., Jr., 811 Gulf States Bldg., Dallas, Texas	1939
Nelson, Dr. Theodora, 2695 Heath Ave., New York, New York	1928
Phelps, William H[enry], Apartado 2009, Caracas, Venezuela	1940
Philipp, Frederick B., 152 Main St., Eatontown, New Jersey	1940
Philipp, Philip Barnard, 27 West 44th St., New York, New York	1914
Procter, William, Bar Harbor, Maine	1937
Roberts, Dr. Thomas Sadler, Museum of Natural History, University of Minnesota, Minneapolis, Minnesota	1914
Shearer, Dr. Amon Robert, Mont Belvieu, Chambers Co., Texas	1893
Stoddard, Dr. Herbert Lee, Route 5, Sherwood Plantation, Thomasville, Georgia	1916
Sutton, Dr. George Miksch, Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York	1920
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
White, Miss Katherine A[ugusta], Route 2, Collinsville, Illinois	1940
Wineman, Andrew, 150 Michigan Ave., Detroit, Michigan	1934
Young, John Paul, 205 Devon Rd., Ithaca, New York	1913
Youngworth, William, 3119 E. 2nd St., Sioux City, Iowa	1934

ACTIVE MEMBERS

Abbott, Dr. Cyril Edward, Harding College, Searcy, Arkansas1937

Adams, I. C., Jr., Box 2592, San Diego, California1933

Aldrich, Dr. John Warren, Fish and Wildlife Service, Washington, D.C.1930

Alperin, Irwin, 1100 E. 19th St., Brooklyn, New York1939

Amadon, Dean, 300 Windsore Pl., Brooklyn, New York1935

Ammann, George Andrew, General Delivery, Shingleton, Michigan1935

Armstrong, Miss Virginia, Musketaquid Rd., Concord, Massachusetts1939

Ashton, Randolph, 800 Crown St., Morrisville, Pennsylvania1941

Austin, Dr. Oliver Luther, Tuckahoe, Westchester Co., New York1930

Bailey, Alfred Marshall, Colorado Museum of Natural History,
Denver, Colorado1928

Baker, John Hopkinson, 1165 5th Ave., New York, New York1930

Baker, William Calvin, 223 W. Pershing St., Salem, Ohio1931

Barber, Dr. Bertram Alpha, 350 West St., Hillsdale, Michigan1923

Bartel, Karl [Emil] Edgar, 2528 W. Collins St., Blue Island, Illinois1934

Bartlett, Guy, Rosendale Rd., Route 1, Schenectady, New York1938

Bartlett, Wesley Hamilton, 204 North Lincoln, Eagle Grove, Iowa1936

Bartsch, Dr. Paul, U.S. National Museum, Washington, D.C.1894

Batchelder, Charles Foster, 7 Kirkland St., Cambridge, Massachusetts.....1927

Baumgartner, Dr. Frederick Milton, Department of Entomology,
A. and M. College, Stillwater, Oklahoma1935

Beebe, Ralph, 4169 Tenth St., Ecorse, Michigan1924

Beeghly, James Leon, Route 1, Lee Run Rd., Poland, Ohio1933

Bellrose, Frank, Jr., Illinois Natural History Survey,
Natural Resources Bldg., Urbana, Illinois1935

Bennett, Dewey, 802 N. 4th St., Garden City, Kansas1940

Bennett, Logan Johnson, 206 Forestry Bldg., Pennsylvania State College,
State College, Pennsylvania1934

Bennett, Miss Mary Allison, 623 E. Carroll St., Macomb, Illinois1933

Bennett, Dr. Rudolf, Department of Zoology, University of Missouri,
Columbia, Missouri1932

Benson, Dr. Seth Bertram, 645 Coventry Rd., Berkeley, California1930

Bent, Arthur Cleveland, 140 High St., Taunton, Massachusetts1893

Black, Charles Theodore, Route 3, Grand Ledge, Michigan1935

Blain, Dr. Alexander Willis, 2201 Jefferson Ave. E., Detroit, Michigan1902

Blake, Emmet R[eid], Field Museum of Natural History, Chicago, Illinois...1939

Boggs, J. B., Morgantown, West Virginia1938

Bole, Benjamin Patterson, Jr., 2717 Euclid Ave., Cleveland, Ohio1938

Borror, Dr. Donald Joyce, Department of Zoology and Entomology,
Ohio State University, Columbus, Ohio1927

Bowman, Lawrence Lincoln, Orchard Hills, Route 7, North Canton, Ohio...1935

Boyd, Robert L., Plymouth Teachers College, Plymouth, New Hampshire...1941

Brant, Irving, 149 Carroll St. S.E., Washington, D.C.1932

Breckenridge, Dr. Walter John, Museum of Natural History,
University of Minnesota, Minneapolis, Minnesota1929

Brodkorb, Dr. [William] Pierce, Museum of Zoology, Ann Arbor, Michigan..1936

Brooks, Alonzo Beecher, Oglebay Park, Wheeling, West Virginia1931

Brooks, Earle Amos, 166 Plymouth Rd., Newton Highlands, Massachusetts..1933

Brooks, Maurice [Graham], Division of Forestry, West Virginia
University, Morgantown, West Virginia1934

Bryens, Oscar McKinley, McMillan, Luce Co., Michigan1924

Burch, Mrs. Jessie Kate [Mrs. George D.], 507 W. 62nd St.,
Chicago, Illinois1938

Burleigh, Thomas Dearborn, Oakhurst Route, Gulfport, Mississippi	1922
Burt, Dr. William Henry, Museum of Zoology, Ann Arbor, Michigan	1928
Burtch, Verdi, Branchport, New York	1924
Butler, Laurence Michael, Dellwood, White Bear, Minnesota	1940
Cahalane, Victor Harrison, Wild Life Division, National Park Service, Washington, D.C.	1933
Campbell, Louis Walter, 4531 Walker Ave., Toledo, Ohio	1926
Carpenter, F. S., 2402 Longest Ave., Louisville, Kentucky	1934
Carter, John Darlington, Lansdowne, Pennsylvania	1930
Cartwright, Bertram William, 238 Guilford St., Deer Lodge, Winnipeg, Canada	1930
Chapman, Dr. Floyd Barton, 1944 Denune Ave., Columbus, Ohio	1932
Chapman, Dr. Frank Michler, American Museum of Natural History, 79th St. and Central Park West, New York, New York	1910
Chase, Henry B., Jr., So. Biological Supply Co., New Orleans, Louisiana ...	1932
Chatham, Richard Thurmond, Jr., Box 620, Elkin, North Carolina	1939
Christy, Bayard Henderson, 403 Frederick Ave., Sewickley, Pennsylvania...	1932
Clark, W. Kimball, Jr., Salem, Missouri	1939
Clout, George John, 89 North St., St. Catharine's, Ontario	1935
Clow, Miss Marion, Box 163, Lake Forest, Illinois	1929
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
Coles, Victor, 2910 Grasselli Ave., Cincinnati, Ohio	1929
Compton, Lawrence Verlyn, Soil Conservation Service, Box 1354, Albuquerque, New Mexico	1923
Cook, Miss Fannye Addine, Research Assistant, State Game and Fish Commission, Jackson, Mississippi	1925
Cottam, Dr. Clarence, Fish and Wildlife Service, Washington, D.C.	1929
Cox, William Thomas, 2186 Doswell Ave., St. Paul, Minnesota	1936
Cruickshank, Allan Dudley, National Audubon Society, 1006 Fifth Ave., New York, New York	1939
Currier, Edmonde Samuel, 8541 N. Chicago Ave., Portland, Oregon	1930
Darrah, Miss Martha, Scenery Hill, Martins Ferry, Ohio	1941
Davidson, William Mark, National Research Center, Beltsville, Maryland...	1933
Decker, C. O., 6450 Kenwood Ave., Chicago, Illinois	1938
De Cou, Richard W., Apt. 204-C., Holden Green, Cambridge, Massachusetts.	1941
DeLury, Dr. Ralph Emerson, Dominion Observatory, Ottawa, Ontario	1920
Dickinson, Francis Reynolds, 1518 Astor St., Chicago, Illinois	1931
Dixon, James Benjamin, Route 1, Box 688, Escondido, California	1936
Dodge, Victor Kenney, 137 Bell Court W., Lexington, Kentucky	1935
Drum, Miss Jean, 900 S. 4th Ave., Minneapolis, Minnesota	1940
DuBois, H[enry] M., Clackamas, Oregon	1940
DuMont, Philip Atkinson, 405 N. Cleveland St., Arlington, Virginia	1928
Duncan, Donald Pendleton, U.S. Forest Service, Harrison, Arkansas	1936
Eastman, Whitney H[askins], 1004 Summit Ave., Minneapolis, Minnesota...	1941
Eastwood, Sidney Kingman, 301 S. Winebiddle Ave., Pittsburgh, Pennsylvania	1928
Edeburn, Dr. R[alph] M[ilton], Route 2, Alquippa, Pennsylvania	1939
Edge, Mrs. Charles Noel, 1200 Fifth Ave., New York, New York	1931
Edge, Peter, 1200 Fifth Ave., New York, New York	1939
Edwards, Miss Margaret Clark, 99 Lathrop Rd., Grosse Pointe Farms, Michigan	1941
Eifrig, Prof. Charles William Gustave, 1029 Monroe Ave., River Forest, Illinois	1907

Ekblaw, Dr. George Elbert, 511 W. Main St., Urbana, Illinois1914

Ekblaw, Dr. Walter Elmer, Clark University, Worcester, Massachusetts1910

Elliott, Dr. Richard M., 1564 Vincent St., St. Paul, Minnesota1940

Emerson, Guy, 16 Wall St., New York, New York1938

Emilio, Shepard Gilbert, 7 Winter St., Salem, Massachusetts1929

English, Dr. Pennoyer Francis, Department of Zoology, Pennsylvania
State College, State College, Pennsylvania1934

Erickson, Miss Mary Marilla, Santa Barbara State College,
Santa Barbara, California1930

Errington, Dr. Paul [Lester], Iowa State College, Ames, Iowa1932

Evans, Dr. Evan Morton, 550 Park Ave., New York, New York1929

Feeny, W. S., 808 E. Worden Ave., Ladysmith, Wisconsin1937

Finster, Miss Ethel Beulah, Asheville College, Asheville, North Carolina1930

Fiorucci, Americo Angelo, Box 5, Iron Mountain, Michigan1941

Floyd, Judge Joseph Larke, 1009-11 George D. Harter Bank Bldg.,
Canton, Ohio1903

Foot, Maurice Edwin, Route 1, Mantua, Ohio1932

Fredine, C[larence] Gordon, Department of Forestry and Conservation,
Purdue University, Lafayette, Indiana1938

French, Franklin Culbertson, 18102 Devonshire Rd., Northridge,
California1941

Fruen, J[ohn] Donald, 1641 Brenner Pass, Tyrol Hills, Minneapolis,
Minnesota1940

Fryklund, P. O., Roseau, Roseau Co., Minnesota1926

Furniss, Owen Cecil, 2203 1st Ave., West, Prince Albert, Saskatchewan,
Canada1934

Gabrielson, Dr. Ira Noel, Fish and Wildlife Service, Washington, D.C.1913

Gault, Benjamin True, Box 11, Glen Ellyn, Illinois1895

Goldsmith, Glenn Warren, Box 1611, University Station, Austin, Texas1931

Grange, Wallace, Babcock, Wisconsin1941

Grant, Cleveland Putnam, 620 Greenup St., Covington, Kentucky1928

Gray, William Arthur, Room 690, 508 S. Dearborn St., Chicago, Illinois1938

Gregory, Stephen Strong, Jr., Box N, Winnetka, Illinois1922

Grimm, William C[arey], 101 Climax St., Pittsburgh 10, Pennsylvania1939

Griscom, Ludlow, Museum of Comparative Zoology, Cambridge,
Massachusetts1937

Gross, Dr. Alfred Otto, Bowdoin College, Brunswick, Maine1927

Haecker, Frederick Woods, 506 S. 52nd St., Omaha, Nebraska1938

Hagar, Mrs. Jack, Box 339, Rockport, Texas1930

Hague, Dr. Florence S., Sweet Briar College, Sweet Briar, Virginia1931

Hainsworth, William Pickard, 216 Railroad Ave., North Andover,
Massachusetts1930

Haller, Karl William, 3 Martindill Terr., Maple Ave., Woodsdale, Wheeling,
West Virginia1934

Hallman, Roy Cline, Box 826, Panama City, Florida1928

Hamerstrom, Frederick N., Jr., Edwin S. George Reserve, Pinckney,
Michigan1934

Hamilton, Dr. William J[ohn], Jr., Department of Zoology, Cornell
University, Ithaca, New York1933

Hanawalt, Donald Roy, 65 W. Broadway, Westerville, Ohio1941

Hand, Ralph Levi, 543 S. 5th St. W., Missoula, Montana1933

Handlan, James T., Jr., 1 Locust Ave., Wheeling, West Virginia1941

Handlan, John Welty, Division of Education, Conservation Commission,
Charleston, West Virginia1932

Handley, Charles Overton, Virginia Polytechnic Institute, Blacksburg,
Virginia1925

Hann, Dr. Harry Wilbur, Department of Zoology, University of Michigan, Ann Arbor, Michigan	1930
Harper, Dr. Francis, 224 S. Chester Rd., Swarthmore, Pennsylvania	1930
Hartman, Frank A[lexander], Hamilton Hall, Ohio State University, Columbus, Ohio	1941
Hartwell, Arthur Mowry, 2324 Lake Pl., Minneapolis, Minnesota	1940
Hayward, C. Lynn, Department of Entomology and Zoology, Brigham Young University, Provo, Utah	1933
Henderson, Walter Cleaveland, 8 Magnolia Parkway, Chevy Chase, Maryland	1928
Hendrickson, Dr. George Oscar, Department of Zoology, Iowa State College, Ames, Iowa	1933
Henry, Cordia John, Box 37, Upham, North Dakota	1933
Herrick, Miss Eleanor Elizabeth, 935 Smith Lane, Woodmere, Long Island, New York	1935
Hillmer, Davis B., 448 W. Ferry Ave., Detroit, Michigan	1926
Hilton, Dr. David Clark, 305 Richards Bldg., Lincoln, Nebraska	1918
Himmel, Dr. Walter J., 1326 Idylwild Dr., Lincoln, Nebraska	1915
Hinds, Frank J., Department of Biology, Western State Teachers College, Kalamazoo, Michigan	1935
Holabird, Christopher, 2236 Lincoln Park, W., Chicago, Illinois	1940
Holland, Harold May, Box 615, Galesburg, Illinois	1915
Howard, William J., 5518 Fairglen Rd., Chevy Chase, Maryland	1940
Hughes, George Thomas, Box 153, Plainfield, New Jersey	1929
Hunt, Ormond Edson, 14-133 General Motors Bldg., Detroit, Michigan	1937
Imler, Ralph Hysel, Wildlife Research Laboratory, Fish and Wildlife Service, 546 Customhouse, Denver, Colorado	1937
Ingersoll, Albert Mills, 908 F. St., San Diego, California	1921
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, Mrs. Irene W., [Mrs. Oscar], 38 Portland Pl., St. Louis, Missouri	1931
Johnson, Robert Anthony, 150 East St., Oneonta, New York	1930
Jones, Harold Charles, Thomas Berry College, Mount Berry, Georgia	1929
Jones, John Courts, Research Center, Delmar, New York	1931
Jones, Solomon Paul, 509 West Ave. N., Waukesha, Wisconsin	1921
Jung, Clarence Schram, 6383 N. Port Washington Rd., Milwaukee, Wisconsin	1921
Kalmbach, Edwin Richard, Fish and Wildlife Service, 546 Custom House, Denver, Colorado	1926
Kase, John Charles, Versailles, Indiana	1937
Kehrer, Victor John, Virginia Episcopal School, Lynchburg, Virginia	1937
Kelker, George Hills, School of Forestry, U.S.A.C., Logan, Utah	1938
Kellogg, Dale Cosnett, Box 343, Norwalk, Ohio	1932
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
Knapp, Elmer Leslie, Route 2, Troy, Pennsylvania	1930
Komarek, Roy Vance, Birdsong Plantation, Route 1, Tallahassee, Florida	1935
Kutz, Harry Leon, Game Research Center, Delmar, New York	1939
Lambert, Bert, 16854 Wildmere Ave., Detroit, Michigan	1936
Larrabee, Prof. Austin Park, Yankton College, Yankton, South Dakota	1921
Laskey, Mrs. Amelia Rudolph, [Mrs. Fred C.], Graybar Lane, Nashville, Tennessee	1928

Leedy, Charles A., 343 Falls Ave., Youngstown, Ohio	1927
Leopold, Prof. Aldo, 424 University Farm Place, University of Wisconsin, Madison, Wisconsin	1928
Lewy, Dr. Alfred, 2051 E. 72nd Place, Windsor Park, Chicago, Illinois	1915
Linsdale, Dr. Jean Myron, Jamesburg Route, Monterey, California	1928
Lloyd, Hoyes, 582 Mariposa Ave., Rockcliffe Park, Ottawa, Ontario, Canada	1922
Low, Seth Haskell, Salt Plains Wildlife Refuge, U.S. Fish and Wildlife Service, Cherokee, Oklahoma	1931
Lowery, George Hines, Jr., Museum of Zoology, Louisiana State University, University, Louisiana	1937
Lubin, Seymour I., 101 Chestnut St., Binghampton, New York	1934
Ludwig, Claud Charles, 506 Wilson Bldg., Lansing, Michigan	1938
Lunk, William, Jr., Fleming Ave., Edgemont, Fairmont, West Virginia	1937
MacDonald, Kenneth F., Fort Niobrara National Wildlife Refuge, Valentine, Nebraska	1941
Magee, Michael Jarden, 603 South St., Sault Ste Marie, Michigan	1919
Manweiler, J[ack], Soil Conservation Service, Baudette, Minnesota	1939
Marsh, Vernon L., Johnson Hall, University of Washington, Seattle, Washington	1934
Maslowski, Karl Herbert, 1034 Maycliff Rd., Cincinnati, Ohio	1934
Mayer, Mrs. John H., 103 S. Miller St., Cynthiana, Kentucky	1935
Mayfield, Dr. George Radford, Vanderbilt University, Nashville, Tennessee	1917
Mayr, Dr. Ernst, American Museum of Natural History, 79th St. and Central Park West, New York, New York	1933
Metcalf, Prof. Franklin P., Arnold Arboretum, Jamaica Plain, Massachusetts	1923
Metcalf, Dr. Zeno Payne, State College, West Raleigh, North Carolina	1900
Meyer, Henry, Zoology Department, University of Tennessee, Knoxville, Tennessee	1939
Meyer, Mrs. Marie McGinley, 1125 Lane Ave., Tarentum, Pennsylvania	1941
Michener, Harold, 418 N. Hudson Ave., Pasadena, California	1926
Miles, Merriam Lee, 1625 Vicklan St., Vicksburg, Mississippi	1941
Miller, Douglas Scott, 122 Lawrence Ave. E., Toronto, Ontario, Canada	1939
Minich, Edward C., 1047 Fairview Ave., Youngstown, Ohio	1923
Mitchell, Mrs. Margaret Knox Howell, [Mrs. O. S.], 49 St. Clair Ave. W., Apt. 405, Toronto, Canada	1933
Moffitt, James, 1879 Broadway, San Francisco, California	1931
Monk, Harry Crawford, 406 Avoca St., Nashville, Tennessee	1920
Monroe, Burt Leavelle, Ridge Road, Anchorage, Kentucky	1938
Moore, Miss Clara Alma, 3510 W. Michigan St., Indianapolis, Indiana	1939
Moore, Miss Dora, 60 E. Mulberry St., Athens, Ohio	1934
Morse, Miss Margarette Elthea, 11432 Mayfield Rd., Cleveland, Ohio	1921
Moseley, Edwin Lincoln, State College, Bowling Green, Ohio	1925
Mousley, William Henry, 4073 Tupper St., Westmount, Montreal, Quebec, Canada	1922
Munter, Captain William Henry, U.S. Coast Guard, 550 Federal Bldg., Seattle, Washington	1933
Murie, Adolph, Jackson, Wyoming	1932
Murie, Olaus Johan, Jackson, Wyoming	1934
Murray, Rev. Joseph James, Lexington Presbyterian Church, Lexington, Virginia	1931
Musgrave, Dr. John Knox, 350 Parkway Dr., Pittsburgh 16, Pennsylvania	1937
McAtee, Waldo Lee, Fish and Wildlife Service, 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. Ernest Perry, 2020 E. 93rd St., Cleveland, Ohio	1937
McKnight, Edwin Thor, 5038 Park Place, Friendship Station, Washington, D.C.	1936
McMath, Robert R., Route 4, Pontiac, Michigan	1934
McNeil, Dr. Charles Andrew, 111 W. Fourth St., Sedalia, Missouri	1914
Neely, William W., 149 W. End St., Chester, South Carolina	1939
Neff, Johnson Andrew, 546 Custom House, Denver, Colorado	1920
Nelson, Arnold Lars, Fish and Wildlife Service, Washington, D.C.	1932
Newth, Donald J[ennings], 480 W. Kirby St., Detroit, Michigan	1939
Nice, Dr. Leonard B., 5708 Kenwood Ave., Chicago, Illinois	1932
Nice, Mrs. Margaret Morse, 5708 Kenwood Ave., Chicago, Illinois	1921
Nichols, Charles Ketcham, 212 Hamilton Rd., Ridgewood, New Jersey	1933
Norse, William J[ohn], 531 W. 211th St., New York, New York	1939
Norton, Arthur Herbert, Portland Society of Natural History, 22 Elm St., Portland, Maine	1934
Oberholser, Dr. Harry Church, 2805 18th St., N.W., Washington, D.C.	1894
Odum, Dr. Eugene Pleasants, Department of Zoology, University of Georgia, Athens, Georgia	1930
Ohern, D. W., 515 N.W. 14th St., Oklahoma City, Oklahoma	1938
Olsen, Dr. Richard Ellsworth, St. Joseph's Hospital, Pontiac, Michigan	1937
Olson, Mrs. Ethel, South Wayne, Wisconsin	1938
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
Overing, Robert, Weaverville, North Carolina	1930
Owre, Oscar, Jr., 2625 Newton Ave. S., Minneapolis, Minnesota	1935
Palmer, Ralph Simon, Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York	1934
Palmer, Dr. Theodore Sherman, 1939 Biltmore St. N.W., Washington, D.C.	1914
Park, Mrs. A. S., [Mrs. Laura Davidson], 1627 Sherwin Ave., Chicago, Illinois	1938
Pearce, John, Wildlife Research Station, University of Maine, Orono, Maine	1939
Peartree, Edward William, 425 S. State St., Oconomowoc, Wisconsin	1941
Peasley, Dr. Harold Raymond, Bankers Trust Bldg., Des Moines, Iowa	1941
Peasley, Mrs. Harold Raymond, 2001 Nash Dr., Des Moines, Iowa	1934
Pemberton, John Roy, 1244 Morada Place, Altadena, California	1925
Peters, Harold Seymore, Route 1, Box 171, Charleston, South Carolina	1936
Peterson, Alfred, Box 201, Brandt, South Dakota	1931
Pettingill, Dr. Olin Sewall, Jr., Department of Zoology, Carleton College, Northfield, Minnesota	1930
Phillips, Alan Robert, 113 Olive Rd., Tucson, Arizona	1934
Pickwell, Dr. Gayle Benjamin, Department of Natural Science, San Jose State Teachers College, San Jose, California	1923
Pirnie, Dr. Miles David, W. K. Kellogg Bird Sanctuary, Michigan State College, Augusta, Michigan	1928
Poor, Hustace Hubbard, 112 Park Ave., Yonkers, New York	1935
Potter, Julian Kent, 437 Park Ave., Collingswood, New Jersey	1915
Pough, Richard Hooper, 33 Highbrook Ave., Pelham, New York	1938
Preble, Edward Alexander, 3027 Newark St., Washington, D.C.	1929
Preble, Norman A[lexander], Zoology Department, Ohio State University, Columbus, Ohio	1941
Presnall, Mrs. Clifford Charles, 5315 Earlston Dr., Washington, D.C.	1930

Prill, Dr. Albert G., Main St., Scio, Oregon	1933
Pueschel, Paul, 520 Drexel Ave., Glencoe, Illinois	1939
Pyle, George W[inner], Box 647, Berwyn, Pennsylvania	1939
Quillian, Marvin C., Wesleyan College, Macon, Georgia	1927
Randall, Mrs. W. S., Alamo Natl. Bldg., San Antonio, Texas	1925
Rebmann, G. Ruhland, Jr., 1418 Packard Bldg., Philadelphia, Pennsylvania ..	1941
Reeder, Miss Clara Maude, 318 College Ave., Houghton, Michigan	1938
Reese, Mrs. Hans H., Circle Close, Shorewood Hills, Madison, Wisconsin ...	1941
Ricks, Jesse J., 30 E. 42nd St., New York, New York	1931
Riley, Joseph Harvey, U.S. National Museum, Washington, D.C.	1914
Roads, Miss Myra Katie, 463 Vine St., Hillsboro, Ohio	1914
Rogers, Mrs. Walter E., 911 E. North St., Appleton, Wisconsin	1931
Rosewall, Dr. Oscar Waldemar, Department of Zoology, Louisiana State University, University, Louisiana	1931
Russell, Dr. Henry Norris, Jr., Cleveland City Hospital, Cleveland, Ohio....	1932
Rust, Henry Judson, Box 683, Coeur d'Alene, Idaho	1921
Rysgaard, George Nielson, Minnesota Museum of Natural History, University of Minnesota, Minneapolis, Minnesota	1937
Satterthwait, Mrs. Elizabeth Allen, 806 W. Ohio St., Urbana, Illinois	1925
Saunders, Aretas Andrews, 361 Crestwood Rd., Fairfield, Connecticut	1934
Saunders, Dr. George Bradford, 562 Custom House, Denver, Colorado	1926
Saunders, William Edwin, 352 Clarence St., London, Ontario, Canada	1902
Savage, James, Buffalo Athletic Club, Buffalo, New York	1939
Schantz, William Edward, 1532 Aberdeen Ave., Columbus, Ohio	1938
Schenck, Robert Chilcote, University of Minnesota Campus Club, Minneapolis, Minnesota	1940
Schneider, Miss Evelyn, 2207 Alta Ave., Louisville, Kentucky	1935
Schorger, Dr. Arlie William, 168 N. Prospect Ave., Madison, Wisconsin.....	1927
Scott, Dr. John W[illiam], Department of Zoology, University of Wyoming, Laramie, Wyoming	1937
Shadle, Professor Albert Ray, Department of Biology, University of Buffalo, Buffalo, New York	1930
Shaffer, Chester Monroe, Tennessee School for the Deaf, Knoxville, Tennessee	1934
Shelar, Keller, State Teachers College, Slippery Rock, Pennsylvania	1940
Shelford, Dr. Victor Ernest, Vivarium Bldg., Wright and Healey Sts., Champaign, Illinois	1931
Silliman, Oscar Perry, 225 W. Alesas St., Salinas, California	1939
Smith, Dr. Arthur Francis, Manning, Iowa	1941
Smith, Professor Frank R., Route 2, Box 100, Laurel, Maryland	1910
Smith, Harry Madison, Whitman Laboratory of Experimental Zoology, University of Chicago, Chicago, Illinois	1936
Smith, Lewis MacCuen, 8040 St. Martins Lane, Chestnut Hill, Philadelphia, Pennsylvania	1931
Smith, Roy Harmon, 183 N. Prospect St., Kent, Ohio	1936
Spears, Joseph F., T.V.A. P-1, C.C.C. Camp, Benton, Kentucky	1939
Speirs, Mrs. Doris Hustis, Tudor Cottage Bird Sanctuary, 11 Mossom Place, Toronto, Ontario, Canada	1938
Stebbins, Miss Fannie Adell, 31 Ely Ave., West Springfield, Massachusetts...1935	
Stevens, O. A., State College Station, Fargo, North Dakota	1926
Stewart, Paul Alva, Leetonia, Ohio	1925
Stiles, Bruce F., 111 Angle Ave., Council Bluffs, Iowa	1935
Stillwell, Jerry E., 7460 San Benito Way, Route 4, Dallas, Texas	1935
Stine, Miss Perna M., State Teachers College, Minot, North Dakota	1931
Stoner, Dr. Dayton, New York State Museum, Albany, New York	1912
Stophlet, John Jermain, 2612 Maplewood Ave., Toledo, Ohio	1934

Storer, Dr. Tracy Irwin, Division of Zoology, University of California, Davis, California	1928
Sturgeon, Myron T., Michigan State Normal College, Ypsilanti, Michigan....	1934
Sumner, Eustace Lowell, 2537 Rose Walk, Berkeley, California	1931
Suthard, James Gregory, 1878½ Junipero Ave., Long Beach, California	1936
Swanson, Dr. Gustav [Adolph], Division of Economic Zoology, Univer- sity of Minnesota, University Farm, St. Paul, Minnesota	1927
Swedenborg, Ernie David, 4905 Vincent Ave. S., Minneapolis, Minnesota....	1929
Taft, Miss Elizabeth A., 664 W. Onondago St., Syracuse, New York	1937
Taverner, Percy Algernon, National Museum of Canada, Ottawa, Ontario, Canada	1905
Taylor, Dr. Aravilla Meek, Lake Erie College, Painesville, Ohio	1936
Taylor, Walter Penn, 254 Faculty Exchange, College Station, Texas	1937
Teachenor, Dix, 1020 W. 61st St., Kansas City, Missouri	1923
Thomas, Edward Sinclair, 319 Acton Rd., Columbus, Ohio	1921
Thomas, Judge Otho S., 205 S. Greene St., Rock Rapids, Iowa	1932
Thomas, Mrs. Rowland, Route 3, North Little Rock, Arkansas	1937
Thornton, William James, Box 1011, Birmingham, Alabama	1940
Thorp, George Boulton, Carnegie Museum, Pittsburgh, Pennsylvania	1935
Tift, Richard, Madison Terrace Apts., Albany, Georgia	1937
Tinker, Almerin David, R.F.D. No. 1, Chelsea, Michigan	1909
Tomkins, Ivan Rexford, U.S. Dredge Morgan, Savannah, Georgia	1931
Townsend, Miss Elsie White, Wayne University, Detroit, Michigan	1938
Tracy, Ernest B., Ferris Hill, New Canaan, Connecticut	1937
Trautman, Milton Bernhard, Stone Laboratory, Put-in-Bay, Ohio	1932
Tubbs, Farley F., Game Division, Department of Conservation, Lansing, Michigan	1935
Turner, Miss Ruth D[ixon], 163 Forest St., Melrose, Massachusetts	1939
Tyler, Dr. Winsor Marrett, 1482 Commonwealth Ave., Brighton, Massachusetts	1914
Uhler, Francis Morey, Fish and Wildlife Service, Washington, D.C.	1931
Vaiden, Meredith Gordon, Rosedale, Mississippi	1937
Van Tyne, Dr. Josselyn, Museum of Zoology, Ann Arbor, Michigan	1922
Vaughan, William Coleman, 591 Ashland Ave., Buffalo, New York	1938
Visscher, Dr. Paul, Biology Laboratory, Western Reserve University, Cleveland, Ohio	1924
Vogt, William, % Mrs. F. V. Brown, 32 Cunningham Ave., Floral Park, New York	1935
Wagner, Fritz, Jr., 384 Hawthorne Lane, Winnetka, Illinois	1938
Walker, Dr. Charles Frederic, Stone Laboratory, Put-in-Bay, Ohio	1939
Walker, W. M., Jr., 201 E. Peachtree, Route 9, Knoxville, Tennessee	1925
Walkinshaw, Dr. Lawrence Harvey, 1416½ W. Michigan Ave., Battle Creek, Michigan	1928
Warren, Edward Royal, 1511 Wood Ave., Colorado Springs, Colorado	1911
Watterson, William H., 3132 Becket Rd., Shaker Heights, Ohio	1929
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
Weyl, Edward Stern, 6506 Lincoln Dr., Mt. Airy, Philadelphia, Pennsylvania	1927
White, Francis Beach, St. Paul's School, Concord, New Hampshire	1926
Williams, Laidlaw Onderdonk, Box 453, Carmel, California	1930
Wilson, Archie F., 1921 Lake Ave., Whiting, Indiana	1937
Wilson, Dr. Gordon, 1434 Chestnut St., Bowling Green, Kentucky	1925
Wing, Dr. Leonard William, Washington State College, Pullman, Washington	1924

Witschi, Dr. Emil, Department of Zoology, State University of Iowa, Iowa City, Iowa	1935
Wood, Dr. Casey Albert, 3459 McTavish St., Montreal, Canada	1924
Wood, Dr. Harold Bacon, 3016 N. Second St., Harrisburg, Pennsylvania	1932
Wood, Norman Asa, Museum of Zoology, University of Michigan, Ann Arbor, Michigan	1925
Woolman, Edward, Panmure Ave., Haverford, Pennsylvania	1928
Work, Mrs. Robert, Bosky Acres, Barrington, Illinois	1934
Worth, Dr. C[harles] Brooke, Department of Zoology, Swarthmore College, Swarthmore, Pennsylvania	1938
Yeatter, Dr. R. E., Illinois Natural History Survey, Urbana, Illinois	1941
Zimmerman, Fred Robert, Wisconsin Conservation Department, Madison, Wisconsin	1935
Zimmerman, Harold Alexander, 2522 W. Jackson St., Muncie, Indiana	1932

ASSOCIATE MEMBERS

Addy, Charles Edward, Blacksburg, Virginia	1941
Albrecht, Milton C[harles], 518 East B. St., Moscow, Idaho	1941
Aler, Miss Lulu May, 301 Newton Ave. N., Minneapolis, Minnesota	1940
Alexander, Donald Child, 18 Hurd St., Lowell, Massachusetts	1937
Alexander, Gordon, Department of Biology, University of Colorado, Boulder, Colorado	1936
Allan, Philip F[arley], 806 Bellview St., Amarillo, Texas	1939
Allen, Durward Leon, Rose Lake Wildlife Experiment Station, East Lansing, Michigan	1933
Allen, Francis H[enry], 215 LaGrange St., West Roxbury, Massachusetts	1941
Allen, Robert Ward, Blackwater Refuge, Cambridge, Maryland	1936
Alpert, Bernard, 170 Broadway, New York, New York	1939
Amundson, Geno A., Fish and Wildlife Service, Box 1032, Yuma, Arizona	1936
Anderson, Anders Harold, Route 5, Box 488, Tucson, Arizona	1937
Anderson, Harry George, 624 E. Green St., Champaign, Illinois	1940
Anderson, Miss Helen, Wausau Public Library, Wausau, Wisconsin	1941
Anderson, John M., East Orwell, 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 Alvin, 713 Hamilton Ave., Waukesha, Wisconsin	1939
Appleton, John Sparhawk, Simi, California	1936
Arnold, Elting, 217 S. Alfred St., Alexandria, Virginia	1941
Arnold, Lee W., 457 3rd St., Yuma, Arizona	1941
Atwood, Earl L. [Jr.], Lacassine Migratory Waterfowl Refuge, Lake Arthur, Louisiana	1939
Atzenhoefer, Daniel Raymond, 12 State St., Norwalk, Ohio	1939
Ault, Harold, Box 476, Fiatt, Illinois	1938
Ayer, Mrs. Nathan Edward, 1300 Hillcrest Dr., Pomona, California	1936
Babcock, Mrs. Lester, 402 Madison Ave., Milton, Wisconsin	1936
Baer, Miss Myrtle W., 1237 N. Jefferson St., Milwaukee, Wisconsin	1941
Baerg, William J., University of Arkansas, Fayetteville, Arkansas	1924
Bailey, Miss Arta I[ndiana], 624 Franklin Ave., Columbus, Ohio	1941
Bailey, Mrs. H. M., 2706 Douglas St., Sioux City, Iowa	1918
Baillie, James Little, Jr., Royal Ontario Museum of Zoology, Queen's Park at Bloor St., Toronto, Ontario, Canada	1938
Baird, Dr. Don O., State Teachers College, Huntsville, Texas	1939
Baker, Bernard William, Marne, Michigan	1938
Baker, Rollin Harold, Fish and Oyster Commission, Texas Game, Box 1056, Lufkin, Texas	1938

Baldwin, Donald D., Box 193, Fessenden, North Dakota	1939
Baldwin, William Plews, Jr., McClellanville, South Carolina	1938
Banks, Miss Ann Rosale, Illiana Hotel, Whiting, Indiana	1941
Banta, Mrs. Dorothy, % Alaska Game Commission, Box 136, Ketchikan, Alaska	1940
Barkalow, Frederick Schenck, 207 Washington Ave., Marietta, Georgia	1936
Barnhurst, Ervin Vere, Hatch, Utah	1941
Barry, Harry L[ouis], 1649 Glenn Ave., Columbus, Ohio	1941
Barsodi, John Michael, 270 W. Lane Ave., Columbus, Ohio	1941
Bartow, Mrs. Leslie W., 2284 N.W. Everett St., Portland, Oregon	1938
Baskett, Thomas S., Department of Zoology, Iowa State College, Ames, Iowa	1941
Batchelder, Edgar Marden, 690 Lynnfield St., Lynn, Massachusetts	1941
Bates, Charles Evarts, Box 34, East Wareham, Massachusetts	1937
Bates, Miss Clara, Box 528, Fort Pierce, Florida	1939
Baumgartner, Dr. Luther L., Department of Conservation, Lansing, Michigan	1936
Beard, Daniel B., 300 Keeline Bldg., Omaha, Nebraska	1938
Beardsley, Miss Margaret Hortense, 125 N. Prospect St., Ravenna, Ohio.....	1941
Beatty, Harry Andrew, Christiansted, St. Croix, Virgin Islands, U.S.A.	1936
Beck, Miss Anna B., 4611 Alaska Ave., St. Louis, Missouri	1941
Beck, D. Elden, Brigham Young University, Provo, Utah	1941
Becker, Miss Edna E[lizabeth], Hollins College, Virginia	1939
Bedell, Miss Marie L., 1430 West St., Lorain, Ohio	1940
Behle, William Harroun, Department of Biology, University of Utah, Salt Lake City, Utah	1935
Belcher, Paul Eugene, 988 Jefferson Ave., Apt. 3, Akron, Ohio	1938
Benchley, Edwin Allen, Jr., 642 Worcester St., Wellesley, Massachusetts.....	1937
Bene, Frank, 1513 W. Garfield St., Phoenix, Arizona	1941
Benedict, Mrs. Howard Smith, 24724 Oakland Rd., Bay Village, Ohio	1926
Benson, Mrs. Mary Heydweiller, Feura Bush Rd., Route 1, Delmar, New York	1937
Berger, Andrew J[ohn], % Frederick Bentley, 9 W. College St., Oberlin, Ohio	1940
Berryman, Jack Holmes, 1859 S. 11th East, Salt Lake City, Utah	1941
Binnington, Miss Nora Louise, 6006 Cabanne Place, St. Louis, Missouri.....	1941
Bischof, Ralph Clem, 507 National Rd., Fulton, Wheeling, West Virginia	1941
Bishop, Howard Elmer, 206 W. Packer Ave., Sayre, Pennsylvania	1941
Bissland, Howard Ross, Los Robles St., Tallahassee, Florida	1940
Bissonnette, T[homas] Hume, Trinity College, Hartford, Connecticut.....	1939
Blair, Robert Fleming, Jr., 3 North Balch St., Hanover, New Hampshire....	1941
Bleich, Herbert Jay, 113 Cook St., Ithaca, New York	1941
Bolt, Benjamin Franklin, 5300 Brookside Blvd., Kansas City, Missouri	1930
Bond, Richard Marshall, 6608 Chabot Rd., Oakland, California	1936
Bordner, Mrs. Frances Comfort, [Mrs. Robert I.], Hudson, Iowa	1930
Borell, Adney Edwin, Soil Conservation Service, Box 1314, Albuquerque, New Mexico	1936
Bowdish, Beecher Scoville, Demarest, New Jersey	1924
Bradley, Homer L., Chautauqua Refuge, Havana, Illinois	1939
Brainerd, John W[hiting], Farm St., Dover, Massachusetts	1940
Brand, Charles Salmon, 200 Highland Ave., Ithaca, New York	1941
Braund, Frank William, General Delivery, St. Petersburg, Florida	1935
Brecher, Leonard C[hables], 1900 Spring Dr., Louisville, Kentucky	1939
Brigham, Edward Morris, Jr., Route 1, Box 348, Battle Creek, Michigan	1938
Brignac, Miss Rita, Mitchell College, Statesville, North Carolina	1939

Brooking, Albert Munsell, Hastings Museum, Hastings, Nebraska	1941
Brooks, Dr. Earl, Noblesville, Indiana	1941
Broun, Maurice, Route 1, Orwigsburg, Pennsylvania	1935
Brown, Clarence D., 222 Valley Rd., Montclair, New Jersey	1938
Brown, Edward Howard, 721 E. Eighth St., Charlotte, North Carolina	1940
Buchanan, Forest Wendell, Amsterdam, Ohio	1939
Buckstaff, Ralph Noyes, 1122 S. Main St., Oshkosh, Wisconsin	1941
Bujak, Boleslaus Joseph, 2547 N. St. Louis Ave., Logan Square Station, Chicago, Illinois	1936
Bundy, M[alcolm] F[oland], Route 2, Atlanta, Indiana	1941
Burland, Lee J[ohnson], Ballston Lake, New York	1939
Burroughs, R. D., Game Division, Department of Conservation, Lansing, Michigan	1937
Buscho, Miss Janet M[arian], 310 E. Second St., Blue Earth, Minnesota	1940
Buss, Irvn Otto, 1004 Garfield St., Madison, Wisconsin	1936
Caldwell, Miss Dorothy W[alcott], Mount McGregor, New York	1940
Calhoun, John Bumpass, Zoology Laboratory, Northwestern University, Evanston, Illinois	1935
Calvert, Earl Wellington, Haliburton P.O. Ontario, Canada	1937
Campbell, Miss Mildred Florence, 29 N. Hawthorne Lane, Indianapolis, Indiana	1938
Capps, Beryl F[ranklin], Big Springs State Park, Van Buren, Missouri	1939
Carlson, C[arl] Edward, 113 E. Cherry St., Stillwater, Minnesota	1940
Carrothers, Miss Vera, 14704 Adler Ave., E. Cleveland, Ohio	1938
Case, Leslie Delos, Sr., 714 W. Madison St., Ann Arbor, Michigan	1938
Cassel, J[oseph] Frank[lin], 1529 Dauphin Ave., Wyomissing, Pennsylvania	1940
Cater, Mrs. Thomas Johnson, Jr., 856 Pine St., Macon, Georgia	1939
Chance, Edgar Percival, B7 Kent Court, Norwood Ave., Summit, New Jersey	1941
Chapman, Lawrence B., 1 Woodridge Rd., Wellesley, Massachusetts	1940
Chutter, Miss Mildred C., Box 229, Athens, Ohio	1936
Clapp, G[eorge] Howard, Pabst Farms, Oconomowoc, Wisconsin	1941
Clark, Anthony Morris, 490 E. Abington Ave., Chestnut Hill, Philadelphia, Pennsylvania	1939
Clark, Miss Eugenie, 47-25 47 St., Woodside, Flushing, New York	1940
Clark, H. E., Rock Falls, Wisconsin	1941
Cole, Mrs. Elizabeth, 912 E. 76 Terrace, Kansas City, Missouri	1940
Cole, Harry Maurice, 3016 Capitol Ave., Cheyenne, Wyoming	1935
Coleman, H[enry] S[hirl], Box 254, Faculty Exchange, College Station, Texas	1941
Conrad, Charles Louis, 423 Warwood Ave., Wheeling, West Virginia	1937
Conway, Albert E., Box 135, West Chester, Pennsylvania	1939
Cook, Clarence Du Bois, Lakeside, Berrien Co., Michigan	1939
Cooley, Miss Eleanor Graham, R.F.D., Berwyn, Maryland	1936
Cooley, Marvin Ellis, Swan Creek Wildlife Experiment Station, Allegan, Michigan	1940
Coombes, Robert Armitage Hamilton, Sea Bank, Bolton-le-Sands Caraforth, Lancashire, England	1939
Cope, Francis R., Dimock, Pennsylvania	1940
Cordes, William Joseph, Jr., 115 Lullwater Rd., Atlanta, Georgia	1941
Cottingham, Henry P., 5151 Carrollton St., Indianapolis, Indiana	1940
Cottrell, George William, Jr., 41 Ross Rd., Belmont, Massachusetts	1941
Counce, Dr. Cynthia Cunningham, Western State Hospital, Hopkinsville, Kentucky	1937
Crane, Alvin Hugh, Box 186, Atoka, Oklahoma	1939

Crook, Compton N., Jr., State Teachers College, Towson, Maryland	1929
Cunningham, James W., 4425 Main St., Kansas City, Missouri	1935
Curtis, Miss Elizabeth Long, 5648 Beach Dr., Seattle, Washington	1935
Daggy, Richard Henry, State Teachers College, Bemidji, Minnesota	1940
Dahlberg, Wendell [Oscar], 11312 S. Michigan Ave., Chicago, Illinois	1939
Dalke, Dr. Paul David, Division of Wildlife Research, Missouri Cooperative Wildlife Research Unit, Columbia, Missouri	1936
Dambach, Charles A., 1902 Auburn Ave., Dayton, Ohio	1934
Damon, David, 724 Sixth St., Ames, Iowa	1933
Dana, Edward F[ox], 57 Exchange St., Portland, Maine	1939
Danner, Mrs. John M., [May S.], 1646 Cleveland Ave. N.W., Canton, Ohio ..	1921
Davey, Winthrop N[ewbury], 2485 Hendee Rd., Jackson, Michigan	1941
Davidson, Mrs. Gaylord, 4735 S. Dupont Ave., Minneapolis, Minnesota	1938
Davis, Clifford Vernon, 224 S. Church St., Bozeman, Montana	1941
Davis, Dr. David Edward, 721 Elmwood Ave., Wilmette, Illinois	1940
Davis, George, State Teachers College, Murfreesboro, Tennessee	1936
Davis, George W., 3 Fremont St., Montpelier, Vermont	1941
Davis, Mrs. Louie Irby, Box 988, Harlingen, Texas	1933
Davis, Dr. William B., Department of Wild Game, College Station, Texas...	1938
Davison, Verne E[lbert], 531 Poplar St., Spartanburg, South Carolina	1939
Dear, Lieut. Col. L[ionel] S[extus], Box 127, Port Arthur, Ontario, Canada	1939
De Arment, Richard, Bessemer, Pennsylvania	1939
Debes, Victor Albert, 1211 Folsom Ave., Prospect Park, Pennsylvania	1937
Dechen, Mrs. Lillian Orvetta, 14 Summer St., Port Dickinson, Binghamton, P.O., New York	1939
Derleth, August [William], Sauk City, Wisconsin	1940
Deusing, Murl, 142 N. 75th St., Milwaukee, Wisconsin	1937
Devitt, Otto Edmund, 31 Willowbank Blvd., Toronto, Ontario, Canada	1935
Deyarmond, Miss Hazel Rae, 21495 Curtis Ave., Detroit, Michigan	1940
Dhelles, Arthur, % L. C. Morley, Patuxent Research Refuge, Bowie, Maryland	1941
Dickinson, J[oshua] C[lifton]. Jr., 1351 W. Arlington St., Gainesville, Florida	1939
Dille, Frederick Monroe, 822 Grand Ave., Nogales, Arizona	1912
Dingle, Edward von Seibold, Huger, South Carolina	1921
Dobbins, H[ugh] C[linton], 1456 W. Clifton Blvd., Lakewood, Ohio	1941
Dobie, John [Robert], 3217 43rd Ave. S., Minneapolis, Minnesota	1940
Dock, George, Jr., 119 Brite Ave., Scarsdale, New York	1940
Dole, J. Wilbur, 51 E. Stone St., Fairfield, Iowa	1930
Doleman, Miss Susan Agnes, 55 Forbes Ave., Northampton, Massachusetts...	1941
Dommm, Dr. Lincoln Valentine, Whitman Laboratory for Experimental Zoology, University of Chicago, Chicago, Illinois	1936
Doughty, Jacob P., Route 2, Prospect, Kentucky	1940
Dreyfoos, Wallace David, 1212 Virginia Ave. N.E., Atlanta, Georgia	1941
Drum, Miss Margaret, Owatonna, Minnesota	1937
Duck, Lester Glen, Mooreland, Oklahoma	1940
Duffield, Mrs. Marjorie Olney, [Mrs. J. W.], 335 Prospect St., New Haven, Connecticut	1940
DuMond, Mrs. Margaret, 2415 Elmwood Dr. S.E., Grand Rapids, Michigan ..	1939
Duncan, Mrs. Dorothy Dodge, [Mrs. John B.], Eaton's Ranch, Wolf, Wyoming	1939
Duncan, Mott Robert, 3796 S. Galapago St., Box 115, Englewood, Colorado...	1939
Dusi, Julian Luigi, 886 Wilson Ave., Columbus, Ohio	1941
Eckelberry, Donald [Richard], 133 W. Indiana Ave., Sebring, Ohio	1938
Elder, William Hanna, Illinois Natural History Survey, Havana, Illinois	1938

Eliot, Samuel Atkins, Jr., 32 Paradise Rd., Northampton, Massachusetts1932

Elwell, Miss Mary I., State Teachers College, Duluth, Minnesota1940

Emerson, David L[owell], 25 Everett Ave., Providence, Rhode Island1939

Emlen, Dr. John Thompson, Jr., University of California, Davis,
California1936

Empey, Miller, Freeland, Michigan1939

Engstrom, Hugh R., Minnesota Museum of Natural History, Minneapolis,
Minnesota1940

Erickson, Arnold Burton, Division of Economic Zoology, University Farm,
St. Paul, Minnesota1938

Erickson, Ray C[h]arles, 1104 Washington Ave., St. Peter, Minnesota1939

Etz, Mrs. Elizabeth [Cecilia], Thornhedge, Wheeling, West Virginia1940

Ewers, Mrs. Dorothea, 5616 Ellis Ave., Chicago, Illinois1941

Faegre, David [Colin], 4945 Fremont Ave. S., Minneapolis, Minnesota1940

Fales, John H[ouse], 1917 Elkhart St., Silver Spring, Maryland1939

Farrington, Miss Anna Gene, 809 Washington St., Stillwater, Oklahoma1939

Fautin, Reed W[in]get, Route 2, Box 230, Provo, Utah1937

Feighner, Miss Lena Veta, 298-I S. Tremont St., Kansas City, Kansas1935

Feldman, Robert J., 6420 N. Berkeley Blvd., Milwaukee, Wisconsin1941

Ferrie, Robert Morris, Box 277, North Battleford, Saskatchewan, Canada1940

Findlay, Miss Hazel Irene, 12810 Robson Ave., Detroit, Michigan1941

Fitzgerald, Maurice Francis, Jr., 1047 S. 24th St., Milwaukee, Wisconsin1941

Fleetwood, Raymond Judy, Piedmont Wildlife Refuge, Round Oak, Georgia1934

Flentge, Louis George, 1564 Thacker St., Des Plaines, Illinois1936

Flouer, George F[r]ank, Lost River State Park, Mathias, West Virginia1941

Floyd, E[arl] Pershing, 414 N. Hervey St., Hope, Arkansas1939

Force, Miss Edith Rhoda, 3021 E. 8th St., Tulsa, Oklahoma1931

Ford, Edward Russell, Newaygo, Michigan1914

Forsyth, Mrs. Louise [Ann], Lebanon Rd., Hanover, New Hampshire1940

Fossler, Miss Mary Louise, 550 N. Los Robles Ave., Pasadena, California1936

Fox, Adrian Caspar, Box 593, Mandan, North Dakota1937

France, H[orace] Owen, 821 Lincoln Place, Boulder, Colorado1941

Freeman, Robert M., Route 5, Laurel, Mississippi1939

Friauf, James J., Jr., Biology Department, University of Florida,
Gainesville, Florida1936

Fried, Louis Alexander, Economic Zoology, University Farm, St. Paul,
Minnesota1940

Friedrich, George William, 1502 Kilian Blvd., St. Cloud, Minnesota1940

Frost, Herbert Hamilton, 57 N. 4th East, Provo, Utah1941

Frothingham, Mrs. Randolph, 56 Sargent Crossway, Brookline,
Massachusetts1932

Frye, Ozro Earle, Jr., Department of Fish and Game, A. & M. College of
Texas, College Station, Texas1940

Furth, John [Thomas], 436 Felton Ave., Highland Park, New Jersey1939

Gadd, Samuel Wesley, [2nd], 1331 N. Weber St., Colorado Springs,
Colorado1941

Gardiner, Dan S., Jr., 1707 S. 21 East, Salt Lake City, Utah1941

Gatterdam, Paul C[hristoffers], 2539 Edgewood Place, La Crosse, Wisconsin1940

Gensch, Robert H[enry], Forest Service, Rhinelander, Wisconsin1939

George, John L[othar], % J. Van Tyne, Museum of Zoology,
Ann Arbor, Michigan1939

Gerstell, Richard, Pennsylvania Game Commission, Harrisburg,
Pennsylvania1939

Gibbs, Walter C., East River Rd., Grosse Ile, Michigan1941

Gifford, Dr. Harold, 323 S. 51st Ave., Omaha, Nebraska1936

Gilfillan, Merrill C[larence], Box 626, Jefferson, Ohio1939

Gillett, Francis C., 500 National Bldg., Minneapolis, Minnesota	1935
Gillette, Miss Fredericka B., 1319 Forest Ave., Ann Arbor, Michigan	1938
Gilligan, James P[ersh], 605 E. Jefferson St., Ann Arbor, Michigan	1938
Giltz, Maurice L[eroy], 841 Lincoln Way, N.W., Massilon, Ohio	1939
Ginn, W[illiam] E[dward], 511 E. Van Buren, Columbia City, Indiana.....	1941
Girard, George L[ycurgus], 710 E. 3rd St., Casper, Wyoming	1939
Glenn, Robert W., 509 Orchard Ave., Avalon, Pittsburgh, Pennsylvania	1934
Gloyd, Dr. Howard Kay, Chicago Academy of Sciences, 2001 N. Clark St., Chicago, Illinois	1925
Good, Ernest E[ugene], Soil Conservation Service, Peru, Indiana	1940
Goodell, Fred C[harles], Edmore, Michigan	1940
Goodnight, Clarence J[ames], Biology Department, Brooklyn College, Bedford Ave. and Ave. H., Brooklyn, New York	1939
Goodrich, Mrs. Calvin, 1120 Hill St., Ann Arbor, Michigan	1941
Goslin, Charles R[ussell], 407 Washington Ave., Lancaster, Ohio	1940
Goslin, Robert Martin, 316 Wilson Ave., Columbus, Ohio	1936
Granrud, Walter Hjalmer, Upper Souris Migratory Waterfowl Refuge, Foxholm, North Dakota	1941
Green, Miss Rhoda J[anet], 1769 Bardstown Rd., Louisville, Kentucky ...	1940
Greene, Earle Rosebury, Box 466, Key West, Florida	1930
Greenfield, Miss Myrtle, 1812 E. Silver St., Albuquerque, New Mexico	1940
Greenhalgh, Clifton M., 1230 E. First St. S., Salt Lake City, Utah	1939
Griffin, Donald R[edfield], Biological Laboratories, Harvard University, Cambridge, Massachusetts	1941
Griggs, Julian G[ladden], 922 S. State St., Ann Arbor, Michigan	1939
Grinnell, Lawrence I[rving], 710 Triphammer Rd., Ithaca, New York	1939
Griswold, John A[ugustus] Jr., 115 South St., Auburn, New York	1941
Grose, E. R., Glenville, West Virginia	1939
Groskin, Horace, 210 Glenn Rd., Ardmore, Pennsylvania	1937
Grossenheider, Richard P., 5415 Gilmore Ave., St. Louis, Missouri	1940
Gunderson, Harvey Lorraine, 1305 Raymond Ave. N., St. Paul, Minnesota ..	1941
Guthrie, Frank Keller, Keuka Park, New York	1938
Haak, A[ldrion], 437 Eugenie St., St. Boniface, Manitoba, Canada	1939
Haas, Miss Bernece Estelle, Bowdon, North Dakota	1940
Haglin, Preston C., 5042 Queen Ave. S., Minneapolis, Minnesota	1941
Hahn, Miss Helen Hamilton, 968 Jefferson Ave., Akron, Ohio	1941
Haines, T. P., 1428 White St., Ann Arbor, Michigan	1941
Haller, Frank D[enver], Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio	1940
Hammond, Merrill C[lyde], Lower Souris Refuge, Upham, North Dakota....	1939
Hanna, Wilson Creal, 141 East F St., Colton, California	1936
Hanson, E. C., 1305 Wisconsin Ave., Racine, Wisconsin	1940
Happ, Professor George Bippus, The Principia College, Elsah, Illinois.....	1935
Hardy, [Cecil] Ross, Dixie College, Saint George, Utah	1940
Harris, Mrs. Hugh H., Emory University, Atlanta, Georgia	1939
Haskins, Miss Edith D., Hanover Rd., Lebanon, New Hampshire	1941
Hausler, Mrs. M., 7348 Paxton Ave., Chicago, Illinois	1936
Hausman, Dr. Leon Augustus, New Jersey College for Women, New Brunswick, New Jersey	1941
Hawkins, Arthur S., Illinois Natural History Survey, Urbana, Illinois	1936
Hawkins, B. L., Hamline University, St. Paul, Minnesota	1936
Hayden, Mrs. John G., 87th and Brooklyn Sts., Kansas City, Missouri	1941
Hebard, Frederick V., 1500 Walnut St. Bldg., Philadelphia, Pennsylvania....	1940
Hedges, Harold [Charles], 5420 Charlotte St., Kansas City, Missouri	1940
Hedges, R. Frank, Box 185, Mesilla Park, Albuquerque, New Mexico	1939
Heinke, Miss Ella M[arie], 215 Dayton St., Mayville, Wisconsin	1939

Heiser, J[oseph] M[atthew], Jr., 1724 Kipling St., Houston, Texas	1939
Helfer, Miss Louise, 111 Ninth St., Watkins Glenn, New York	1937
Henderson, [William] Grant, Route 6, Greensburg, Indiana	1930
Henwood, Mrs. Ethel May, 609 W. Ohio St., Urbana, Illinois	1941
Hesselschwerdt, R[obert] E[dward], Route 2, Urbana, Illinois	1941
Hewes, Miss S[arah] Elizabeth, Department of Conservation, New Orleans, Louisiana	1941
Hiett, Lawrence Davison, 1945 Ottawa Drive, Toledo, Ohio	1929
Higgins, Harold Guymon, 4943 E. 2nd St. N., Price, Utah	1941
Hill, Herbert Oliver, 329 Summitt Ave., Redlands, California	1938
Hill, Julian Werner, 1106 Greenhill Ave., Wilmington, Delaware	1935
Hill, Norman Peirce, Lowell House L-33, Cambridge, Massachusetts	1941
Hill, Raymond W., 3816 Kenmore Rd., Shaker Heights, Cleveland, Ohio.....	1941
Hinchman, Richard May, 75 Fairbanks Rd., Milton, Massachusetts	1931
Hinshaw, Thomas Doane, Museum of Zoology, Ann Arbor, Michigan	1926
Hitchcock, John D., Bee Culture Laboratory, Laramie, Wyoming	1941
Hoadley, Dr. Harwood, Box 381, Thornwood, New York	1941
Hobson, Mrs. L. G., Bloomingdale, Indiana	1935
Hoffman, Paul William, 8415 Kenyon Ave., Wauwatosa, Wisconsin	1940
Hoffmeister, Linus C[hristian], 3700 Hoffmeister Ave., Lemay, Missouri.....	1939
Holt, Ernest Goslan, 2000 F St. N.W., Washington, D.C.	1926
Hoodema, Richard, 116 W. 14th St., Holland, Michigan	1941
Hooper, Mrs. Pearl Hubbard, [Mrs. John E.], 3151 Douglass St., Memphis, Tennessee	1941
Hostetter, D[avid] Ralph, Eastern Mennonite School, Harrisonburg, Virginia	1937
Hotchkiss, Neil, Patuxent Research Refuge, Bowie, Maryland	1940
Hough, Mrs. Eleanor Sloan, 4820 Olentangy Blvd., Columbus, Ohio	1941
Howell, Joseph Corwin, Department of Zoology, Oklahoma A. & M., Stillwater, Oklahoma	1938
Howell, L[ouis] Moffitt, Route 1, Box 433, Jacksonville, Florida	1938
Hoyt, George B[rown], 2603 Habersham Rd., Atlanta, Georgia	1941
Hoyt, J[ohn] Southgate Y[eston], Fernow Hall, Cornell University, Ithaca, New York	1936
Huggins, Russell A., Eastern State Teachers College, Madison, South Dakota	1937
Huggitt, Floyd C., Bellevue, Michigan	1933
Hulbert, Lloyd Clair, 529 W. Grand River Ave., East Lansing, Michigan	1938
Hunter, Lawrence E., Hanna City, Illinois	1934
Hurley, John Beatty, 401 S. 17th Ave., Yakima, Washington	1937
Hutchens, Lynn H., 738 Thatcher Ave., River Forest, Illinois	1939
Hutchinson, Arthur E., Chester Springs, Chester County, Pennsylvania.....	1940
Hyde, A[ethus] Sidney, Eastern Oregon College of Education, La Grande, Oregon	1939
Ijams, Henry Pearle, % News-Sentinel, Knoxville, Tennessee	1924
Imsick, Roy Christian, 7512 N. 20th St., Philadelphia, Pennsylvania	1941
Jackson, Mrs. Earl, Montezuma Castle National Monument, Camp Verde, Arizona	1941
Jaques, F[rancis] L[ee], American Museum of Natural History, 79th St. and Central Park West, New York, New York	1939
Jameson, Everett Williams, Jr., Delta Phi, Llenroc, Ithaca, New York	1941
Jarvis, Carson M[cAllister], Med. Det., 160th F.A., Ft. McClellan, Alabama	1940
Jenkins, Dale W., 38 N. Chase Ave., Columbus, Ohio	1937

Jenkins, James H[obart], Wildlife Research Station, Ohio State University, Columbus, Ohio	1939
Jessman, Miss Lena M., 1250 Hubbard St., Detroit, Michigan	1935
Johnson, Frank, Y.M.C.A., Main and Wayne Sts., South Bend, Indiana.....	1935
Johnson, William M[cNutt], 108 E. Depot St., Knoxville, Tennessee	1939
Johnston, Miss Irma K., 23 Dewey Ave., Huntington, New York	1941
Johnston, Miss Verna Ruth, Cerro Gordo, Illinois	1941
Jones, Paul F., Route 7, Box 443, Toledo, Ohio	1937
Jones, Victor Emmons, University of Idaho, Southern Branch, Pocatello, Idaho	1938
Jordan, Miss Helen E[laine], Alma College, Alma, Michigan	1941
Joseph, Sister Ann, 4132 Page Blvd., St. Louis, Missouri	1941
Jurica, E., Lisle, Illinois	1940
Kahmann, Karl W., Route 2, Hayward, Wisconsin	1941
Kahn, Mrs. Dina Hope, [Mrs. Reuben L.], 1122 Michigan Ave., Ann Arbor, Michigan	1938
Katz, David, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio	1938
Kaufman, Herbert P[eter], 30 N. 28th St., Harrisburg, Pennsylvania	1941
Kelly, Mrs. George A., 2300 La Salle Gardens, N., Detroit, Michigan	1935
Kelsey, Paul Manning, 109 Comstock Rd., Ithaca, New York	1941
Kennedy, H. N., Box 294, Rosslyn Station, Arlington, Virginia	1924
Kerns, Chester M[errill], 97 W. Green St., Westminster, Maryland	1940
Kiefer, Mrs. Elizabeth D[eyo], 243 Gratiot Blvd., Port Huron, Michigan....	1941
Kindler, Mrs. Grace Emma, Sheridan Dr., Lancaster, Ohio	1937
King, J. Stanley, 422 Potomac Ave., Buffalo, New York	1941
Kinslow, Miss Hazel K., Sans Souci, Apt. D., Paducah, Kentucky.....	1939
Kinzel, Carl, 1805 N. 17th St., Milwaukee, Wisconsin	1941
Kirk, Allan D[ixon], 14 Forest Hill Rd., Wilksburg, Pennsylvania	1939
Klein, Richard, Brecksville Rd., Brecksville, Ohio	1940
Kleiver, William Charles, 1278 Woodland Ave. N.W., Canton, Ohio	1941
Klonick, Allan S., 28 Ericsson St., Rochester, New York	1941
Knight, Charles Harold, 4157 E. 113th St., Cleveland, Ohio	1939
Koch, Peter, Terrace Park, Ohio	1939
Koehler, Mrs. Arthur, 109 Chestnut St., Madison, Wisconsin	1941
Koestner, E. J., Box 263, Piper City, 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
Krefting, Laurits W[ilhelm], Division of Economic Zoology, University Farm, St. Paul, Minnesota	1940
Kriebel, Ralph Meschter, 1111 N. St., Bedford, Indiana	1935
Kruger, Hans W., % Gordon Schroeder, 322 Lime St., Mankato, Minnesota	1940
Krumm, Miss Helen, 416 S. 22nd St., Columbus, Ohio	1941
Kuitert, Louis Cornelius, 315 Snow Hall, University of Kansas, Lawrence, Kansas	1938
Kyllingstad, Henry C[arrell], Mountain Village, Alaska	1940
Lacey, Miss Mifton H., % Canton Girl Scouts, 433 Tusc. W. Headquarters, Canton, Ohio	1939
Laffoon, Jean [Luther], 1401 W. 3rd St., Sioux City, Iowa	1940
Lagler, Dr. Karl F., Department of Zoology, University of Michigan, Ann Arbor, Michigan	1941
Laidlaw, A[lan] F., Soil Conservation Service, Court House Annex, Chippewa Falls, Wisconsin	1939

Laird, Miss Lonnie, 3664 Washington St., St. Louis, Missouri1935
 Lake, Robert N., Wilton, New Hampshire1941
 Larson, Adrian, Route 1, Box 141-A. Alderwood Manor, Washington1941
 Lay, Daniel Wayne, Box 1056, Lufkin, Texas1939
 Laycock, George E[dwin], Ohio Wildlife Research Station, Ohio State
 University, Columbus, Ohio1941
 Lea, Robert Bashford, 737 Center St., Elgin, Illinois1940
 Lee, Dr. Howard James, 100 Elmwood, Oshkosh, Wisconsin1941
 Leedy, Dr. Daniel Lovey, Ohio Wildlife Research Station, Ohio State
 University, Columbus, Ohio1936
 Leenhouts, Miss Pearle Esther, Pease Rd., Williamson, New York1941
 Legg, William C[larence], Mt. Lookout, West Virginia1939
 Leonard, Mrs. J. W., Hunt Creek Experiment Station, Lewiston, Michigan...1941
 Leopold, A[ldo] Starker, Box 247, West Plains, Missouri1940
 Lepinske, Wilford Howard, 400 Howard St., Pullman, Washington1941
 Leshar, S. W., Vivarium Bldg., University of Illinois, Champaign,
 Illinois1941
 Levy, Mrs. Alice K[lund] [Mrs. H. P.] 235 E. 22 St., Apt. 11T., New
 York, New York1941
 Levy, Seymour, 5140 Kimbark Ave., Hyde Park Station, Chicago, Illinois...1940
 Lewis, Dr. Harrison Flint, Lands, Parks and Forest Branch, Department
 of Mines and Resources, Ottawa, Ontario, Canada1939
 Lewis, Brother Hubert, Cretin High School, St. Paul, Minnesota1940
 Lewis, Merriam Garretson, Box 549, Salem, Virginia1930
 Limes, Ernest Odell, Jr., 1906 E. Minnesota Ave., Columbus, Ohio1941
 Lincoln, Frederick Charles, Fish and Wildlife Service, Washington, D.C. ...1914
 Lindsey, Dr. Alton Anthony, 1050 Walnut Ave., Redlands, California.....1936
 Linton, M. Albert, 315 E. Oak Ave., Moorestown, New Jersey1941
 Lloyd, C. K., 11 N. Elm St., Oxford, Ohio1925
 Lodge, William Ralph, Silver Lake Estates, Route 2, Cuyahoga Falls, Ohio...1935
 Loefer, John B[enjamin], 28 Chestnut St., Berea, Kentucky1941
 Long, Samuel T., Wildlife Research Station, Ohio State University,
 Columbus, Ohio1941
 Loomis, Lee Johnson, 202 E. Union St., Endicott, New York1941
 Lord, Dr. Frederick P[omeroy], 39 College St., Hanover, New Hampshire...1939
 Lovell, Harvey B., 3011 Meade Ave., Route 3, Box 216, Louisville,
 Kentucky1936
 Low, Dr. Jessop, Illinois Natural History Survey, Havana, Illinois1941
 Ludwig, Dr. Frederick Edwin, 320 Sperry Bldg., Port Huron, Michigan.....1941
 Lum, Miss Elizabeth C[aroline], Cincinnatus, New York1940
 Luthy, Ferd, Jr., 306 N. Institute, Peoria, Illinois1937
 Lynes, Miss Florence A., Cook Station, Missouri1937
 MacArthur, John W[ood], 200 Glencairn Ave., Toronto, Ontario, Canada...1941
 MacDonald, Donald L[aurie], 72 Alexander Blvd., Toronto, Ontario,
 Canada1941
 Mack, Horace Gordon, % Gilson Mfg. Co. Ltd., Guelph, Ontario, Canada...1937
 Maclean, Miss Dorothy W[illiams], 21 Ashley St., Hartford, Connecticut...1939
 MacMullan, R. Austin, Department of Zoology, Michigan State College,
 East Lansing, Michigan1940
 Mader, William Henry, 8 Lorraine Terrace, Wheeling, West Virginia1941
 Magath, Dr. Thomas Byrd, Mayo Clinic, Rochester, Minnesota1935
 Magney, Mrs. G. R., 5329 Washburn Ave. S., Minneapolis, Minnesota1940
 Maguire, Walter Stanley, Y.M.C.A., New Westminster, British Columbia...1937
 Malley, Philip Patrick, 336 E. Lincoln Highway, Coatesville, Pennsylvania...1935
 Manville, Richard H., Museum of Zoology, University of Michigan,
 Ann Arbor, Michigan1941

Manz, Frank J., Jr., 609 S. Water S., Northfield, Minnesota	1938
Martin, Ernest Crosby, 801 Lauderdale St., Selma, Alabama	1941
Mason, Robert French, Jr., 3921 Fulton St. N.W., Washington, D.C.	1937
Mathiak, Harold A[lbert], Babcock, Wisconsin	1941
Mayfield, Harold F[ord], 3311 Parkwood Ave., Toledo, Ohio	1940
Mead, Frank W[aldreth], 227 Brighton Rd., Columbus, Ohio	1941
Mead, Miss [Mary] Esther, Sherburne, New York	1941
Meade, Dr. Gordon Montgomery, Strong Memorial Hospital, 260 Crittenden Blvd., Rochester, New York	1937
Means, Amos Isaiah, Atwood, Illinois	1938
Mellinger, E. O., North Lima, Ohio	1939
Meltvedt, Burton W., Paullina, Iowa	1930
Manaboni, Athos, 4556 Jett Rd., Route 6, Atlanta, Georgia	1941
Mendall, Howard L., Department of Wildlife Research, University of Maine, Orono, Maine	1936
Merkel, Dr. Carl George, Murray Hill, Mount Morris, New York	1940
Michaud, Howard H[enry], 1205 Kensington Blvd., Fort Wayne, Indiana ..	1938
Mierow, Miss Dorothy, 205 E. 2nd St., Northfield, Minnesota	1940
Miller, Alden Holmes, Museum of Vertebrate Zoology, Berkeley, California ..	1930
Miller, Mrs. Clarence Heath, 4830 Sheffield Ave., Mt. Lookout, Cincinnati, Ohio	1941
Miller, Conrow R., 314 W. Washington Ave., Jonesboro, Arkansas	1941
Miller, Henry C., Route 3, Saginaw, Michigan	1938
Miller, Loye [Holmes], University of California at Los Angeles, . Los Angeles, California	1939
Miller, Paul Jennings, 720 E. Mulberry St., Lancaster, Ohio	1941
Mills, Robert H[enry], 2466 Medary Ave., Columbus, Ohio	1941
Milnes, Miss Hattie Kernahan, 331 Gowen Ave., Philadelphia, Pennsylvania	1935
Mitchell, Earl T[homas], 2101 Knapp St., St. Paul, Minnesota	1940
Mitchell, Harold Dies, 378 Crescent Ave., Buffalo, New York	1936
Moeran, Edward Henry, 541 Bronx River Rd., Yonkers, New York	1940
Mohr, Dr. Carl Otto, Illinois Natural History Survey, Urbana, Illinois	1936
Monson, Gale, General Delivery, Socorro, New Mexico	1933
Montagna, William [Guglielmo Trono], Cornell University, Laboratory of Ornithology, Ithaca, New York	1937
Moore, George A., Route 3, Stillwater, Oklahoma	1938
Moore, Miss Louise Christine, 766 N. W. 13th Ave., Miami, Florida	1940
Moore, Robert Thomas, Route 1, Box 28A, Pasadena, California	1941
Moorman, Robert B., 137 Lynn St., Ames, Iowa	1941
Moos, Louis M., 311 Wyoming St., Billings, Montana	1939
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
Mueller, Walter Josef, 3043 N. Prospect Ave., Milwaukee, Wisconsin	1936
Muirhead, Miss Peggy, Carleton College, Northfield, Minnesota	1940
Mullin, Miss Elizabeth, Apt. 304, 522 W. Adams, Muncie, Indiana	1938
Munroe, James Alexander, Okanagan Landing, British Columbia, Canada ..	1935
Murdoch, Earle C., Soil Conservation Service, Upper Darby, Pennsylvania	1936
Murdock, James Ingram, 311 Irving Ave., Glendale, California	1940
Murphey, Dr. Eugene Edmund, 432 Telfair St., Augusta, Georgia	1935
Musselman, T[homas] E[dgar], 124 S. 24th St., Quincy, Illinois	1940
McBeath, Donald Young, L'Anse, Michigan	1936
McCann, Lester J., 3743 Emerson Ave. N., Minneapolis, Minnesota	1939

McClanahan, Robert Charles, Fish and Wildlife Service, Washington, D.C....	1935
McConnell, Miss Mary Lou[ise], 151 Center Ave., Emsworth, Pennsylvania..	1940
McCowen, Max C., Thomas Edison High School, 7025 Madison Ave., Hammond, Indiana	1941
McDonald, Floyd Ashley, Box 283, Vista, California	1940
McDonald, Malcolm, Parsons College, Fairfield, Iowa	1936
McDowell, Francis, Bayview, Michigan	1941
McGraw, Charles F[rancis], Soil Conservation Service, Elmwood, Illinois....	1940
McGraw, Harry A., 1600 5th Ave., Altoona, Pennsylvania	1936
McKee, Keith A[lfred], Box 763, Las Cruces, New Mexico	1941
McMurray, Arthur, 2110 Jones Ave., Nashville, Tennessee	1939
McMurry, Frank B[aille], Wichita Mountains Wildlife Refuge, Cache, Oklahoma	1939
McNish, Edgar Mann, Madison, Tennessee	1940
Nash, Nathaniel C[ushing], IV, 1 Reservoir St., Cambridge, Massachusetts..	1941
Nelles, Arthur D., 223 McLeod St., Ottawa, Ontario, Canada	1940
Nelson, Charles Ellsworth, Jr., 124 Oxford Rd., Waukesha, Wisconsin	1937
Nelson, Martin Knute, State Game Warden, Fertile, Minnesota	1939
Nelson, Urban C., Soil Conservation Service, Faribault, Minnesota	1939
Netting, M. Graham, Carnegie Museum, Pittsburgh, Pennsylvania	1941
Newton, Earl T[homas], 5500 College St., Kansas City, Missouri	1939
Nichols, John Treadwell, American Museum of Natural History, Central Park West at 79th St., New York, New York	1941
Nichols, L[eon] Nelson, 331 E. 71st St., New York, New York	1937
Nichols, Mrs. Mary Jane, Route 5, Box 391 B, Tucson, Arizona	1941
Nicholson, Dr. A[rnold] J[oseph], Game, Fish & Oyster Commission, Austin, Texas	1939
Nolan, Val, Jr., 111 E. 1st St., Bloomington, Indiana	1940
Nord, Warren Harrison, 611 Sherwood Ave., St. Paul, Minnesota	1940
Nordquist, Theodore, Camden Station, Route 5, Minneapolis, Minnesota....	1941
Norris, Robert Allen, 1408 N. College Ave., Tifton, Georgia	1941
Norris, Russell T[aplin], Box 847, Preston Laboratory, Butler, Pennsylvania	1939
North, George Webster, 249 Charlton Ave., Hamilton, Ontario, Canada	1941
O'Conner, Miss Esther Laura, 3818 Warwick Blvd., Kansas City, Missouri	1940
Olin, Mrs. Walter C., 27 S. 56th Ave. E., Duluth, Minnesota	1941
Oliver, Miss Mary Clara, Ganado Mission, Ganado, Arizona	1934
Olsen, Humphrey A., 172 Manchester St., Battle Creek, Michigan	1941
Orr, Ellison, Waukon, Iowa	1936
Osmer, Thomas L[ewis] G[regory], 1521 Illinois St., Lansing, Michigan	1939
Ott, Frederick Louis, 2527 N. Wahl Ave., Milwaukee, Wisconsin	1941
Packard, Stanley E., Troy, Pennsylvania	1936
Painton, Dr. Harry R., 488 Lilac Dr., Montecito, Santa Barbara Co., California	1939
Parker, Henry Melville, Lowell House G-32, Cambridge, Massachusetts	1941
Parker, Lansing A[rthur], % Soil Conservation Service, Faribault, Minnesota	1939
Partch, Max L[orenzo], 663 W. Prairie St., Columbus, Wisconsin	1940
Paschen, Miss Margaret F., 7 S. Balch St., Hanover, New Hampshire.....	1941
Paxton, Thomas R[ice], 1064 E. Clifton Rd. N.E., Atlanta, Georgia	1941
Peattie, Dr. Donald Culross, 224 Buena Vista Rd., Santa Barbara, California	1938
Peavey, Mrs. Leonore Gastineau, 4222 Carrollton St., Indianapolis, Indiana..	1937
Peelle, Professor Miles L., 329 Rice St., Adrian, Michigan	1940
Peet, Dr. Max Minor, 2030 Hill St., Ann Arbor, Michigan	1935

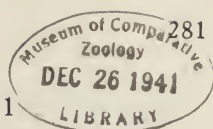
Pell, S[tuyvesant] Morris, Huron Mountain Club, Marquette County, Michigan	1938
Penner, Lawrence R., Department of Zoology, University of Connecticut, Storrs, Connecticut	1940
Persons, Charles John, Box 1212, Bisbee, Arizona	1941
Peters, Harry F[rederick], 227 Ardmore Ave., Haddonfield, New Jersey	1941
Peterson, Mrs. Charles Emil, Madison, Minnesota	1936
Peterson, Miss Eleanor Lelia, Forest Products Laboratory, Madison, Wisconsin	1941
Peterson, Liven A[dam], Jr., 904 S. 4th Ave., Virginia, Minnesota	1940
Peterson, Mrs. Theodore, 80 Oaklawn Ave., Battle Creek, Michigan	1941
Pitelka, Frank Alois, Department of Zoology, University of California, Berkeley, California	1938
Plattes, Cyril William, 392 Woodlawn Ave., St. Paul, Minnesota	1940
Plumb, Vanche Etoile, 1615 Durant St., Santa Ana, California	1940
Poncy, Robert, Rue Lachenal, 19, Geneva, Switzerland	1939
Pope, Grant M., Kanab, Utah	1941
Porter, Thomas Wayne, 327 W. Water St., Oak Harbor, Ohio	1938
Potter, Louis Henry, Route 2, West Rutland, Vermont	1941
Prather, Millard F[illmore], 912 McMillan Ave., W.E., Apt. H., Birmingham, Alabama	1940
Pratt, Delbert Randall, McKinley High School, Canton, Ohio	1932
Pratt, Harold Parker, U.S. Soil Conservation Service, Box 899, Grand Junction, Colorado	1939
Pratt, Loring Withee, 716 Crescent Parkway, Westfield, New Jersey	1941
Prockiwi, Miss Helen O[lga], 144 Tannahill St., Dearborn, Michigan	1940
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., 935 Jackson St., Easton, Pennsylvania	1939
Randall, Robert N[cal], Georgetown, Colorado	1939
Randel, Mrs. Janet B[elknap], [Mrs. W. P.], 1361 N. Cleveland Ave., St. Paul, Minnesota	1940
Rapp, William F[rederick], Jr., 130 Washington Ave., Chatham, New Jersey ..	1941
Rea, Gene, 2378 Neil Ave., Columbus, Ohio	1936
Reed, Mrs. Carlos Isaac, [Mrs. Bessie P.], 448 S. Villa Ave., Villa Park, Illinois	1937
Reed, Miss Willie Ruth, Route 1, Greenville, Tennessee	1939
Reeves, Maurice C., 506 Hart St., Vincennes, Indiana	1941
Rencher, John L., Pine Valley, Utah	1941
Rett, Egmont Z[achary], Museum of Natural History, Santa Barbara, California	1940
Rice, Mrs. Harry Wilson, [Mrs. Lulu M.], 3940 Richfield Rd., Minneapolis, Minnesota	1940
Rich, Dr. Guy C., 1820 El Cerrito Place, Hollywood, California	1914
Richards, Tudor, Joy's Lane, Groton, Massachusetts	1941
Richardson, Mrs. William Devrick, 4215 Prairie Ave., Chicago, Illinois	1938
Riner, Miss Alice, 403 S. Millwood St., Wichita, Kansas	1939
Robbins, Chandler S., Windsor Mountain School, Manchester, Vermont.....	1941
Rollings, Clair Thomas, Economic Zoology, University Farm, St. Paul, Minnesota	1940
Root, Oscar M[itche]ll, Brooks School, North Andover, Massachusetts	1940

Rorimer, Mrs. Irene Turk, [Mrs. J. M.], 22275 Parnell Rd., Shaker Heights, Ohio1938
Rosene, Walter Melvin, Ogden, Iowa1923
Ross, C[h]arles], Chandler, 7924 Lincoln Dr., Chestnut Hill, Pennsylvania1937
Ross, Hollis Trevor, 109 S. 3rd St., Lewisburg, Pennsylvania1933
Rowan, Dr. William, University of Alberta, Edmonton, Alberta, Canada....1939
Ruckman, Fred S., 2735 Oakwood Dr., Cuyahoga Falls, Ohio1941
Rudd, R. L., 345 West St., Salinas, California1939
Rudert, Dale, Saxonburg, Pennsylvania1941
Russell, Dr. Whitfield Leggett, Box 22, Rhome, Texas1935
Saari, Hugo Henerick, 227½ 2nd St. N., Virginia, Minnesota1940
Saugstad, N[els] Stanley, Box 531, Bismarck, North Dakota1939
Sawyer, Miss Dorothy, Unadilla, New York1937
Saylor, Lawrence W[ebster], Fish and Wildlife Service, Washington, D.C....1940
Schaeffer, John Ferdinand, 2168 N. 37 St., Milwaukee, Wisconsin1941
Schaub, Miss Mary Hall, 1040 Isabella St., Wilmette, Illinois1939
Schlenker, Miss Lydia, 410 Floyd St., Toledo, Ohio1937
Schrantz, F[rederick] George, Western Military Academy, Alton, Illinois....1941
Schroeder, Miss Clara, % St. John's Hospital, Jackson, Wyoming1937
Schultz, Miss Helen Homes, Box 105, Mary Washington College, Fredericksburg, Virginia1929
Schutz, Miss Clara I[rene], 277 Park Place, Meadville, Pennsylvania1941
Scotland, Dr. Minnie Brink, 42 Continental Ave., Cohoes, New York1938
Scott, Thomas George, Department of Zoology, Science Bldg., Ames, Iowa....1936
Scott, Walter Edwin, Wisconsin Conservation Department, Madison, Wisconsin1938
Seamans, Roger A[lbert], Fish & Game Service, Montpelier, Vermont.....1940
Seibert, Henri, 204 Vivarium Bldg., University of Illinois, Champaign, Illinois1941
Serbousek, Miss Lillian, 1226 2nd St. S.W., Cedar Rapids, Iowa1935
Sharp, Dr. Ward M., Valentine Lakes Waterfowl Refuge, Valentine, Nebraska1936
Sharritt, Miss Grace V[ivian], 13533 Roselawn Ave., Detroit, Michigan....1941
Shaw, Dr. Charles H[icks], Bremen, Ohio1941
Sheppard, Roy Watson, 1805 Mouland Ave., Niagara Falls, Ontario, Canada..1933
Sherwood, John Willits, Route 2, Box 150, Salinas, California1936
Shortt, Terence Michael, Royal Ontario Museum Zoology, Toronto, Ontario, Canada1941
Short, [Hubert] Wayne, 1207 N. 7th St., St. Louis, Missouri1941
Sime, P. R., 2427 26th St., Lubbock, Texas1939
Skaggs, Merit Bryan, Julian Rd., South Euclid, Ohio1934
Slack, Miss Mabel, Secretary, Kentucky Ornithological Society, 1004 Everett Ave., Louisville, Kentucky1934
Slagle, Elmer Charles, 115 Court House, Duluth, Minnesota1941
Smiley, Daniel, Jr., Lake Mohonk Mountain House, Mohonk Lake, New York1939
Smith, Miss Gertrude M[ilne], 779 Jefferson St., Redwood Falls, Minnesota1940
Smith, J. Donald, Forest Lake, Minnesota1939
Smith, Orion O., Dept. 11, Barber Colman Co., Rockford, Illinois1936
Smith, Thomas [Price], Osage Ave., Anchorage, Kentucky1941
Smith, Wendell Phillips, Wells River, Vermont1921
Smyth, J[ames] Adger, Route 2, Salem, Virginia1933
Snapp, Mrs. Edith La Vantia, [Mrs. R. R.], 310 W. Michigan, Urbana, Illinois1940

Snyder, Lester Lynne, Royal Ontario Museum of Zoology, Bloor St. and Avenue Rd., Toronto 5, Ontario, Canada	1929
Snyder, Richard Craine, 431 Clark St., South Orange, New Jersey	1940
Sonnenberg, Glen Roland, 6200 N. Mississippi Dr., Minneapolis, Minnesota ..	1941
Sooter, Clarence Andrew, Malheur National Wildlife Refuge, Burns, Oregon ..	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
Spawn, Gerald B., South Dakota State College, Brookings, South Dakota	1941
Speirs, John Murray, 204 Vivarium Bldg., Wright & Healey Sts., Champaign, Illinois	1931
Spencer, Miss O. Ruth, 1031 25th Ave., Moline, Illinois	1938
Sperry, Charles Carlisle, 1455 S. Franklin St., Denver, Colorado	1931
Staebler, Robert M[iller], Glen Mills, Pennsylvania	1939
Stacey, J[ohn] W[illiam], 236 Flood Bldg., San Francisco, California	1940
Stackpole, Richard, 292 Beacon St., Boston, Massachusetts	1940
Staebler, Arthur Eugene, Route 5, Box 252, Ann Arbor, Michigan	1937
Stanford, Jack A., 1900 N. Circle Dr., Jefferson City, Missouri	1941
Stanley, Allan J., Louisiana State University, University, Louisiana	1941
Stark, Miss Wilma R[uth], 1701 16th, N.W., Washington, D.C.	1939
Starrett, William Charles, 5432 N. Campbell Ave., Chicago, Illinois	1933
Steele, Mrs. John Dutton, Route 5, Box 406, Tucson, Arizona	1941
Steen, Melvin O., 4816 Service Rd., Robbinsdale, Minnesota	1941
Steggerda, Dr. Morris, Department of Genetics, Carnegie Institute of Washington, Cold Spring Harbor, Long Island, New York	1941
Steib, Peter, 1749 N. 17th St., Milwaukee, Wisconsin	1940
Stevens, Dr. Thomas Calderwood, Morningside College, Sioux City, Iowa ..	1911
Stevens, Dwight W., White Cloud, Michigan	1941
Stevenson, H[orace] Godwin, Jr., 301 College Ave., Ithaca, New York	1939
Stewart, Robert Earl, Patuxent Research Refuge, Bowie, Maryland	1939
Storer, John Humphreys, 579 Beaver St., Waltham, Massachusetts	1939
Storer, Robert Winthrop, 2420 Channing Way, Berkeley, California	1938
Stoudt, Jerome H., Box 741, Cass Lake, Minnesota	1941
Street, Thomas M., Bottineau, North Dakota	1940
Strehlow, Elmer William, 721 W. Mason St., Green Bay, Wisconsin	1941
Stringham, Dr. Emerson, Box 94, Madison, Wisconsin	1940
Stullken, Donald Edward, 5464 W. Walton St., Chicago, Illinois	1941
Swan, Kenneth D[upe], Box 778, Missoula, Montana	1939
Swanson, Miss [Bernice] Mildred, 702 E. 4th St., Newton, Iowa	1941
Taber, Wendell, 3 Mercer Circle, Cambridge, Massachusetts	1936
Tabor, Miss Ava Rogers, 305 Canal Blvd., Thibodaux, Louisiana	1940
Tallman, William S[weet], Jr., 4 Linden Place, Sewickley, Pennsylvania	1940
Tanner, James Taylor, State Teachers College, Johnson City, Tennessee	1937
Tanner, [Ward] Dean, 2928 12th Ave. S., Minneapolis, Minnesota	1940
Taylor, Miss Florence Pegg, 1125 Dennison Ave., Columbus, Ohio	1941
Taylor, Miss Joanne, 1176 Shattuck, Berkeley, California	1941
Taylor, William Ralph, Museum of Vertebrate Paleontology, University of Kansas, Lawrence, Kansas	1940
Tawney, Harry Dixon, 2418 Nicholas Place, N.W., Canton, Ohio	1941
Terres, J[ohn] Kenneth, 309 N. Franklin St., Watkins Glen, New York	1939
Thabes, Mrs. Daisy Adelaide, [Mrs. J. A., Sr.], 417 Holly St., Brainerd, Minnesota	1938
Thompson, Milton D., Museum of the Public Library, 1001 Hennepin Ave., Minneapolis, Minnesota	1940
Tipton, Samuel R[idley], 3928 Guilford St., Detroit, Michigan	1941
Todd, Mrs. Elizabeth D., 918 W. Main St., Kalamazoo, Michigan	1939

Todd, Henry Oliver, Jr., Woodbury Rd., Murfreesboro, Tennessee	1938
Todd, Mrs. Mabel [Augusta] Sellers, [Mrs. A. P.], 1622 Kensington St., Houston, Texas	1940
Tome, Miss Ann, Cooperstown, New York	1940
Tonkin, George, 1140 Park Square Bldg., Boston, Massachusetts	1935
Travis, Bernard V., Box 655, New Smyrna Beach, Florida	1935
Trump, George J[ackson], Room 110, Wildlife Conservation Bldg., Columbia, Missouri	1940
Tuttle, George Mott, Jr., River Rd., Youngstown, New York	1940
Tuttrup, Miss Jane, 3574 11th St., N.W., Washington, D.C.	1941
Tvedt, Harold B[loom], Q-55 Col. Gen. Depot, Columbus, Ohio	1941
Twomey, Dr. Arthur Cornelius, Carnegie Museum, Pittsburgh, Pennsylvania.	1936
Umbach, Miss Margaret, 2526 East Dr., Fort Wayne, Indiana	1941
Uttal, Leonard Jordan, Department of Zoology, University of Oklahoma, Norman, Oklahoma	1940
Van Coevering, Jack, 9816 Ingram-Rosedale Gardens, Plymouth, Michigan.	1939
Van Dyke, Ellen C., 824 Gilbert St., Columbus, Ohio	1941
Vaniman, Miss Nora S., 408 W. Iowa St., Urbana, Illinois	1941
Vesall, David Bernard, Stillwater, Minnesota	1940
von Bloeker, Jack C[hristian], Jr., Allan Hancock Foundation, University of Southern California, Los Angeles, California	1940
Vonnegut, Miss Pauline, 1804 Park Ave., Indianapolis, Indiana	1939
Wade, Douglas E., Department of Zoology, University of Missouri, Columbia, Missouri	1936
Wagner, Russel O[lson], 1528 Thurston Ave., Racine, Wisconsin	1940
Walbridge, Miss Marion Elizabeth, 107 Chaddock Ave., Hornell, New York	1941
Wallace, George John, Pleasant Valley Sanctuary, Lenox, Massachusetts ...	1937
Wallis, Miss Virginia Dare, 612 Bridge St., Johnsonburg, Pennsylvania.	1941
Walton, Philip Coates, University Club, Kingston, Rhode Island	1941
Wanless, Dr. Harold R[ollin], 704 S. McCullough St., Urbana, Illinois	1940
Warner, Mrs. Carmen Hambleton, 117 W. Hubbard Ave., Columbus, Ohio.	1939
Watson, Frank Graham, 1217 Oak Grove Ave., Burlingame, California	1937
Watson, Lucius H., 4013 Sheridan Blvd., Lincoln, Nebraska	1925
Wear, John Frederick, 505 N. Walnut St., Starke, Florida	1941
Weaver, Dr. Richard Lee, Dartmouth College, Hanover, New Hampshire.	1936
Webb, James W., 1220 4th Ave., Gadsden, Alabama	1941
Webster, J[ackson] Dan, Biology Department, Rice Institute, Houston, Texas	1939
Webster, [Noah] Randall, 341 Western Ave., Brookville, Pennsylvania	1940
Welles, Mrs. Mary Pyke, Route 2, Ossining, New York	1938
Wells, Mrs. Rolla H., 3819 Zenith Ave. S., Minneapolis, Minnesota	1938
Wessel, John P., Wright City Junior College, 3400 Austin Blvd., Chicago, Illinois	1941
West, Russell, 113 Edgewood St., Wheeling, West Virginia	1941
Whittemore, Miss Arlene M., Plymouth, New Hampshire	1941
Widmann, Berthold, 4621 Wesley Ave., Los Angeles, California	1936
Wight, Howard Marshall, School of Forestry and Conservation, University of Michigan, Ann Arbor, Michigan	1935
Wilcox, Harry Hammond, Jr., Madison Ct., Ann Arbor, Michigan	1938
Wiles, Dr. Harold O[liver], 6038 Dorchester Ave., Jackson Park Station, Chicago, Illinois	1936
Wilson, Mrs. Carl, 6208 Yinger St., Dearborn, Michigan	1941
Wilson, Mrs. E. O., [Mrs. Nellie Ottueau], Montevideo, Minnesota	1939
Wilson, Harold Charles, Ephraim, Wisconsin	1938
Wilson, Louis Wayne, Moorefield, West Virginia	1941

Wilson, Miss Rose Brunner, 1539 E. River Terrace, Minneapolis, Minnesota	1940
Wilson, Rowland Steele, 5274 Riverside Dr., Columbus, Ohio	1941
Wiltshire, Mrs. Grace T., Randolph-Macon Woman's College, Lynchburg, Virginia	1941
Wing, Harold F., Route 3, Jackson, Michigan	1941
Winterbottom, J[ohn] M[iall], African Education Office, Mazabuka, Northern Rhodesia	1939
Wollerman, Edward Henry, 4513 Laffin Ave., Cleveland, Ohio	1938
Woodward, Arthur Jason, 504 Kahkwa Blvd., Erie, Pennsylvania	1937
Worley, John G., 237 Charleston St., Cadiz, Ohio	1936
Wright, Earl G., Neville Public Museum, 129 S. Jefferson St., Green Bay, Wisconsin	1935
Wright, Ernest Bicknell, 140 W. Chestnut Ave., Chestnut Hill, Philadelphia, Pennsylvania	1941
Wright, J[ohn] T[homas], Route 5, Box 665, Tucson, Arizona	1941
Wright, Philip L[incoln], Montana State University, Missoula, Montana....	1940
Wright, Thomas, Jr., Rhode Island Agricultural Experiment Station, Kingston, Rhode Island	1939
Wyman, Miss Mary May, 1040 Mary St., Louisville, Kentucky	1940
Yeager, Lee E[mmett], Illinois Natural History Survey, Urbana, Illinois ...	1939
Young, James Boswell, 2516 Talbott Ave., Louisville, Kentucky	1937



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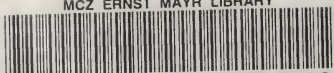
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